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Research Article

Risk Factors of Metabolic Syndrome Among Nurses Hospital Banten, Indonesia

Anisa Yulistriani^{1*} | Fitriyan Rayasari² | Munaya Munaya³ | Wati Jumaiyah⁴ | Rika Mustika Abriyanti⁵

^{1,2,3,4,5}Universitas Muhammadiyah Jakarta. Jakarta, Indonesia

*contact

anisayulistriani@gmail.com

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Abstract

Aims: This study was to determine the prevalence of metabolic syndrome and its associated factors among nurses in Banten.

Methods: The cross-sectional design of this particular type of quantitative correlation study. A total of 102 respondents were comprised of samples selected using random sampling. Variabel aktivitas fisik diidentifikasi menggunakan APARQ (Adolescent Physical Activity Recall Questionnaire) dan Stres diidentifikasi menggunakan DASS 21. Metabolic indicators include hypertension, Obesity, cholesterol, and diabetes. Data analysis used logistic regression.

Result: The prevalence of metabolic syndrome among nurses was 16.7%. Older age ($p=0.006$), smoking ($p=0.008$), and stress ($p=0.000$) were significantly associated with metabolic syndrome. While gender and exercise were not significantly associated with metabolic syndrome.

Conclusion: smoking and stress were the major modifiable risk factors of metabolic syndrome among nurses. Campaigns and prevention of healthy behavior are crucial even among healthcare professionals.

Keywords:

Metabolic Syndrome, Nurse, Prevalence, Smoking, Stress

INTRODUCTION

Metabolic syndrome is a condition characterized by metabolic dysregulation, resulting in symptoms such as central obesity, high blood triglyceride levels, reduced HDL cholesterol, hypertension, hyperglycemia, and insulin resistance (1). The rise in metabolic syndrome is strongly linked to the rise in non-communicable diseases (NCDs), including atherosclerotic cardiovascular disease (ASCVD) and type 2 diabetes, due to its complex risk factors (2).

Metabolic syndrome is considered a public health problem due to its increasing prevalence (3). Worldwide, epidemiological research has shown that 5-7% of youth suffer from metabolic syndrome. Certain

MetS chemicals may be indicators of the future onset of this disease in children. Thus, determining the frequency of metabolic syndrome in youth appears to be crucial in lowering the risk of illness, particularly cardiovascular disease and its fatality (4).

In Indonesian men and women, the prevalence of metabolic syndrome is 28% and 46%, respectively, with hypertension (61%) and hyperglycemia (51%) being the two most common components (5). Consuming sweet foods more than once per day is also prevalent, with 43.5% of the population affected. Individuals who consume sweet foods more than once per day have a 6,567 times higher likelihood of developing metabolic syndrome (6)

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According to the Health and Safety Executive, altering shift schedules has the potential to disturb circadian rhythms. Disruptions in circadian rhythms are associated with several physiological ailments, including sleep disorders, as well as health complications such as hypertension, diabetes, heart attacks, and digestive tract issues. Furthermore, these disturbances can also have an impact on an individual's social life. Shift employment has been found to induce psychological alterations, such as modifications in dietary habits, increased smoking behavior, and elevated use of caffeine. The disruption of an individual's circadian rhythm and subsequent disturbances in blood pressure can be attributed to irregular schedules, such as those with shifting shifts. A decrease in the speed at which the shift rotation is executed is associated with a reduction in the negative impact on the duration of sleep. Shift employment has been found to have an indirect impact on the consumption of foods that are rich in carbohydrates, as well as alterations in the lipid profile, particularly triglyceride levels. These effects can contribute to the development of obesity and elevated blood sugar levels (7).

A nurse is an individual who provides care and support to individuals who are facing health challenges. Nevertheless, over time, the concept of a nurse has undergone expansion and diversification. Presently, the term "nurse" denotes someone who occupies a role within the healthcare workforce, delivering services to the community in a proficient and specialized manner. (8). Nurses adhere to a rotating shift plan to prioritize the round-the-clock care required by patients. Shift work is a prevalent scheduling practice employed by organizations to extend operational hours by having personnel alternate their presence in the workplace. The use of shift work has the potential to optimize worker productivity; nevertheless, it also exerts a detrimental influence on the health of workers. Individuals who engage in shift

work are more susceptible to health issues compared to those who do not engage in shift work (8).

Limited study has been conducted on the association between metabolic syndrome and shift work among nurses, particularly within the context of Banten District Hospital. Based on the findings of an initial survey conducted at Banten District Hospital, secondary data was collected about the number of nurses assigned to specific rooms. Specifically, Garuda Room 5 had a total of 9 nurses, Garuda Room 8 had 10 nurses, the ICU Room had 8 nurses, the Cendrawasih Room had 13 nurses, the ER Room had 10 nurses, and the Surgery Room had 10 nurses. The primary data utilized in this study is derived from interviews performed with two nurses employed in the inpatient unit. The focus of the interviews was to gather information about metabolic syndrome, specifically addressing three out of the four criteria outlined by the World Health Organization (WHO).

METHODS

Study design

This research is a cross-sectional study, which is a study to study the dynamics of correlation between factors and effects of metabolic syndrome. The sample size of 102 respondents was taken using a random sampling technique. The population in this study was shift work nurses at Banten Regional Hospital, which was 214 people. Based on the calculation of the sample size application, a sample number of 102 respondents was taken by random sampling technique. The inclusion criteria in this study were nurses working shifts in inpatient rooms and willing to be respondents, while the exclusion criteria were pregnant nurses and nurses who had thyroid disorders. Demographic data collection of respondents includes age, gender, and smoking behavior. Metabolic indicators including hypertension (yes = blood pressure $\geq 130 / \geq 85$ mmHg and no = blood pressure $< 130 / < 85$ mmHg) and



obesity (yes = male abdominal circumference \geq 90 cm and female abdominal circumference \geq 80 cm and no = male abdominal circumference $<$ 90 cm and female abdominal circumference $<$ 80 cm) were measured. A cholesterol check tool (Yes = HDL in men $<$ 40 mg/dl and in women $<$ 50 mg/dl and No, if HDL levels in men \geq 40 mg/dl and women \geq 50 mg/dl) and a blood sugar check tool (Yes = fasting plasma glucose levels \geq 110 mg/dl and No = fasting plasma glucose levels $<$ 110 mg/dl) were used. Physical activity variables were identified using the APARQ (Adolescent Physical Activity Recall Questionnaire) questionnaire consisting of 12 questions

with 5 Likert scale answer choices. The measurement results are high = 40-60, Medium = 19-39, and low = $<$ 18. Stress was identified using the DASS 21 questionnaire with numerical measurement results ranging from 0 – 63. Data collection begins with informed consent. Measuring blood pressure, waist circumference, cholesterol levels, and blood sugar levels of respondents and recording the results in the observation sheet. Then give the APARQ and DASS 21 questionnaires. Data were analyzed univariately using frequency distribution, and central tendency. Bivariate using the T-test and multivariate using logistic regression analysis.

RESULTS

The findings of this study are provided utilizing univariate, bivariate, and multivariate analysis techniques.

Table 1. Respondent Characteristic

Respondent Characteristic		f	%
Age	\geq 40 year	29	28,4
	$<$ 40 year	73	71,6
Gender	female	63	61,8
	male	39	38,2
Smoking	yes	17	16,7
	no	85	83,3

According to Table 3, 73 of the shift-working nurses were younger than 40 (71.6%), 63 were women (61.8%), and 85 did not smoke (83.3%).

Table 2. Metabolic Syndrome Indicator among nurses Banten District Hospital

Variable	NO	YES	Mean	min-maks
	f(%)	f(%)		
Obesity	87 (85,3%)	15 (14,7%)	79,63	70 – 96
Hypertension	79 (77,5%)	23 (22,5%)	Systolic = 116,67 Diastolic = 71,03	Systolic = 90 - 155 Diastolic = 60 - 100
Cholesterol	80 (78,4%)	22 (21,6%)	125,29	90-200
Diabetes	86 (84,3%)	16 (15,7%)	124,83	90-240

According to the data presented in Table 2, it is evident that out of the total 102 nurses employed at Banten Regional Hospital, the predominant majority, including 87 nurses or 85.3% of the workforce, do not exhibit symptoms of obesity. The mean waist circumference is 79.63 cm, with the maximum waist circumference recorded at 96 cm and the minimum waist circumference recorded at 70 cm. Blood pressure measurements showed that 79 (77.5%) did not have hypertension, with a systolic mean of 116.67 mmHg (lowest 90, maximum 155). The mean diastolic blood pressure is 71.03 mmHg (lowest 60, maximum 100). Blood pressure measurements showed that 79 (77.5%) did not have hypertension, with a systolic mean of 116.67 mmHg (lowest 90, maximum 155). The mean diastolic blood pressure is 71.03 mmHg (lowest 60, maximum 100). HDL values indicated that 78.4% of 80 shift nurses had no cholesterol. The lowest HDL level is 90 mg/dl and the highest is 200 mg/dl. The mean is 125.29 mg/dl. The mean blood glucose level was 124.83 mg/dl, with the lowest being 90 mg/dl and the highest being 240 mg/dl. 86 nurses working shifts did not have diabetes (84.3%).

Table 3. Distribution of the Frequency of Metabolic Syndrome

Metabolic Syndrome	f	%
Yes	17	16,7
no	85	83,3
Total	102	100,0

Table 3 shows that 17 shift work nurses at Banten District Hospital (16.7%) had metabolic syndrome. This was based on measurements of four signs of the condition: abdominal circumference, blood pressure, HDL levels, and blood glucose levels.

Table 4. Description of Physical Activity and Stress among Nurses

Variable	f (%)	mean	Min-max
Physical activity	low good	42 (41,2%) 60 (58,8%)	39,41 21 - 46
stress		34,41	17 - 56

Table 4 shows that 60 nurses working shifts had good physical activity (58.8%), with a mean of 39.41 and a range of 21 to 46. Stress averaged 34.41 with Low stress was 17 and excessive stress was 56. These results indicate that nurses working shifts at Banten Regional Hospital on average experience moderate stress.

Table 5. Association between age, gender, physical activity, smoking, stress and metabolic syndrome

Variable	Metabolic Syndrome	
	P Value	OR
Age	0,006	4,962
Gender	0,101	3,429
Smoking	0,008	5,250
Physical activity	0,470	-
Stress	0.000	-

Based on Table 5, shows that the results of the bivariate analysis show that the variables associated with metabolic syndrome in shift workers at Banten Regional Hospital are age ($p: 0.006$), smoking ($p: 0.008$), and stress ($p: 0.000$). Meanwhile, the variables gender and physical activity have no relationship ($p > 0.05$).

Table 6. The influence of stress and smoking on metabolic syndrome

Variable	Sig.	Exp(B)	95% C.I. for EXP (B)	
			Lower	Upper
Stres	0,002	0,924	0,879	0,971
Smoking	0,038	3,895	1,077	14,084

Based on Table 6, it can be explained that in the final modeling of the logistic regression analysis, 2 (two) variables had a partial influence on the dependent variable (metabolic syndrome) with a p -value < 0.05 , the stress (p -value: 0.002) and the smoking (p -value: 0.038). Of the 2 (two) variables, the one that has the largest partial influence on the dependent variable (metabolic syndrome) is the smoking variable with the largest Exp(B) or OR value = 3.895.

The smoking variable is known to be connected to the incidence of metabolic syndrome with a risk value of 3.895 based on the Exp(B) or OR value, which suggests that shift work nurses who smoke have a 3.895 times greater chance of getting metabolic syndrome than nurses who do not smoke. Meanwhile, the stress variable has a 0.924 risk value association with the incidence of metabolic syndrome, which suggests that nurses working shifts who feel stress are 0.924 times more likely to develop metabolic syndrome than nurses who do not experience stress. The smoking variable with the highest Exp(B) or OR value, 3.895, has the greatest partial influence on the dependent variable (metabolic syndrome) of the two (two) factors. After controlling for stress variables, this suggests that shift-working nurses who smoke are 3.895 times more likely to acquire metabolic syndrome than nurses who do not smoke. According to the findings of the logistic regression study, smoking has a significant influence on

metabolic syndrome in nurses who work shifts at Banten Regional Hospital.

DISCUSSION

Metabolic syndrome is a group of metabolic abnormalities that include central obesity, hypertension, glucose intolerance, and dyslipidemia that can lead to a variety of degenerative diseases such as cardiovascular disease, stroke, and type 2 diabetes mellitus (9). According to the study's findings, up to 16.7% of shift-working nurses at Banten District Hospital had metabolic syndrome. In this study, metabolic syndrome in nurses is determined by measuring clinical symptoms that describe the presence of disorders in body metabolism such as central obesity (measured by waist circumference), high blood pressure or hypertension (measured by blood pressure), and cholesterol (measured by High Density levels). Lipoprotein (HDL) and increased blood sugar levels can be measured at any time. Waist circumference measurements revealed that 14.7% of Banten District Hospital's shift-working nurses were obese. The average waist circumference is 79.63 cm, with the largest waist circumference at 96 cm and the smallest at 70 cm.

The study found that 22.5% of shift-working nurses at Banten District Hospital had hypertension, with varying levels of blood pressure and HDL levels. Additionally, 15.7% had diabetes, with

varying levels of blood glucose. Although not many nurses have metabolic syndrome, caution is advised as it increases the risk of cardiovascular disease and diabetes (10). Metabolic syndrome increases the risk of heart disease or stroke by three times, despite cardiovascular disease and diabetes mellitus being noncommunicable diseases with increasing prevalence (11)

Obesity, high blood pressure, low HDL levels, and high blood glucose levels are all symptoms of metabolic disorders that require immediate attention, with central obesity accounting for 22.1% of metabolic syndrome (12). Low physical activity, high stress levels, high carbohydrate, and fat intake, and a lack of attention to health and fitness are all risk factors for metabolic syndrome (13). This study confirms Indonesian Basic Health Research's 23% prevalence of metabolic syndrome in over-18-year-olds, and 5.16% of nurses working shifts have the condition (14). In previous research at RSUD Dr. Zainoel Abidin Banda Aceh discovered that 5.16% of nurses working shifts had metabolic syndrome (15). Metabolic syndrome develops as a result of genetic susceptibility interactions and is influenced by obesity, lifestyle changes, poor diet, and lack of physical activity (16). Lifestyle changes, management of atherogenic dyslipidemia, blood pressure control, hyperglycemia management, and management of prothrombotic conditions can all be used to treat metabolic syndrome (17). All of these steps are intended to reduce the risk of cardiovascular disease caused by metabolic syndrome. Obesity and sedentary lifestyles are being addressed through lifestyle changes. Calorie restriction and regular physical activity help to achieve this.

A study at Banten District Hospital found a significant relationship between age and metabolic syndrome among shift work nurses over 40. 34.5% of these nurses had metabolic syndrome, while only 9.6% had it. The odds ratio (OR) was 4.962, indicating that nurses older than 40 working shifts are

at a 4.962 times greater risk of developing the condition. The study also revealed that the risk of metabolic syndrome increased with age, with 34.5% of shift-working nurses over 40 having it and only 9.6% of those under 40. This suggests that the risk of developing metabolic syndrome increases with age (18). Old age leads to changes in body composition, including decreased muscle mass, decreased basal metabolic rate, increased fat, decreased activity, increased disease risk, and decreased blood vessel elasticity, all contributing to metabolic syndrome.

Research shows a significant relationship between age and the incidence of metabolic syndrome, with 48.3% of those who tested positive being between the ages of 46 and 60 (9). This association is due to the decline in body function with age, leading to common chronic diseases like diabetes mellitus, heart disease, and stroke. As a result, the risk of developing metabolic syndrome increases. Shift work nurses over 40 should adopt a healthy lifestyle, meeting their nutritional needs, engaging in physical activity, and avoiding smoking and alcoholic beverages (19). This is because the decline in body function with age increases the likelihood of developing metabolic syndrome. Therefore, shift work nurses must adopt a healthy lifestyle to reduce the risk of developing metabolic syndrome.

The study reveals that 77.8% of female shift-working nurses do not have metabolic syndrome, while 92.3% of male nurses do. This contradicts previous research suggesting women are more at risk due to their higher body fat accumulation, making them more susceptible to hypertriglyceridemia. The statistical test results, obtained at a p-value of 0.101, indicate no significant relationship between gender and metabolic syndrome in nurses working shifts at Banten District Hospital in 2023 (19). Previous research results show that the prevalence of metabolic syndrome is higher in women than men, thus emphasizing that women are more at risk of

metabolic syndrome than men (9). This condition emphasizes that women are more at risk of metabolic syndrome than men. This study's findings differ from previous studies that found no significant relationship between gender and metabolic syndrome (12,15).

A study found that 41.2% of shift-working nurses who smoke have metabolic syndrome, compared to 11.8% who do not smoke. Smoking nurses are 5,250 times more likely to develop the syndrome, and their metabolic rate is higher compared to non-smoking nurses. This highlights the significant relationship between smoking and metabolic syndrome. Smoking causes an increase in body weight, cholesterol levels, atherosclerosis, insulin resistance, metabolic disorders, and cardiovascular disease (11). Smoking is linked to insulin resistance and central fat accumulation, with toxic chemicals like nicotine causing elevated blood pressure. Research indicates a 2,750 times higher risk of metabolic syndrome in smokers compared to non-smokers (Ibrahim (2019)). Research suggests smoking increases blood pressure, a risk factor for metabolic syndrome, and recommends nurses working shifts to reduce or stop smoking to reduce cardiovascular disease and metabolic syndrome risk.

The study found that shift work nurses with metabolic syndrome and those without have similar average physical activity levels. However, there was no significant relationship between physical activity and metabolic syndrome in 2023 nurses at Banten District Hospital, contradicting the theory that less physical activity increases the risk of metabolic syndrome (13). The study found that shift work nurses with metabolic syndrome and those without have similar average physical activity levels. However, there was no significant relationship between physical activity and metabolic syndrome in 2023 nurses at Banten District Hospital, contradicting the theory that less physical activity increases

the risk of metabolic syndrome (20). The study suggests that the lack of a link between physical activity and metabolic syndrome may be due to smoking habits, highlighting the importance of regular physical activity and healthy habits to prevent obesity and cardiovascular disease.

The study found a significant relationship between stress and metabolic syndrome in nurses with shift work at Banten Regional Hospital in 2023. Nurses with metabolic syndrome had higher stress levels, with an average of 43.76, compared to 32.54 lower stress levels in those without the syndrome. Chronic stress can lead to physiological and structural changes, including insulin resistance, atherosclerosis, and cardiovascular disease(21). A study by Dr. Zainoel Abidin Banda Aceh at RSUD revealed that moderate work stress increases the risk of metabolic syndrome by 8.98 times, while severe stress increases it by 15.13 times (15). The study revealed that higher stress levels increase the likelihood of developing metabolic syndrome.

CONCLUSION

The study found that shift nurses experience moderate stress, highlighting the need for hospital management to reduce stress levels. High-stress levels can impact health and service quality. Regular meetings between nurses can help identify and resolve stress sources. A multivariate analysis of logistic regression revealed that age, sex, physical activity, stress, and smoking had a partial influence on metabolic syndrome. The smoking variable had the largest partial effect. Smoking habits are the most influential factor in metabolic syndrome, especially cardiovascular disease and high blood pressure.

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