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THE RELATIONSHIP OF SHIFT AND NON-SHIFT SYSTEMS ON OBESITY IN HEALTHCARE WORKERS RSUD BANTEN

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ABSTRACT

Obesity is a major health challenge for the world, especially Indonesian society, obesity is one of the five main risk factors involved in the highest incidence of death and disability in Indonesia. Jobs with a shift work system have a negative impact on health involving disruption of circadian rhythms, thereby increasing the risk of obesity. This research was conducted with a cross sectional study design. The data used is primary data from measurements of the respondent's body mass index. The research subjects consisted of 144 health workers at Banten District Hospital who were selected using a stratified random sampling technique. Data analysis used the Chi-Square statistical test. Of the 144 Banten Regional Hospital health workers, 44 respondents (61.1%) with a shift work system were obese and 31 respondents (43.1%) with a non-shift work system were obese. In the analysis, it was found that the p value was <0.05 and the OR was 2.078 (1.068-4.04) so that statistically there was a significant relationship between shift work systems and non-shift work systems and obesity in health workers at the Banten District Hospital. There is a relationship between shift work systems and non-shift work systems and obesity in health workers at Banten District Hospital. Health workers with a shift work system are 2.078 times more at risk of experiencing obesity than health workers with a non-shift work system.

Keyword: Obesity, shift work system, non-shift work system, circadian rhythm disorders

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INTRODUCTION

Jobs with shift work systems have a detrimental impact on health involving disturbances to circadian rhythms, which can lead to obesity and metabolic syndromes such as central obesity, insulin resistance, abnormal lipid profiles, and increased blood pressure.[1] Non-shift work system can also negatively affect health, with the possibility of obesity when workers have poor lifestyles, such as being less physically active and having poor sleep quality. [2] Poor sleep quality plays a significant role in regulating leptin and ghrelin hormones. Poor sleep quality can increase energy intake through decreased leptin hormone levels and increased ghrelin hormone levels. Because of changes in leptin and ghrelin hormone levels, the risk of obesity may increase.[3]

Obesity presents a significant health challenge to the world, especially in Indonesian society, as it is a risk factor for non-communicable diseases such as cardiovascular diseases and diabetes. According to the Global Burden of Disease (GBD) in 2019, obesity is one of the five major risk factors contributing to the highest rates of death and disability in Indonesia.[4] According to the World Health Organization (WHO), the prevalence of obesity tripled from 1975 to 2016. According to the Basic Health Research (Riskesdas) results, Indonesia had an obesity prevalence of 21.8% in 2018, with the prevalence of obesity in Banten in 2018 being above the national average.[5,6] Generally, healthcare workers bear a significant workload, especially in RSUD Banten as the Provincial Government Hospital of Banten. This can be seen from the total number of inpatient visits in 2022 at RSUD Banten, which reached 14,717 patients.[7]

There are two work systems implemented in hospitals: shift work system and non-shift work system. Shift work system typically involve three time divisions: morning, afternoon, and night. Non-shift work system are carried out every day for seven hours per day over six working days. In Law Number 6 of 2023 concerning Manpower, there are no specific regulations regarding the timing and work system in hospitals. Chapter 77 section 2 only specifies working hours, which are set at seven hours per day over six working days and eight hours per day over five working days.[8]

Researchers have found several studies related to the relationship between shift work systems and obesity. A meta-analysis of twenty-six studies showed a connection between shift workers and obesity.[9] However, another meta-analysis of six studies on nurses with cross-sectional studies did not find an increased prevalence of obesity among shift workers.[10]

The presence of two meta-analyses with differing results above prompts researchers to conduct a study on the relationship between shift work system and non-shift work system with obesity.[9,10] According to Riskesdas, the prevalence of obesity in Banten province in 2018 was above the national average, and there is currently no data available on obesity among healthcare workers, especially in

Banten Province. Therefore, it is important to conduct research on obesity in Banten.[6] Furthermore, the absence of research on the relationship between shift work system and non-shift work system with obesity, especially among healthcare workers at RSUD Banten, encourages researchers to conduct a study on the association between shift work system and non-shift work system with obesity among healthcare workers at RSUD Banten.

METHODS

The research design is cross-sectional aimed to determine the relationship between shift work system and non-shift work system with obesity among healthcare workers at RSUD Banten. The minimum sample size in this study is 144 samples. Sampling is done by probability sampling so that all accessible population subjects have equal opportunities to be selected as research respondents. The study was conducted in outpatient units, inpatient units, pharmacy units, and laboratory units, so sampling techniques were performed using stratified random sampling to ensure that respondents in each unit have an equal opportunity to be selected or not selected as research respondents. Additionally, the technique of taking samples using stratified random sampling was chosen to facilitate researchers in sampling in each unit by randomly selecting from each unit. The tool used is the seca 755 column medical scale. [12]

In the study, primary data collection was conducted with the results of height and weight measurements on healthcare workers with shift work system and non-shift work system at RSUD Banten. After data collection, data processing was carried out using Statistical Program for Social Science (SPSS) version 27.0 software, consisting of univariate analysis (displaying respondent characteristics, such as age, gender, work system, and body mass index in the form of frequency and percentage) and bivariate analysis with chi-square test to obtain the relationship between independent variables (shift work system and non-shift work system) with dependent variables (obesity). The processed data were then presented in the form of research tables according to the stipulated regulations and a report was made based on the analyzed data. The study involved humans as respondents, so research ethics approval was required; this study was approved by the Ethics Committee with letter number 16/UN43.20/KEPK/2024.

RESULTS

A. Overview of Research Location & Sampling Procedure

According to the Minister of Health Decree Number 01/36/KLS/kes/BKPMT/2015, Banten Regional General Hospital (RSUD) is a type B public hospital owned by the Banten Provincial Government. RSUD Banten is located on Jl. Syech Nawawi Al-Bantani, Banjasari Village, Cipocok Jaya Subdistrict, Serang City, Banten Province.[13]

The samples in the study are healthcare workers with shift work system and non-shift work system working at Banten Regional General Hospital (RSUD). The accessible population consists of 408 shift workers and 179 non-shift workers. The minimum sample size in this study is 144 samples, with details of 72 samples of healthcare workers with shift work system and 72 samples of healthcare workers with non-shift work system. From the accessible population, there are a total of 243 individuals with shift work system and 76 individuals with non-shift work system who meet the inclusion criteria, as shown in Figure 1. The accessible population that meets the inclusion criteria is then sampled using stratified random sampling so that respondents in each unit have an equal opportunity to be selected. These units include inpatient units, outpatient units, pharmacy units, and laboratory units, as shown in Figure 2.

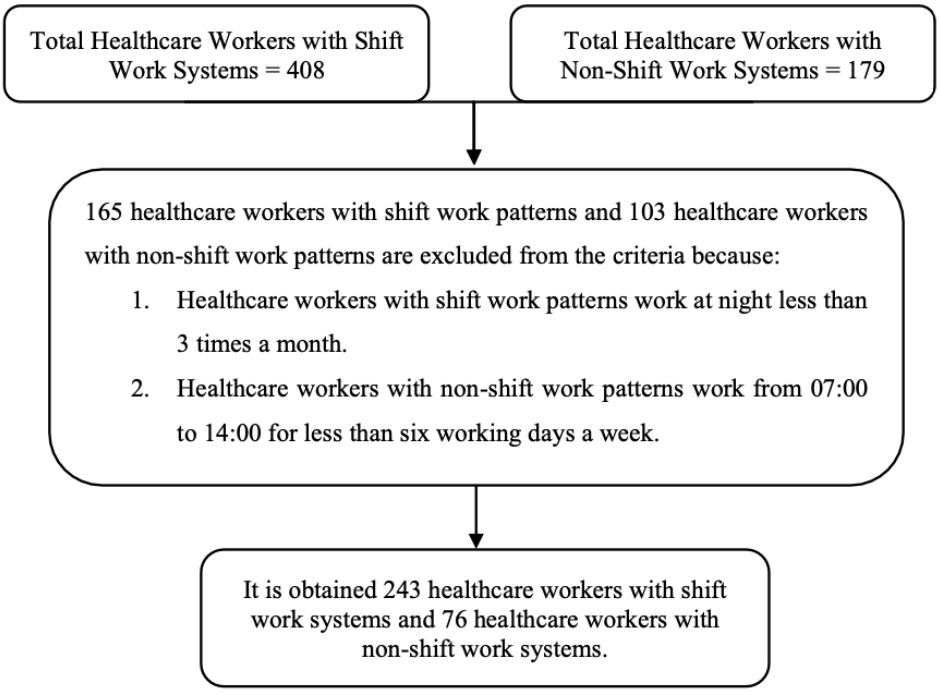

Figure 1. Sampling Procedure

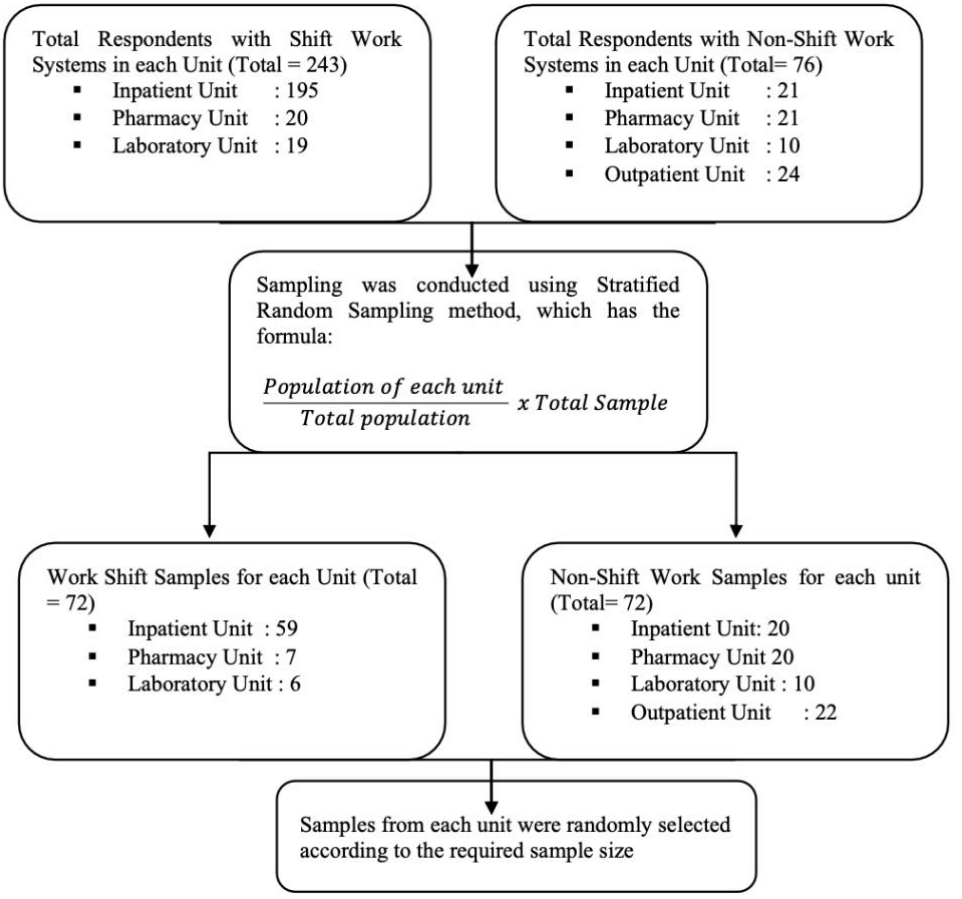

Figure 2. Sampling Procedure for Each Unit

B. Univariate Analysis

Univariate analysis was conducted to describe respondent characteristics, such as age, gender, shift work system, non-shift work system, and body mass index in terms of frequency and percentage. The number of healthcare workers at Banten Regional General Hospital (RSUD) selected as respondents was 72 healthcare workers with shift work system and 72 healthcare workers with non-shift work system. According to Table 1, the respondents in the study had a mean age of 33.94 years, with the majority being female respondents, totaling 104, and 40 male respondents. Respondents in the study were more likely to be obese, at 52.1%, compared to respondents who were not obese, at 47.9%. Below is the complete data regarding the characteristics of healthcare worker respondents at RSUD Banten, as seen in Table 1.

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Table 1. Characteristics of Healthcare Workers Respondents at RSUD Banten

Variables	Description	n (%)
Age**	33,94 ± 6,589	
Gender*		
Female		104 (72,2)
Male		40 (27,8)
Work System*		
Shift		72 (50)
Non-shift		72 (50)
Body Mass Index*		
Obesity		75 (52,1)
Non-Obesity		69 (47,9)

Based on Table 2, healthcare workers with shift work system have an average age of 32.06 years, while healthcare workers with non-shift work system have an average age of 35.83 years. The majority of respondents are female in both shift work system (70.8%) and non-shift work system (73.6%). Healthcare workers with shift work system have a higher percentage of body mass index classified as obese (61.1%) and non-obese (38.9%), whereas healthcare workers with non-shift work system have a higher percentage of body mass index classified as non-obese (56.9%) and obese (43.1%).

Table 2. Distribution of age, gender, and BMI based on Work System

Variables	Shift (n=72)		Non-Shift (n=72)	
	Description	n (%)	Description	n (%)
Age**	32,06 ± 5,624		35,83 ± 6,969	
Gender*				
Female		51 (70,8)		53 (73,6)
Male		21 (29,2)		19 (26,4)
Body Mass Index*				
≥25 kg/m^2		44 (61,1)		31 (43,1)
<25 kg/m^2		28 (38,9)		41 (56,9)

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C. Bivariate Analysis

Bivariate analysis was conducted to determine the relationship between independent variables (shift work system and non-shift work system) and the dependent variable (obesity) using the chi-square test. Based on the results of the statistical test, it can be said that the shift work system among healthcare workers with obesity has a significant relationship (p-value = 0.03). Below is the complete data regarding the relationship between shift work system and non-shift work system with obesity, as seen in Table 3.

Table 3. Relationship between Work System and Obesity

Variables	BMI		Total	P value	OR(95%CI)
	Obesity n (%)	Non-Obesity n (%)			
Shif	44 (61,1)	28 (38,9)	72	0,03*	2,078 (1,068-4,041)
Non-Shift	31(43,1)	41 (56,9)	72		
Total	75	69	144		

DISCUSSION

Based on the research results, the average age of respondents is 33.94 years, as shown in Table 1. Previous research conducted by Sulistyo, et al. (2022) on healthcare workers in hospitals showed that the majority of research respondents fell into the category of early adulthood, aged 26-35 years (63.3%).[14] As age increases, it can lead to a decrease in muscle mass and an increase in body fat mass; therefore, the age range of 26-35 years increases the risk of obesity. [15]

Based on the research results, 75 out of 144 healthcare workers at RSUD Banten are obese (52.1%), as shown in Table 1. The results of previous research conducted by Darmawi H (2015) on nurses in hospitals showed a prevalence that is not significantly different (59.3%). Obesity is common among healthcare workers due to disruptions in circadian rhythms, and most healthcare workers have short sleep durations, leading to poor sleep quality and excessive calorie intake when working night shifts. [16]

Healthcare workers with shift work system have a higher percentage of body mass index classified as obese (61.1%). This research finding is consistent with the study conducted by Salsabila

AS, et al. (2023), which stated that 83.3% of RSUD employees with shift work system have poor sleep quality and are classified as obese based on their body mass index.[17] Sleep plays a role in regulating hormone metabolism, which can result in imbalances in leptin and ghrelin hormones if there is insufficient sleep. [1,3] Meanwhile, there are still healthcare workers with shift work system who are classified as non-obese (38.9%). This is because obesity has many risk factors not solely influenced by shift work system. Workers with shift work system, if leading a healthy lifestyle, have a positive impact on their bodies due to an increase in muscle mass and a decrease in body fat mass, thereby reducing the risk of obesity.[18]

Healthcare workers with non-shift work system have a higher percentage of body mass index classified as non-obese (56.9%). This is because healthcare workers with non-shift work system have more rest time due to working within normal hours, from 07:00 to 14:00. This research finding is consistent with Darmawi H (2015), stating that workers with non-shift work system have a sleep duration of >7 hours at 76.7%.[16] Sleep is an important human need as it affects neuroendocrine function and body hormone metabolism. Workers with non-shift work system, if they have less sleep than the normal duration (<7 hours), can affect hormone changes, such as decreased leptin hormone levels and increased ghrelin hormone levels, which can result in increased appetite and thereby increase the risk of obesity.[19]

Based on the research results, shift work system are more at risk of obesity compared to non-shift work system. However, in this study, healthcare workers with non-shift work system still have a percentage of obesity (43.1%). This is due to various other factors such as exercise habits. Lack of movement and failure to engage in physical activity among workers with non-shift work system can contribute to obesity because it can decrease muscle mass and increase body fat tissue due to suboptimal energy expenditure.[18] These research findings are consistent with a study conducted by Darmawi H (2015), stating that 95.4% of nurses with non-shift work system do not have exercise habits.[16]

Statistically, the research results show a significant relationship indicating that healthcare workers with shift work system are 2.078 times more likely to experience obesity compared to healthcare workers with non-shift work system (p-value <0.05; 95% CI 1.068-4.041). These research findings are also consistent with a study conducted by Darmawi H (2015), which showed a significant relationship between nurses working shifts and obesity, with 69.8% of them experiencing obesity with a p-value of 0.04. According to this research, nurses working shifts will experience lifestyle changes due to disruptions in circadian rhythms. Furthermore, this study indicates several risk factors that increase the occurrence of obesity among shift workers, including sleeping less than 7 hours and excessive calorie intake, with excessive calorie intake being the most dominant risk factor in increasing the risk of obesity. [16]

One of the risk factors for obesity is the work schedule. Shift work system generally involve a three-part time division system: morning, afternoon, and night. Shift work system entail busy schedules and working hours that conflict with circadian rhythms, especially in night shift work systems, leading to disruptions in circadian rhythms. Circadian rhythms are processes in the body that respond to light and dark, resulting in physical, mental, and behavioral changes. Under normal conditions, the bright cycle, with high light intensity, plays a role in energy metabolism for daily activities and eating, while the dark cycle, with low light intensity, is involved in sleeping and fasting.[3,10]

Disruption of circadian rhythms can affect physiological changes in hormones, especially leptin hormone, which plays a role in reducing food consumption by suppressing appetite through the inhibition of Neuropeptide Y (NPY) signaling and stimulation of melanocortin signaling release from the hypothalamus, and ghrelin hormone, which acts as an appetite stimulant by activating neurons that produce Neuropeptide Y (NPY) in the hypothalamus. Disruption of circadian rhythms results in decreased levels of leptin hormone and increased levels of ghrelin hormone, leading to increased energy intake, which can increase the occurrence of obesity.[3]

In workers with shift work system, disruptions in circadian rhythms are also influenced by sleep quality. In adults, normal sleep time is around 7 to 8 hours. Researchers suggest that sleeping for six hours at night increases the risk of obesity by 23%, sleeping for five hours at night increases the risk by 50%, and sleeping for four hours at night increases the risk by 75%.[3,20]

Night shift work system have schedules for waking up and sleeping that conflict with the body's physiology, resulting in shorter sleep durations and poor sleep quality. Poor sleep quality can affect changes in leptin and ghrelin hormones, leading to hormone imbalances that result in increased food intake and increased obesity occurrence.[1,3] Additionally, eating system among workers with shift work system, especially eating at night while in the sleep and fasting phase (dark cycle), contribute to weight gain because they go against the body's biological cycle, leading to disruptions in circadian rhythms.[3]

CONCLUSION

There is a significant relationship between shift work system and non-shift work system with obesity among healthcare workers at RSUD Banten, with a p-value of 0.03 ($p<0.05$). Healthcare workers with shift work system are 2.078 times more likely to experience obesity compared to healthcare workers with non-shift work system at RSUD Banten.

REFERENCES

1. Ritchie HK, Broussard JL. Crosstalk proposal: insufficient sleep is responsible for increased risk of metabolic disease in shift workers. Journal of Physiology. 2022;600(7):1599–602.

2. Hulsegge G, Proper KI, Loef B, Paagman H, Anema JR, van Mechelen W. The mediating role of lifestyle in the relationship between shift work, obesity and diabetes. Int Arch Occup Environ Health. 2021;94(6):1287–95.

3. Sherwood L. Fisiologi manusia dari sel ke sistem. 9th ed. Suyono Y, Iskandar M, Isella V, Susanti F, Sanjaya N, Agustina L, editors. EGC. Jakarta: EGC; 2020.

4. Ayuningtyas D, Kusuma D, Amir V, Tjandrarini DH, Andarwati P. Disparities in obesity rates among adults: analysis of 514 districts in indonesia. Nutrients. 2022;14(16):1–18.

5. Obesity and overweight [Internet]. World Organization Health (WHO). 2021 [cited 2023 Nov 21]. Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

6. Kesehatan B penelitian dan pengembangan. Laporan nasional riskesdas 2018. Kementerian Kesehatan RI. 2018.

7. Rumah Sakit Umum Daerah Provinsi Banten [Internet]. Dinas Komunikasi dan Informatika Provinsi Banten. 2023 [cited 2023 Nov 27]. Available from: https://rsud.bantenprov.go.id/#

8. Undang-undang republik indonesia nomor 6 tahun 2023 tentang penetapan peraturan pemerintah pengganti undang-undang nomor 2 tahun 2022 tentang cipta kerja [Internet]. Kementerian Sekretariat Negara Republik Indonesia. 2023 [cited 2023 Nov 21]. Available from: https://peraturan.bpk.go.id/Details/246523/uu-no-6-tahun-2023

9. Liu Q, Shi J, Duan P, Liu B, Li T, Wang C, et al. Is shift work associated with a higher risk of overweight or obesity? A systematic review of observational studies with meta-analysis. Int J Epidemiol. 2018;47(6):1956–71.

10. Hemmer A, Mareschal J, Dibner C, Pralong JA, Dorribo V, Perrig S, et al. The effects of shift work on cardio-metabolic diseases and eating patterns. Nutrients. 2021;13(11):1–15.

11. Sastroasmoro S, Ismael S. Dasar-dasar metodologi penelitian klinis. 5th ed. Jakarta: Sagung Seto; 2016.

12. Vogel R, Vogel F. Seca catalog 2022/2023 [Internet]. 2023 [cited 2023 Jan 13]. Available from:

https://www.seca.com/fileadmin/documents/Kataloge/2022/cat_med_INT_en_22_A4_low__2_.pdf

13. Widyastuti Y, Rizkiyani T, Rahayu S. Implementation state civil apparatus (ASN) core values at RSUD banten. Jurnal Ilmiah Ilmu Administrasi Publik: Jurnal Pemikiran dan Penelitian Administrasi Publik [Internet]. 2023;13(2):677–94. Available from: http://ojs.unm.ac.id/iap

14. Sulistyo O, Dewi A, Putri L, Pranasti A, Rosyida L. Hubungan kebiasaan makan terhadap tingkat stres kerja dan kejadian obesitas tenaga kesehatan di rs akademik ugm. 2022;365–70.

15. Cazellina NS. Faktor-faktor yang berhubungan dengan obesitas sentral pada petugas keamanan dan kebersihan uin syarif hidayatullah jakarta tahun 2020 [Skripsi]. UIN Jakarta. Universitas Islam Negeri Syarif Hidayatullah Jakarta; 2020.

16. Darmawi H. Hubungan antara kerja gilir dengan obesitas serta faktor faktor yang mempengaruhinya pada perawat di rumah sakit [Skripsi]. FKUI. Universitas Indonesia; 2015.

17. Salsabila AS, Frisca. Hubungan kualitas tidur dengan obesitas pada Karyawan rsud kepahiang bengkulu. 2023;29(1):12–21.

18. Hall J, Hall M. Guyton and hall textbook of medical physiology. 14th ed. Philadelphia: Elsevier; 2021.

19. Saleh I, Rochmawati, Wulandari F. Hubungan pola makan dengan kejadian obesitas pada tenaga kesehatan di puskesmas. Jurnal Borneo Akcaya. 2020;6(1):12–8.

20. Overweight and obesity causes and risk factors [Internet]. National Heart, Lung, and Blood Institute. 2022 [cited 2023 Nov 28]. Available from: https://www.nhlbi.nih.gov/health/overweight-and-obesity/causes