Journal of Epidemiology and Public Health (2022), 07(03): 367-379
Masters Program in Public Health, Universitas Sebelas Maret

Meta-Analysis

Meta-Analysis: Effects of Night Shift Work on Hypertension and Sleep Patterns in Factory Workers

Amanda Kesli Ramadhani[1)], Hanung Prasetya[2)], Bhisma Murti[1)]

[1)]Masters Program in Public Health, Universitas Sebelas Maret
[2)]Health Polytechnics, Ministry of Health Surakarta

ABSTRACT

Background: Night shift work has an impact on the health of factory workers. One of the impacts of night shift work is the risk of hypertension and disturbed sleep patterns. The purpose of this study was to determine how big the effect of night shift work on hypertension and sleep patterns in factory workers.
Subjects and Method: This was a meta-analysis and systematic study with the population: factory workers. Intervention: night shift work. Comparation: morning and afternoon shift work. Outcome: hypertension and sleep patterns. The article search process was carried out according to the PRISM Flow Diagram and searched through several indexes such as PubMed, ScienceDirect, Google Schoolar, and Springer Link with the search keywords "Night Shift" AND "Hypertension" AND "Sleep" AND "Worker". The articles used are articles from 2013-2022 and are written in English.
Results: A total of 11 articles originating from the Asian continent (China, Indonesia, South Korea, Malaysia, and Japan) were considered suitable for meta-analysis. From the results of data analysis that has been carried out, it is known that factory workers who work night shifts have a risk of experiencing hypertension (aOR= 3.43; 95% CI= 2.48 to 4.72; p<0.001), and disturbed sleep patterns (aOR= 3.63; 95% CI= 2.66 to 4.95; p<0.001) compared with morning and afternoon shift workers and the results were statistically significant.
Conclusion: Night shifts can increase the risk of hypertension and sleep disturbances in factory workers.

Keywords: Night shift, hypertension, sleep pattern, factory worker

Correspondence:
Amanda Kesli Ramadhani. Masters Program in Public Health, Universitas Sebelas Maret, Jl. Ir. Sutami No.36, Kentingan, Jebres, Surakarta 57126, Central Java. Email. amandakesly@yahoo.com. Mobile: 085692832776.

Cite this as:
Ramadhani AK, Prasetya H, Murti B (2022). Meta-Analysis: Effects of Night Shift Work on Hypertension and Sleep Patterns in Factory Workers. J Epidemiol Public Health. 07(03): 367-379. https://doi.org/10.-26911/jepublichealth.2022.07.03.09.

BACKGROUND

The industrial sector in Indonesia is very diverse, ranging from the food industry, cosmetics, textiles, transportation, electronics, energy generation, upstream, metals to the chemical industry. In the national industrial development master plan for 2015-2035, Indonesia targets to strengthen all fields in the industrial sector as a goal to realize the Vision of becoming a Resilient Industrial State (Ministry of Industry, 2019). The production process in the industrial sector generally runs continuously and without stopping, resulting in the need for a good and effective division of working hours so that workers do not work excessi-

vely and get bad effects such as psychological disorders and body functional disorders.

Generally, the application of work shifts will affect several things in the lives of workers such as sleeping hours, meal times, activity times, rest periods, and energy use (Hemmer et al., 2021). Shift work, especially night shifts, can cause disturbances in sleep patterns and rest periods, where sleep disturbances and rest periods have an impact on changes in sleeping hours and disturbances in sleep. Chronic sleep disturbances can impair blood circulation, increase blood pressure and increase heart rate. Some of these disorders will result in the risk of hypertension (Park et al., 2019).

The implementation of work shifts is important to do, especially for companies that carry out work processes or production processes that continue for 24 hours. However, seeing the negative impact of implementing this shift, it is necessary to make efforts to minimize this impact. So, the important role of experts, ranging from health workers, health promotion experts, occupational health and safety experts, the government to the company to make efforts to reduce the negative impact of implementing shift work.

The most common impacts due to the implementation of work shifts, especially on night shifts, are disturbances in sleep patterns and the risk of hypertension. To avoid and reduce this impact, it is recommended to check blood pressure regularly, maintain a healthy diet, lead a healthy lifestyle and not delay work so that there are no night work hours (Yeom et al., 2017).

Based on (IARC, 2010) shift work is a system of applying different working hours to normal working hours, which is outside 7 or 8 am to 5 or 6 pm every day. Shift work is the application of working hours that are not bound by the same time or can be adjusted as needed, have several variations of working hours and are not the same as the usual working hours.

Normal human blood pressure for systolic pressure is 110 mmHg while for diastolic blood pressure is 90 mmHg. Meanwhile, for someone who has a history of hypertension, systolic blood pressure is more than 140 mmHg and diastolic blood pressure is more than 90 mmHg. Hypertension can be influenced by many things such as heredity, gender, age and lifestyle, where lifestyles such as exercise habits, healthy eating patterns and physical activity greatly affect the incidence of hypertension (Hastuti, 2019). Sleep can be defined as a behavior when physical activity is reduced, there is reduced interaction with living things and with the environment, and is generally characterized by positions such as lying down, sitting and eyes closed. Functional sleep can help grow and develop as well as to maximize the learning process (Muniz, 2012).

Various studies have been conducted to determine the effect of night shift work on hypertension and sleep patterns, but the results of these studies are still inconsistent. In research conducted by (Guo et al., 2013) and (Yeom et al., 2017) (Yeom et al., 2017) it is known that night shift work is one of the risk factors for hypertension and disrupts worker patterns. Meanwhile, according to (Lu et al., 2017) and (Ceide et al., 2015) stated that there is no relationship between hypertension and sleep patterns with night shift work. Therefore, the purpose of this study was to determine the effect of night shift work on hypertension and sleep patterns in factory workers.

SUBJECTS AND METHOD

1. Study Design

This research is a meta-analysis and systematic study. Article searches were conducted based on the PRISM Flow Diagram and through several indexes such as PubMed, ScienceDirect, Google Schoolar, and Springer Link. The research articles used are research from 2013-2013. The keywords used in the article search were "Night Shift" AND "Hypertension" AND "Sleep" AND "Worker".

2. Inclusion Criteria

The inclusion criteria in this study were the articles used were primary studies with a cross sectional study design, research related to the effect of shift work on hypertension and sleep patterns in factory workers, and a quantitative study that had statistical values of OR/mean/median/SD/ 95%CI, written in both English and Indonesian, published articles from 2013-2022.

3. Exclusion Criteria

The exclusion criteria for this research are qualitative research articles, using a non-cross sectional study design, research conducted before 2013 and written in languages other than English and Indonesian.

4. Operational Definition of Variables

This research is a meta-analysis and systematic study written based on the predetermined PICO formula. The PICO formulation in this study is population: factory workers, intervention: night shift work, comparison: morning and afternoon shift work and outcome: hypertension and sleep patterns.

Shift work is a night shift work hours carried out to meet the company's operational needs for 24 hours. The night shift pattern usually applies at 20.00– 03.00 or 23.00 – 07.00 am.

Hypertension is a condition where the blood pressure value reaches 140/90 mmHg or more.

Sleep pattern is a good quality of sleep measured by the duration of sleep and the presence or absence of disturbances during sleep.

5. Study Instruments

This research was conducted using the PRISMA Flow Diagram guide for article search and using the Critical Appraisal Checklist for Analytical Cross- sectional Studies (Joanna Briggs Institute 2017).

6. Data Analysis

Data analysis was carried out with the help of computer software, namely the review manager application (RevMan 5.3). Forest plots and Funnel plots will be used to determine the size of the effect of the effect of night shift work on hypertension and sleep patterns in factory workers and also to determine the heterogeneity of the data. Fixed effect model is used for homogeneous data, while random effect is used for heterogeneous data across sectors.

RESULTS

The article search process in this study was carried out using the PRISM Flow Diagram guide and through several indexing such as PubMed, ScienceDirect, Google Scholar, and Springer Link which can be seen in Figure 1. In the early stages of article search, 629 articles were found. Then from that stage, checks for duplication, suitability of titles, abstracts to full articles are carried out. So, in the end, 11 articles were obtained for 2 outcomes in this study, namely hypertension and sleep patterns. The research articles used are primary research that has been carried out in various countries such as China, Indonesia, Japan, South Korea, and Malaysia, this can be seen in Figure 2.

The articles that will be used for meta-analysis and systematic studies have previously gone through the process of assessing the quality of the articles which can be seen in table 1. Then in table 2 it can be seen about the details of the articles used in this study, such as the study population, intervention, comparison, and the results of the research. each study. All articles used in this study were articles with a cross sectional study design and were written in English.

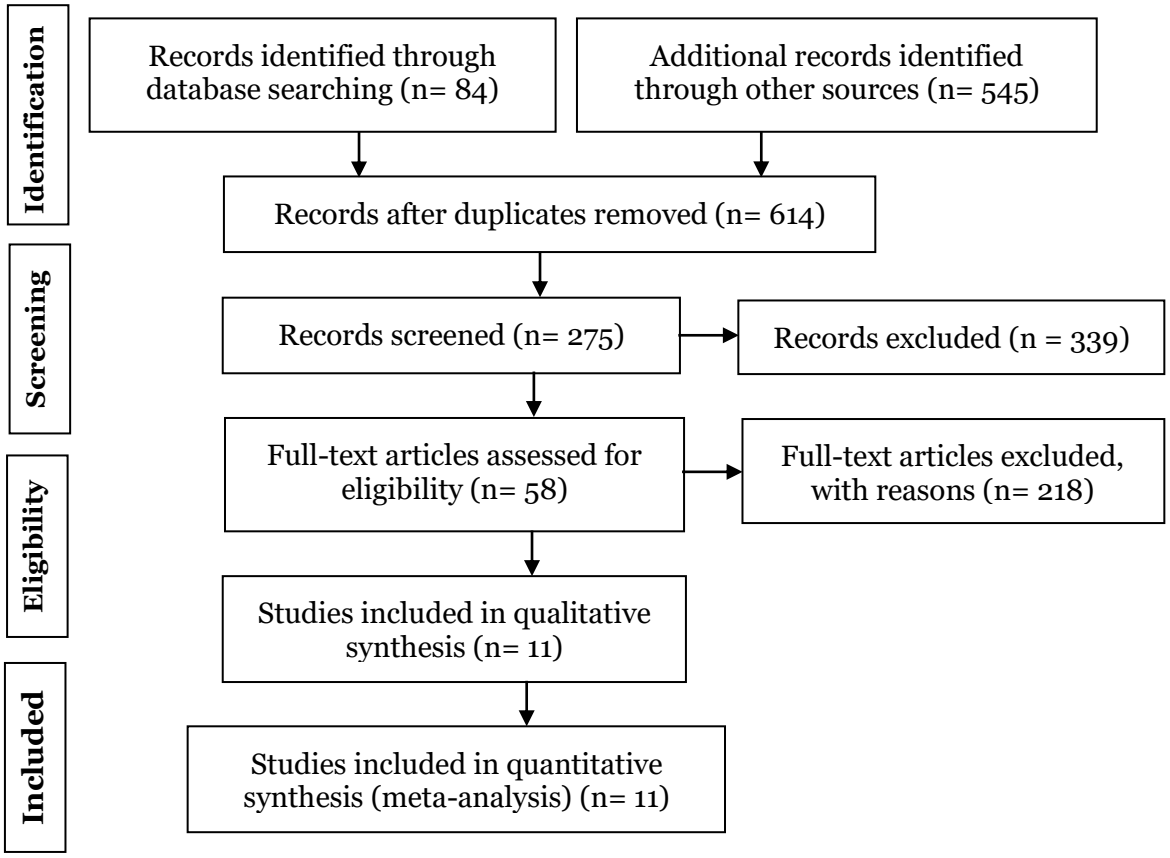

Figure 1. PRISMA Flowchart

Figure 2. Map of study area

Table 1. Assessment of study quality using the Critical Appraisal Checklist for Cross-sectional published by Checklist for Cross-sectional Study published (CEBM)

No	Indicators	Publication (Author, Year)								
		Yang et al. (2021)	Debora et al. (2020)	Lu et al. (2017)	Kawabe et al. (2014)	Lim et al. (2020)	Yeom et al. (2017)	Sheon et al. (2016)	Kim et al. (2015)	Oh et al. (2014)
1	Were the inclusion criteria well explained?	1	1	1	1	1	1	1	1	1
2	Is the subject and location of the research clear?	1	1	1	1	1	1	1	1	1
3	Is the measurement of the independent variable valid and reliable?	1	1	1	1	1	1	1	1	1
4	Is there a standard of measurement in the study?	1	1	1	1	1	1	1	1	1
5	Is there a counfounding factor?	1	1	1	1	1	1	1	1	1
6	Is there control over the counfounding factors?	1	1	1	1	1	1	1	0	1
7	Is the measurement of the dependent variable valid and reliable?	1	0	1	1	1	1	1	1	1
8	Was a good data analysis done?	1	1	1	1	1	1	1	1	1
Total		**8**	**7**	**8**	**8**	**8**	**8**	**8**	**7**	**8**

Note: 1: Yes; 0: No

Table 2. Description of primary studies included in the meta-analysis

Author (Year)	Country	Study Design	Sample	Population	Intervention	Comparison	Outcome	aOR (95%CI)
Yang et al. (2021)	China	Cross sectional	3040	Oil Factory Workers	Night Work Shift	Morning and Afternoon Shift	Sleep Patterns and Hyper-tension	1.70 (1.17 to 2.47)
Debora and Widanarko (2020)	Indonesia	Cross sectional	107	Construction company workers	Night Work Shift	Morning and Afternoon Shift	Hypertension	7.47 (2.48 to 4.32)
Lu et al. (2017)	China	Cross sectional	4519	Stone Factory Workers	Night Work Shift	Morning and Afternoon Shift	Sleep Patterns and Hypertension	1.97 (1.40 to 2.79)
Kawabe et al. (2014)	Japan	Cross sectional	4427	Factory worker	Shift work	Non-Shift Work	Hypertension	1.51 (0.98 to 1.97)
Lim et al. (2018)	China	Cross sectional	494	Manufacturing Factory Workers	Night Work Shift	Morning and Afternoon Shift	Sleep Pattern	-1.43 (-2.15 to -0.84)
Yeom et al. (2017)	South Korea	Cross sectional	1953	Chemical Factory Workers	Night Work Shift	Morning and Afternoon Shift	Hypertension	1.51 (1.11 to 2.06)
Shon et al. (2016)	South Korea	Cross sectional	4750	Electronics Factory Workers	Shift work	Non-Shift Work	Sleep Pattern	1.95 (1.58 to 2.41)
Kim et al. (2015)	South Korea	Cross sectional	2818	Manufacturing Factory Workers	Night Work Shift	Morning and Afternoon Shift	Sleep Pattern	1.42 (1.13 to 1.77)

Table 2. Cont.

Author (Year)	Country	Study Design	Sample	Population	Intervention	Comparison	Outcome	aOR (95%CI)
Oh et al. (2014)	South Korea	Cross sectional	1029	Aluminum Factory Workers	Shift work	Non-Shift Work	Hypertension	1.39 (0.91 to 2.13)
Itani et al. (2022)	Japan	Cross sectional	2375	Factory worker	Shift work	Non-Shift Work	Sleep Pattern	0.90 (0.60 to 1.36)
Wang et al. (2022)	China	Cross sectional	3240	Aluminum Factory Workers	Night Work Shift	Morning and Afternoon Shift	Sleep Pattern	1.64 (1.10 to 2.46)
Anane et al. (2015)	Japan	Cross sectional	200	Chocolate Factory Workers	Night Work Shift	Morning and Afternoon Shift	Hypertension	0.40 (0.13 to 0.73)

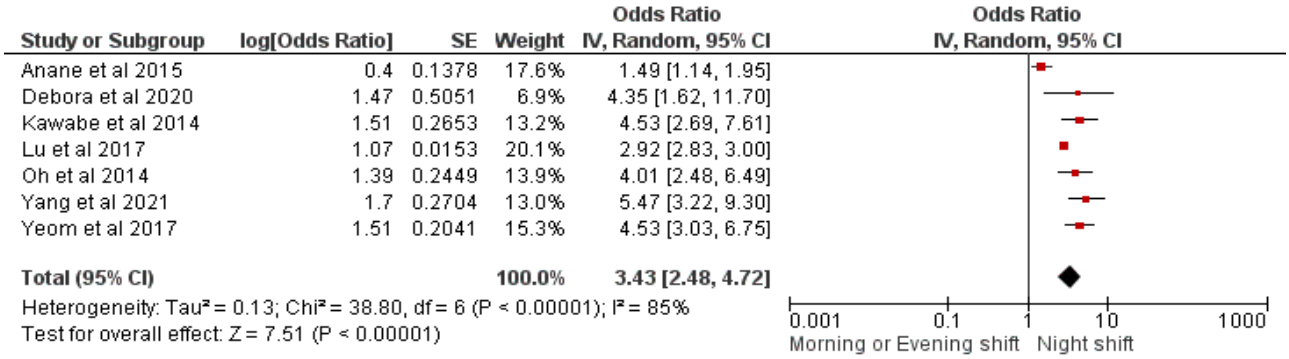

Figure 3. Forest plot of night shift effect on hypertension

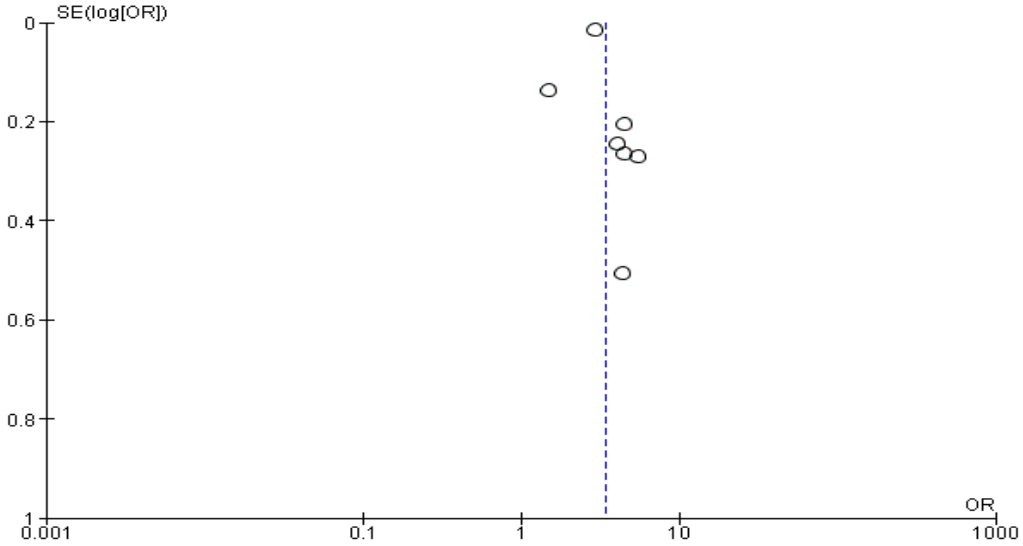

Figure 4 Funnel plot Effects of Night Shift Work on Hypertension

a. Forest plot

The results of the meta-analysis of the effects of night shift work on hypertension can be seen through the forest plot in Figure 3, where from these results it is known that night shift work affects the risk of increasing hypertension. Factory workers who work on night shifts have a risk of experiencing hypertension by 3.43 times compared to morning and afternoon shifts and is statistically significant (aOR= 3.43; 95% CI= 2.48 to 4.72; p<0.001). The heterogeneity of the data I^2= 85% so that the distribution of the data is declared heterogeneous (random effect model).

b. Funnel plot

Based on Figure 4. it shows that there is a publication bias which is indicated by the asymmetry of the right and left plots where 5 plots are on the right and 2 plots are on the left. The plot on the right of the graph appears to have a standard error (SE) between 0.2 and 0.5. The plot on the left of the graph appears to have a standard error (SE) between 0 and 0.2. Bias also occurs from the imbalance between the distances between studies on both the right and left sides of the funnel plot.

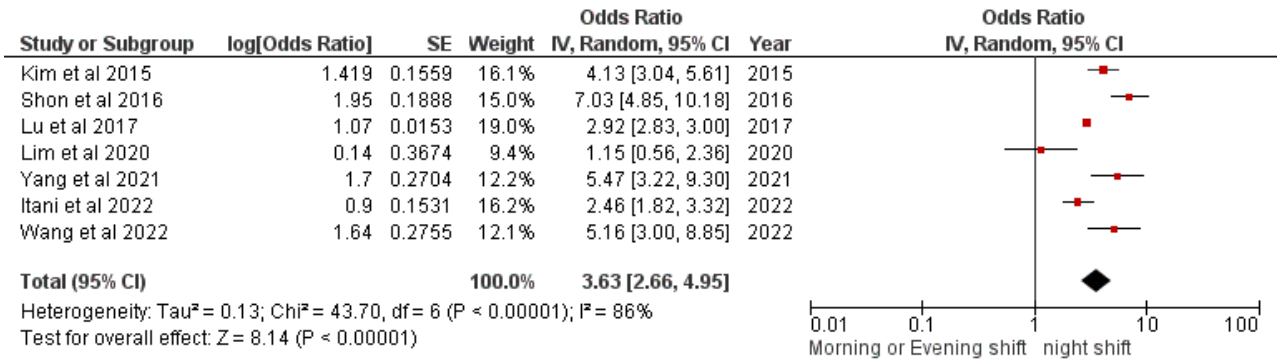

Figure 5. Forest plot of Night Shift Work Effect on Sleep Pattern

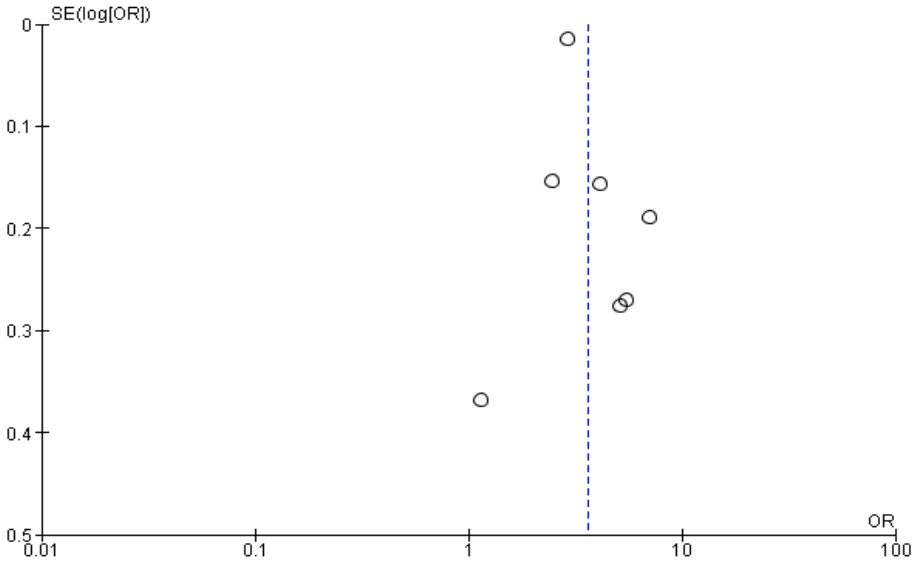

Figure 6. Funnel plot of the Effect of Night Shift Work on Sleep Patterns

a. Forest plot

The results of the meta-analysis of the effects of night shift work on sleep patterns can be seen through the forest plot of Figure 5, where from these results it is known that night shift work affects workers' sleep patterns. Factory workers who work on night shifts have a 3.63 times risk of disturbed sleep patterns compared to morning and afternoon shifts and are statistically significant (aOR= 3.63; 95% CI= 2.66 to 4.95; p< 0.001). The heterogeneity of the research data showed I^2= 86% so that the distribution of the data was declared heterogeneous (random effect model).

b. Funnel plot

Figure 6 shows that there is a publication bias which is indicated by the asymmetry of the right and left plots, where 4 plots are on the right and 3 plots are on the left. The plot on the right of the graph appears to have a standard error (SE) between 0.1 and 0.3. The plot on the left of the graph appears to have a standard error (SE) between 0 and 0.4. Bias also occurs from the imbalance between the distances

between studies on both the right and left sides of the funnel plot.

DISCUSSION

This research is a meta-analysis and systematic study, with the final result knowing how much effect night shift work has on hypertension and sleep patterns in factory workers. The data collection process uses the PRISMA Flow Diagram guide. Data analysis was carried out with the help of computer software, namely the review manager application (RevMan 5.3). the final result of this research is displayed in the form of forest and funnel plots.

The forest plot shows information about each study and visually shows the magnitude of variation or heterogeneity of the study results, while the funnel plot is later used to show the magnitude of the study effect from various studies measured in different ways (Murti, 2018).

From the article search process, 11 primary research articles were found regarding the effects of night shift work on hypertension and sleep patterns in factory workers. The research was conducted in various countries such as China, Indonesia, South Korea, Japan and Malaysia.

The search and determination of the articles used were carried out in accordance with the PRISMA Flow Diagram and the inclusion and exclusion criteria that had been previously determined. The inclusion criteria in this study are research articles published in 2013-2022, research with a cross sectional study design, written in English or Indonesian and have statistical values in the form of adjusted odds ratio (aOR) and confident interval (CI).

In this study, a cross sectional study design was used to determine the effect of night shift work (Intervention) on hypertension and sleep patterns (Outcome) in the research subject, namely factory workers. In the research, factory workers are referred to not only from one type of factory work but from several types of work, such as motorcycle factory workers, industrial factory workers, chemical factory workers, stone, and aluminum factory workers. The similarity of characteristics in the research population is regarding the duration of working hours and also work shifts, namely night shift workers and working for 8 hours per day.

1. Effects of night shift work on hypertension

night shift has an effect on the risk of increasing hypertension. Factory workers who work on night shifts have a 3.43 times higher risk of developing hypertension compared to morning and afternoon shifts. The effect between night shift work and hypertension was shown to be significant (aOR= 3.43; 95% CI= 2.48 to 4.72; p <0.001). The heterogeneity of the research data shows I^2= 85% so that the distribution of the data is declared heterogeneous (random effect model).

The results of the effect of night shift work on hypertension are in line with research conducted by (Yeom et al, 2017) regarding the relationship between work shifts and the incidence of hypertension in factory workers in South Korea, it is known that work shifts are associated with the incidence of hypertension. In his research, it was explained that work shifts can affect hypertension from 2 things, the first is the duration of work and the length of work of

workers. The longer the duration and working period of a person, the higher the risk of hypertension. On average, shift workers who are affected by hypertension due to their working hours have a working period of about 20 years, but it also does not rule out the possibility of a lower working period of <10 years having a risk of developing hypertension. Blood pressure in shift workers will be more difficult to regulate than non-shift workers. Therefore, it is necessary to have regular blood pressure measurements and maintain a healthy lifestyle to avoid the risk of hypertension. In a study conducted by (Anane et al, 2015) it was also explained that work shifts can increase stress on workers. Work stress will lead to unhealthy lifestyles and patterns, such as alcohol consumption. Work stress is also a risk factor for hypertension. This study also explained that there was a decrease in the trend of hypertension in shift workers aged 50-59 years, this was because the company provided a heavier workload at a more productive age and caused the elderly to have lower stress levels.

Shift work, especially night shifts, can affect the incidence of hypertension in workers, but there are also other things that make it worse, such as alcohol consumption, physical activity, exercise habits, and most importantly good sleep habits and patterns.

2. The effect of night shift work on sleep patterns

Based on the primary research used, 2 measurements were used to measure sleep patterns of workers, namely PSQI and AIS. Poor sleep patterns such as the habit of waking up during sleep, short sleep duration and poor sleep quality can have an impact on increasing the risk of hypertension, this can be exacerbated if you are a shift worker, especially the night shift (Yang et al, 2021). Night shifts can affect sleep patterns and disrupt circadian rhythms. Where this can be a risk factor for hypertension. The mechanism of night shift work can affect the sympathetic nervous system, endothelial dysfunction, and kidney work (Guo et al, 2013).

The results of the analysis of the effect of night shift work on sleep patterns in factory workers are also in line with research conducted by (Kim et al., 2015). It was explained in the study that night shifts affect a person's sleep quality. As for things that also affect work shifts, such as type of work, work shift rotation patterns, number of night shifts, and rest periods and holidays. In general, night shift workers have less sleep and lower levels of concentration than non-shift workers. Where things like lack of sleep and low concentration of workers are things that must be considered so as not to cause accidents.

Disruptions to sleep patterns due to night shifts are generally in the form of difficulty sleeping, insomnia, waking at night, and drowsiness during the day (Wang et al., 2022). Sleep disturbances due to shift work can be exacerbated by several factors such as length of work, alcohol consumption, duration of work shifts, working hours per week, smoking habits, physical activity, and rest periods (Shon et al., 2016). Based on tests that have been carried out on animals and people suffering from insomnia, lack of sleep can increase sympathetic activity and cause vascular endothelial dysfunction. Insomnia can also

lead to higher systolic blood pressure, a higher risk of developing hypertension, diabetes and dyslipidemia (Wang et al., 2022).

AUTHOR CONTRIBUTION

Amanda Kesli Ramadhani as the main writer who determines the topic, searches for and determines the article, Hanung Prasetya and Bhisma Murti conduct data analysis and conduct a writing review.

AKCNOWLEDGMENT

The authors are grateful for the ease of accessing data on PubMed, Google Schoolar, Science Direct and Link Springer.

CONFLICT INTEREST

There is no conflict of interest in this study.

FUNDINGS AND SPONSORSHIP

This study is self-funded.

REFERENCES

Anane H, Abdul L A, Ofori EK, Abdul R M, Amanquah SD (2015). Shift work and the risk of cardiovascular disease among workers in cocoa processing company, Tema. BMC Res. Notes 8. doi: 10.1186/s13104-015-1750-3.

Ceide ME, Pandey A, Ravenell J, Donat M, Ogedegbe G, Jean-Louis G (2015). Associations of Short Sleep and Shift Work Status with Hypertension among Black and White Americans. Int. J. Hypertens. 697275. doi: 10.1155/2015/697275.

Debora HS, Widanarko B (2020). The association between night shift work and hypertension among workers at a construction company in jakarta. Malaysian J. Med. Heal. Sci. 16: 100–105.

Guo Y, Liu Y, Huang X, Rong Y, He M, Wang Y, Yuan J, et al. (2013). The Effects of shift work on sleeping quality, hypertension and diabetes in retired workers. PLoS One 8: 1–6. doi: 10.1371/journal.pone.0071107

Hastuti AP (2019). HIPERTENSI (HYPERTENSION) - Google Buku, Penerbit Lakeisha. Penerbit Lakeisha.

Hemmer A, Mareschal J, Dibner C, Pralong JA, Dorribo V, Perrig S, Genton L, et al. (2021). The effects of shift work on cardio-metabolic diseases and eating patterns. Nutrients 13. doi: 10.339-0/NU13114178.

Itani O, Kaneita Y, Otsuka Y, Tokiya M, Jike M, Matsumoto Y, Nakagome S, et al. (2022). A cross-sectional epidemiological study of the relationship between sleep duration, quality, and rhythm and presenteeism in workers. Sleep Biol. Rhythms 20: 53-63. doi: 10.1007/S41105-021-00339-4/TABLES/5.

Kawabe Y, Nakamura Y, Kikuchi S, Murakami Y, Tanaka T, Takebayashi T, Okayama A, et al. (2014). Relationship between shift work and clustering of the metabolic syndrome diagnostic components. J. Atheroscler. Thromb. 21: 703-711. doi: 10.5551/jat.19380.

Kementerian Perindustrian. (2019). Kemenperin: Industri Tekstil dan Pakaian Tumbuh Paling Tinggi. Kementrian Perindustrian 7 November 2019.

Kim JY, Chae CH, Kim YO, Son JS, Kim JH, Kim CW, et al. (2015). The

relationship between quality of sleep and night shift rotation interval. Ann. Occup. Environ. Med. 27: 1–8. doi: 10.1186/s40557-015-0084-x.

Lim Y, Hoe V, AD O (2018). Association between night-shift work, sleep quality and metabolic syndrome. oem.bmj.com.

Lu K, Chen J, Wang L, Wang C, Ding R, Wu S, Hu D (2017). Association of sleep duration, sleep quality and shift-work schedule in relation to hypertension prevalence in chinese adult males: A cross-sectional survey. Int. J. Environ. Res. Public Health 14. doi: 10.3390/ijerph14020210.

Lu K, Chen J, Wang L, Wang C, Ding R, Wu S, Hu D (2017). Association of sleep duration, sleep quality and shift-work schedule in relation to hypertension prevalence in chinese adult males: A cross-sectional survey. Int. J. Environ. Res. Public Health 14. doi: 10.3390/ijerph14020210.

Lyon: International Agency for Research on Cancer. (2010). IARC Monographs on the Evaluation of Carcinogenic Risk to Humans.

Muniz EI (2012). A Clinical Guide to Pediatric Sleep. J Dev Behav Pediatr. 33: 95. doi: 10.1097/dbp.0b013e318-23c5f81.

Murti B (2018). Prinsip dan metode riset metodologi. Surakarta : Program Studi Ilmu Kesehatan Masyarakat, Program Pascasarjana, Universitas Sebelas Maret, 2018, Surakarta.

Oh JS, Choi WJ, Lee MK, Han SW, Song SH, Yun JW, Han SH (2014). The association between shift work and hyperuricemia in steelmaking male workers. Ann. Occup. Environ. Med. 26. doi: 10.1186/S40557-014-0042-Z.

Park S, Lee JH, Lee W (2019). The effects of workplace rest breaks on health problems related to long working hours and shift work among male apartment janitors in Korea. Saf. Health Work 10: 512–517. doi: 10.1016/J.SHAW.2019.10.003

Shon Y, Ryu S, Suh BS, Kim SG, Kim WS, Son HS, Kim HY, et al. (2016). Comparison of sleep quality based on direction of shift rotation in electronics workers. Ann. Occup. Environ. Med. 28. doi: 10.1186/s40557-016-0122-3.

Wang L, Zhang S, Yu M, Yuan J (2022). Association between insomnia and subclinical atherosclerosis among Chinese steelworkers: a cross-sectional survey. Arch. Public Heal. 80. doi: 10.1186/s13690-022-00834-1.

Wiersinga WJ, Rhodes A, Cheng AC, Peacock SJ, dan Prescott HC (2020). Pathophysiology, transmission, diagnosis, dan treatment of coronavirus disease 2019 (COVID-19): A Review. J. Am. Med. Assoc. 324(8): 782–793. doi: 10.1001/JAMA.2020.12839.

Yang F, Zhang Y, Qiu R, Tao N (2021). Association of sleep duration and sleep quality with hypertension in oil workers in Xinjiang. PeerJ 9: e11318. doi: 10.7717/peerj.11318.

Yeom JH, Sim CS, Lee J, Yun SH, Park SJ, Yoo CI, Sung JH (2017). Effect of shift work on hypertension: Cross sectional study. Ann. Occup. Environ. Med. 29: 1–7. doi: 10.1186/s40557-017-0166-z.