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Physical and Blood Examining Characteristics of Shift Workers Nurses in Pandemic COVID-19

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Abstract

Shift work is a rotating work time outside normal working hours, either rotating with the shift work division method; this shift work can cause changes in metabolism, immunological status, and oxidative status, which will cause inflammation due to changes in circadian rhythms. During this Covid-19 pandemic, nurses who are mostly women in providing 24-hour service also continue to do shift work. There are several risk factors that might be in the Covid- 19 pandemics, such as age, hypertension, obesity, and diabetes. The purpose of this study was to look at the physical characteristics of female workers who worked shifts during the Covid-19 pandemic. The results of the study on 40 nurses who worked at Al Ihsan and Muhamadiyah Hospitals West Java showed that 50% were over 31 years old, 97.5% of people had worked >5 years, 80% of people worked in the room, the results were as follows: 97.5% systolic blood pressure normal, diatolic 97.5% normal, BMI less 1.5%, normal 40%, excess 32.5%, 25% fat; Fasting blood sugar 92.5% normal, normal ESR 31 people 97.5%, normal cholesterol as much as 100%, normal triglycerides 95%, aerobic capacity (Vo2max) average 35.15±3.18, while cGMP levels 14.28(1.4-67.7). These results indicate that there are risk factors for COVID-19, such as high BMI and abnormal fasting blood sugar.

Keywords: *Physical and Blood Examining; Shift Workers Nurses; COVID-19*

INTRODUCTION

The definition of shift work is that hours are rotating work time outside normal working hours, either rotating by the rotational division of labor method or permanent for a period of 24 hours. 1,2, Shift work may result in discrepancies between the timing of endogenous circadian rhythms and behavioral cycles, including sleep cycles, wake cycles, and feeding cycles.3 The SCN as the center of circadian rhythm regulates leptin levels, plasma glucose, glucose tolerance, corticosteroids, and cardiovascular function via neural and/or humoral signals to associated tissues.4 Sleep disorders associated with shift work can cause circadian rhythm aberrations, which are established to be the main cause of metabolic and cardiovascular dysregulation effects that can be detrimental to shift workers.6 Increased body weight and abdominal fat are found in workers with night shift rotation, namely nurses and midwives. 6, 7, 8

Changes in circadian rhythm caused by this shift work cause hormonal and metabolic changes that result in an increase in blood pressure and blood sugar so that later it affects the function of blood vessels and, in the end, results in a person's work capacity. Studies had shown that when subjects ate and slept for about 12 hours outside of their usual phase, they exhibited decreased leptin, increased glucose, increased

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insulin, reversed daily cortisol rhythms, increased mean arterial pressure, and reduced sleep efficiency. This study demonstrates the detrimental cardiometabolic implications of circadian rhythm disturbances.9 Until July 2021, data showed that 1459 health workers died because of Covid-19, and among them, 545 were doctors, 453 nurses, and others. Indonesia was the highest number of health workers who died and had five ranks in the world. In the Covid-19 pandemic, health workers such as nurses who work in hospitals have a high risk factor for getting infected with this virus. It is stated that this covid-19 infection is more common in the elderly, in men, and subjects with diabetes mellitus, hypertension, cardiovascular disease, and malignancy.10 For this reason, this study aims to determine the risk factors for nurses who work shifts to exposure to Covid 19. First, due to shift work, there can be changes in metabolism, then this becomes a risk for Covid-19 infection. This study showed there might be a risk factor in shift workers nurses such as high IMT and Fasting Blood Glucose.

RESEARCH METHODOLOGY

This study is a cross-sectional study with purposive sampling, which took nurses who worked in hospitals. Inclusion criteria were female nurses aged 20-40 years with the length of stay in hospital >6 months and had no previous cardiovascular disease and diabetes.

Blood pressure examination subjects were asked to sit comfortably in a room with adequate lighting. The researcher/examiner then guides the subject to carry out the test procedure and start the blood pressure calculation and is listened to with a stethoscope, then the subject's blood pressure results will be read and recorded. The examination will be repeated two times; if the examiner is still not sure of the results, the examiner will ask the subject to repeat the procedure.

Five mL of blood is separated by 2 mL for ESR examination, and 3 mL for examination of cholesterol, triglycerides, and blood sugar. 2 mL of blood without anticoagulant was mixed with 3.8% Sodium Citrate in a ratio of 4:1 and then put into a Westergreen tube and placed upright. Results are read after 1 hour. As for cholesterol, triglycerides using the CHOD-PAP method (cholesterol oxidase peroxidase using a chemical analyzer), while blood sugar using the GOD-PAP technique using a photometer.

Examination of cGMP using ELISA examination technique with kitt from R & D System USA. The study standard range was 75–219 pmol/mL with a minimum detection of 0.56–3.06 (mean; 1.14 pmol/mL). HRP) on rabbit polyclonal antibodies. During incubation, the polyclonal antibody became bound to the goat anti-rabbit antibody coated onto the microplate. After washing to remove excess conjugate and unbound samples, a substrate solution was added to the wells to determine the activity of the bound enzyme. Color development was stopped, and absorbance was read at 450 nm. The intensity of the color is inversely proportional to the concentration of cGMP in the sample. The sampling method is by taking blood from the subject from venous blood. Blood sampling is carried out by trained personnel from the laboratory using safety and security standards for research subjects.

Measurement of VO2max by measuring the pulse at rest in the following way: Respondents were asked to rest for 20 minutes, and then their pulse was calculated using a chest-mounted device, counted for one full minute, then repeated three times, and then averaged. Then it is entered into Measuring the maximum pulse rate, namely: 220-age is entered into the formula VO2max = 15 x (HR max/HR rest).
The ethical clearance for this research was approved by the Research Ethics Committee of the University of Indonesia (No. 19121964). And the subject was asked for informed consent and approval for measuring physical and laboratory examination.

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FINDINGS AND DISCUSSION

From the inclusion criteria and sample calculations, 40 research subjects were obtained, namely female nurses who work shifts at Al Ihsan Hospital, West Java and Muhammadiyah Hospital, Bandung, with the following characteristics:

Table 1. Characteristic Subject Study

Characteristic	(n=40)	%
Age (year)		
20-25	4	10
26-30	16	40
>31	20	50
Working period (year)		
<5 tahun	9	22,5
6-10 tahun	20	50
11-15 tahun	11	27,5
Working unit (division)		
IGD	5	12,5
Rawat Inap	32	80
ICU	3	7,5
Blood Pressure (mmHg)		
Systolic		
Normal	39	97,5
Not normal	1	2,5
Diastolic		
Normal		
Not normal	39	97,5
	1	2,5
BMI (kg/m2)		
Low	1	2.5
Normal	16	40
Overweight	13	32.5
Obese	10	25
Blood fasting Glucose (gr/dL)		
Normal	37	92.5
Not Normal	3	7.5
Kolesterol		
Normal	40	100
Di	0	0
Trigliserida		
Normal	38	80
Not normal	2	20
ESR		
Normal	31	77,5
Not normal	9	22,5

From the data on the characteristics of the research respondents, it was found that there were 20 nurses working shifts or 50% aged over 31 years, 16 people aged 26-30 years, and four people aged 20-25 years.

Most of the nurses, or as many as 20 people, have worked for 6-10 years, nine people worked under five years, and over ten years as many as 11 people. A total of 32 nurses work in the inpatient room, only five people work in the emergency room, and three people work in the ICU.

From the results of the blood pressure examination, almost all nurses or as many as 39 people had normal systolic blood pressure, and only one person had systolic blood pressure above normal as much as one person. Similarly, in diastolic blood pressure, only one person had a diastolic pressure above normal, while 39 people had a normal diastolic pressure. On examination of body mass index, as many as 16 people have a normal IMT, and three people are below normal while the overweight and obese is more than 20 people (57,5%)

Blood tests for fasting blood sugar on nurses who work shifts, most or as many as 37 people have normal fasting blood sugar levels, and only three people are abnormal/above 100 mg/dL. The following table shows the comparison of the average systolic and diastolic blood pressure, average fasting blood glucose, cGMP, and aerobic functional capacity through Vo2max measurements on female nurses who work shifts at Al Ihsan Hospital and Muhamdiyah Hospital West Java.

Table 2. Average Systolic and Diastolic Blood Pressure, Average Fasting Blood Glucose, cGMP and Aerobic Functional Capacity in Nurses Working Shifts Al Ihsan Hospital and Muhamadiyah Hospital, West Java

Data	Average (n=40)	SD/ Min-Maks
Blood pressure (mmHg)		
Systolic	110.37	8.43 (90-130)
Diastolic	73.75	6,07 (60-85)
MABP	85,71	6,33 (70-96,7)
Fasting BLood Glucose (gr/dL)	83,15	10.97(54-102)
cGMP (pmol/mL)	14,28	15,77 (1,4-67,7)
Aerobic Capacity (mg/kg/menit)	35,15	3,18 (28.45-44,77)

It was obtained from the table above that the mean systolic, diastolic, and MABP blood pressure, the mean systolic blood pressure is 110.37 ± 8.43, the highest value is at 130 mmHg, and the lowest value is 90 mmHg, the average diastolic blood pressure is 73.75 ± 6.07 with a minimum at 60 mmHg and maximum value at 85 mmHg, while the MABP calculation obtained an average of 85.71 ± 6.33 with a minimum value of 70 and a maximum value of 96.7. All mean values of systolic, diastolic, and MABP blood pressure were still within normal limits.

Fasting blood glucose values obtained a normal mean of 83.15 ± 10.97 g/dL with a minimum value of 54 g/dL and a maximum value of 102 g/dL. The average value of cGMP was 14.28 ± 15.77 pmol/mL, with the highest value at 67.7 pmol/mL and the lowest value at 1.4 pmol/mL. At the same time, the aerobic capacity obtained an average of 35.15 ± 3.18 ml/kg/minute with a maximum value of 44.77 ml/kg/minute and a minimum value of 28.45 ml/kg/minute.

Discussion

From the data on the characteristics of the research respondents, it was found that 20 female nurses who worked shifts were aged between 31-35 years, 16 people aged 26-30 years, and only four

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people aged 20-25 years. Most of the nurses, or as many as 20 people, have worked for 6-10 years, nine people worked under five years, and over 11 years as many as eight people. A total of 32 nurses work in the inpatient room, only five people work in the emergency room, and three people work in the ICU. From these data, it can be analyzed that age and length of work do not affect the placement of nurses. It was found that in the ICU and ER nurses, the average age was over 30 years, and it was also found that the average length of work was more than five years. In the Badri12 study, there was a significant relationship between workload and work environment with nurse work stress ($p<0.05$), especially in ICU and ER workers, it was mentioned that ICU and ER had a heavier workload than other units. Meanwhile, Ansori's13 research on dental nurses stated that the characteristics of age above 34 years and working period of more than ten years had the most work stress, so that age and length of work we're expected to be considered in placing nurses in hospitals.

From the results of the blood pressure examination, almost all nurses or as many as 39 people had normal systolic blood pressure, and only one person had systolic blood pressure above normal as much as one person. On diastolic blood pressure examination, 39 were found to be normal below 80 mmHg, and only one person had diastolic blood pressure above normal. On examination of Body Mass Index, as many as 16 people have a normal BMI, and one people are below normal while the BMI is more than 23 people. From the data, it was found that respondents who had systolic blood pressure above normal had a BMI above 25, as well as those who had a BMI above 25 kg/m2 had a MABP above 80 mmHg as many as 16 people. It is stated from many studies that BMI has a relationship with blood pressure, namely the Dua's14 study in adult women with $p = 0.03$. Landi's 15 study also stated that BMI had a strong relationship with hypertension, while Tesfaye16 stated that the average BP level increased with increasing blood pressure. BMI.

Blood tests for fasting blood sugar, most or as many as 38 people had normal fasting blood sugar levels, and only two people who were abnormally above 100 mg/dL and two people who had fasting blood sugar above normal had normal BMI and blood pressure. Mentioned in Yin's17 study that examined factors that influence fasting blood glucose in addition to genetics, lifestyle, and environmental factors, including daily food intake.

It is obtained data that the mean systolic, diastolic, and MABP blood pressure, the mean systolic blood pressure is 110.37 ± 8.43, the highest value is at 130 mmHg, and the lowest value is 90 mmHg, the average diastolic blood pressure is 73.75 ± 6.07 with a minimum of 60 mmHg and a maximum value of 85 mmHg, while the MABP calculation obtained an average of 85.71 ± 6.33 with a minimum value of 70 and a maximum value of 96,7. All mean values of systolic, diastolic, and MABP blood pressure were within normal limits. This shows that nurses who work at this hospital have normal blood pressure, possibly because they are under 35 years of age and 50% BMI below 25 kg/m2. This is in accordance with Choi's 18 research that the factors that influence blood pressure are mainly age and BMI. However, from the results of the BMI calculation, it was found that 20 people or 50% of the sample had a BMI above 25 kg/m2. Lorenzo19 stated that the prevalence of obesity was higher in shift workers than non-shift workers, while the distribution of body fat did not differ between the two groups. Shift workers had a higher BMI than day workers, and shift work was associated with BMI, regardless of age and duration of work. As mentioned by Peplonska20 Cumulative night shift work showed a significant relationship with BMI, with BMI increasing by 0.477 kg/m2 per 1000 night shifts and by 0.432 kg/m2 per 10,000 night shift hours. Current and cumulative night work was associated with obesity (BMI≥30kg/m2), with OR=3.9 (95%CI:1.5-9.9), in women reporting eight or more night shifts per month. This increase in BMI is related to changes in eating patterns at night.

Fasting blood glucose values obtained a normal mean of 83.15 ± 10.97 g/dL with a minimum value of 54 g/dL and a maximum value of 102 g/dL. From the results of the blood glucose examination, it was found that the results of fasting blood glucose were normal in nurses; this was in the condition of factors that could increase glucose, such as too much food, such as food or snacks with more carbohydrates than usual, inactivity, not enough insulin or diabetes oral medication or side effects of other drugs, such as steroids or antipsychotic drugs, illness, stress, short-term or long-term pain, menstruation, and dehydration21. Roestamadji's22 study stated that there was a significant difference in fasting blood sugar between shift work and non-shift work. The shift work occurs changes in circadian rhythms associated with tissue metabolism and hormone secretion.

The average value of cGMP was 14.26 ± 16.6 pmol/mL, with the highest value at 67.7 pmol/mL and the lowest value at 1.64 pmol/mL. cGMP values indicate the function of the blood vessels, which means an increase in Nitric oxide in the blood, which indicates that the blood vessels are functioning properly. Due to the above functions of NO, when its production is impaired or its bioavailability is reduced, the following can occur: vasoconstriction (e.g., coronary vasospasm, increased systemic vascular resistance, hypertension), thrombosis due to platelet aggregation, and adhesion to the vascular endothelium, inflammation due to upregulation of leukocyte molecules and endothelial adhesion, hypertrophy, and stenosis of blood vessels. Things that can reduce NO levels clinically, such as hypertension, obesity, dyslipidemia (especially hypercholesterolemia and hypertriglyceridemia), diabetes (both type I and II), heart failure, atherosclerosis, aging, smoking.23

Aerobic capacity or VO2max obtained an average of 34.48 ± 2.5 ml/kg/minute with a maximum value of 40 ml/kg/minute and a minimum value of 28.45 ml/kg/minute. Aerobic capacity shows a person's fitness; on the results of the VO2max measurement on female nurses who work in shifts, the VO2max value is still in the average category even though there are six people in the good fitness category based on age.24 Rahmawaty's25 study also showed a significant change in construction shift workers who worked night shifts in BMI and blood pressure $p<0.01$, but there was no significant change in the working VO2max.

In pandemic Covid-19, there are several risk factors that increase the possibility to get infected, such as the elderly, in men, and subjects with diabetes mellitus, hypertension, cardiovascular disease, and malignancy.26 is also stated by CDC27 that obesity increased the risk for severe Covid 19-associated illness. It was found in this study that many nurses who work in shifts (57,5%) have a BMI more than normal that can cause a risk of Covid-19 infection.

CONCLUSION AND FURTHER RESEARCH

This study found there was a risk factor for Covid 19 in nurses shift workers such as high BMI, high blood pressure, and high fasting blood glucose. This was indicated for nurses to maintain a healthy lifestyle.

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