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FACTORS ASSOCIATED WITH BLOOD PRESSURE ON SHIFT WORKERS AND NON-SHIFT WORKERS IN PT. X GRESIK

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ABSTRACT

Blood pressure is a critical factor in the circulation system. There are two kinds of blood Blood pressure is a critical factor in the circulation system. There are two kinds of blood pressure abnormality known as hypertension or high blood pressure and low blood pressure or hypontension. Many risk factors to enhace it, or person who suffering hypertension, one of them shift work. A research about Malaysian male workers in a firm showed that the prevalence of shift work related to hypertension was significantly higher shift worker than non-shift worker. The result of Medical Check Up PT. X Gresik worker on 2017, that shift worker and non-shift have hypertension risk approxiamety 15,75 % or 26 workers. The purpose of this research, knowing the factors related to blood pressure on shift worker or non-shift worker in PT. X Gresik.

This research cross-sectional designed with 44 workers into 2 groups and selected with systemic random sampling. The data taken through measurement and questionnaire. The data analysis were univariate analysis with cross tabulation and bivariate analysis with statistic test, its chisquared test and spearmen correlation.

The result explained that shift worker non-shift worker who have 44,5% prehypertension less than shift worker 39,1%. And then, significantly statistic of the history of family disease and body massa index are correlated to blood pressure ($p<0,05$). While the age, education level, job stress, physical activity,

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caffeine consumtion, drugs ingestion, and smoking habit are significantly statistic uncorrelated to blood pressure (p>0,05).

Based on research, it would be suggest to a company to provide routine health service, provide worker who have academic health background, to workers check routinely blood pressure tension and also to set diet with balanced nutrition.

PRELIMINARY

Blood pressure is a very important factor in the circulatory system. There are two kinds of blood pressure disorders known as hypertension or high blood pressure and hypotension or low blood pressure. Hypertension has become a disease of concern in many parts of the world, as it is often the number one infectious disease in many countries. According to the World Health Organization (WHO) (2013), an increase in blood pressure / hypertension is one of the global deaths and estimate to have caused 9.4 million deaths and 7% of disease burden as measured in the Disability Adjusted Life Year (DALY) 2010. Prevalence of hypertension in Indonesia in 2012 through Riskesdas survey amounted to 26.5% (Balitbangkes, 2013). Hypertension can occur due to various factors.

Many factors that increase the risk or the tendency of someone suffers from hypertension, including individual traits such as age, gender, and tribe, genetic factors, and environmental factors that include obesity, stress, smoking habit, alcohol consumption, and so on (Kaplan, 1985). In addition, other factors are due to work shifts, in studies showing that shift workers have a higher risk than non-shift workers (Culpepper, 2010).

Setyawati (2008) in Saftarina (2013) states that night shift workers have a 28% higher risk of injury or accident. In addition, night shift can reducing the ability of work, increased errors and accidents, impeding social and family relationships, the presence of risk factors in the digestive tract, nervous system, heart, and blood vessels and disruption of sleep.

Based on the results of Medical Check Up on 2017 showed that workers at PT. X Gresik both shift workers and non-shift workers were found to be at risk of hypertension by 15.75% or 26 workers, total of 165 workers. From the above results can be formulated problems to determine what are the factors related to blood pressure in shift workers and non-shift workers in PT. X Gresik.

LITERATURE REVIEW

Blood pressure is the pressure from the bloodstream in arterial arteries. The heart beats, typically 60 to 70 times in 1 minute at rest (sit or lie down), blood is pumps into the blood through an artery. The highest blood pressure occurs when the heart beats / contracts pumping blood called systolic pressure. Blood pressure decreases as the heart relaxes between two pulses called diastolic pressure (Kowalski, 2010).

The mechanism of blood pressure comes from two forces, a force created by the heart when it pumps blood into the arteries and through the circulation. While the other strength is the strength of the arteries when they urge the blood to flow into the heart (Ramadan, 2010). Meanwhile, according to (Ganong, 2001) blood will always flow because of pressure. The pressure comes from high pressure areas to low pressure areas, except in certain situations.

Blood pressure classification in Indonesia in 2007 carried out a hypertensive consensus performed by the Indonesian Hypertension Association has the same classification as JNC (The Joint National Committee on the Detection, Evaluation and Treatment of High Blood Pressure), as follows:

Tabel 1. Hypertension According to the Indonesian Hypertension Association.

Category	Sistole (mmHg)	And Or	Diastole (mmHg)
Normal	<120	Dan	<80
Pre hipertensi	120-139	Atau	80-89
Hipertensi tahap 1	140-159	Atau	90-99
Hipertensi tahap 2	≥ 160	Atau	≥ 100

Source by The Indonesian Hypertension Association, 2007

Blood pressure measurements can be performed directly or indirectly. In the direct method, the arterial catter is inserted into the artery. The results are very precise however, causing other health problems (Smeltzer and Bare, 2002). While indirect measurement can be done by using sphygmomanometer and stethoscope.

The sphygmomanometer is composes of developed cuffs and a blood pressure measuring instrument associated with the cavity in the cuff. The device is calibrated in such a way that the pressure read on the manometer corresponds to the pressure in

millimeters of mercury delivered by the brachial artery (Smeltzer and Bare, 2002).

Indirect measurement method with modern use of digital sphygmomanometer tool. Things to consider in measuring blood pressure for more accurate measurements (Singgih, 1989) are: inspection chamber, tool, preparation, measuring quantity, measuring point, pumping and cuffing.

Factors affecting blood pressure are age, family disease history, body mass index, education level, occupational stress, physical activity, caffeine consumption, drug consumption, and smoking habits.

METHOD OF RESEARCH

This research was conducted in PT. X Gresik during April-May 2017. The type of this research is systemic random sampling study. The population in this study are shift and non-shift workers in the Directorate of Engineering and Production of PT. X Gresik. Sampling technique with purposive sampling with population 37 shift production workers and 41 workers non-shift R & D, LH, and Jamintas. The sample size was calculated using the sample formula for a single sample to estimate the proportion of a population with 90% power and significance level of 0.10, to obtain a total sample of 44 people. Sample inclusion criteria has a working period of at least 1 year.

The sample of this research are male workers only. The reason for the selection of research subjects are not female because postmenopouse around the age of 40 year will experience changes in body fat metabolism (Davis et al., 2012).

The shift workers who rotates morning, evening, and night within 8 days (two days of morning shift, two afternoon shift, 2 night shift, and 2 days off) with working time ± 8 hours per day. Workers who have normal working hours from around 7:00 or 8:00 to 15:00 or 16:00 are referred to as non-shift workers.

The dependent variable in this study consisted of blood pressure. Individual characteristics data include blood pressure, age, family disease history, body mass index, education level, occupational stress, physical activity, caffeine consumption, drug consumption and smoking habits. Blood pressure measurement using a digital Sphygmomanometer.Measurements are categorized as normal if systolic blood pressure <120 mmHg and or <80 mmHg, Pre hypertension if systolic blood pressure 120-139 mmHg or diastolic 80-89mmHg, Hypertension stage I if systolic blood pressure 140 - 159 mmHg or diastolic 90 - 99 mmHg , And Hypertension stage II if systolic blood pressure ≥160 mmHg or diastolic ≥ 100 mmHg (PHI, 2007).

The measurement of body mass index (BMI) by measuring body weight was measured by a digital scale that has a precision of 0.1 kilograms, height measured with a microtoice stature that has a precision of 0.1 centimeters. Measurement of body weight and height are used to determine the nutritional status of workers by calculating body mass index (BMI). BMI is categorized as: BMI BMI <18.5 Normal IMT ≥18,5 - <24.9, Overweight BMI ≥25,0 - <27, and Obese IMT ≥27,0 (Ministry of Health, 2013).

Working stress using the Depression, Anxiety, and Stress Scales (DASS-42) questionnaires used to obtain data related to stress levels, in this study only focused on the question as an indicator of stress level. Category of work stress as follows: Normal score 0-14, Stress light score 15-18, Stress is score 19-25, Stress severe score 26-33, and Stress is very severe score> 34 (Loviband, 1995).

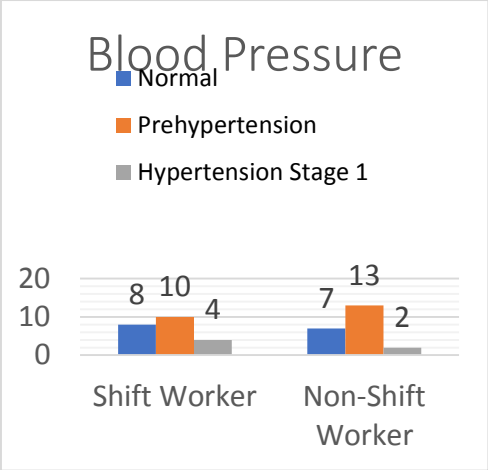
Physical activity uses the Beacke Questionnaire questionnaire used to obtain work-related indexing, sports index, and leisure time indexes. Divided into 3 categories: Light activity score <5.6, Medium activity score 5,6-7,9, and High activity score ≥8 (Baecke,1982).

Age, family disease history, education level, caffeine consumption, drug consumption, and smoking habits data are obtain through questionnaires and interviews.

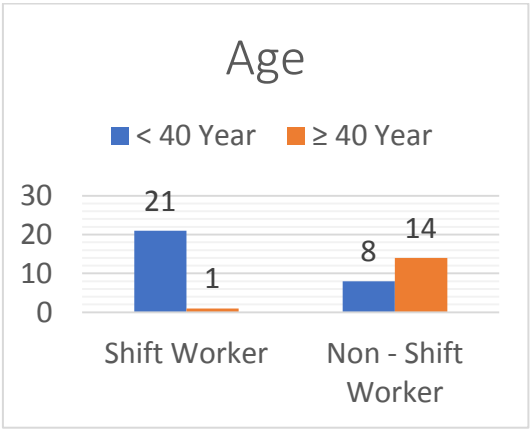
Processing and data analysis using univariate analysis and bivariate analysis. Univariate analysis is to analyze each variable from the research results expressed by the frequency distribution, either by absolute numbers or percentage, then presented in the form of bar graph along with explanation. While the bivariate analysis using chi-square test is contingency coefficient used to nominal data scale. Spearman Correlation test is used to ordinal data scale. The purpose of both is to knowing relation. The significance level used is 95% ($\alpha = 0.05$). If the value $p \leq 0.05$, then the results of statistical calculations significant which means have relations between the independent variable with the dependent variable. However, if p> 0,05, then the result of statistical calculation is not significant, which means not have relations between independent variable with dependent variable.

The study involved 44 workers divided into 22 shift workers and 22 non-shift workers. There are the distribution of data characteristics of shift and non-shift workers based on the variables:

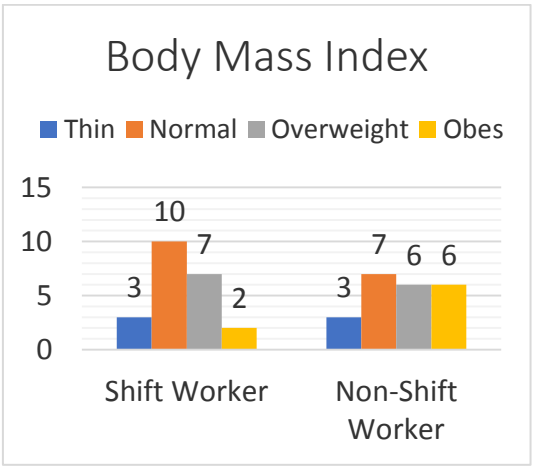
Univariate Analysis

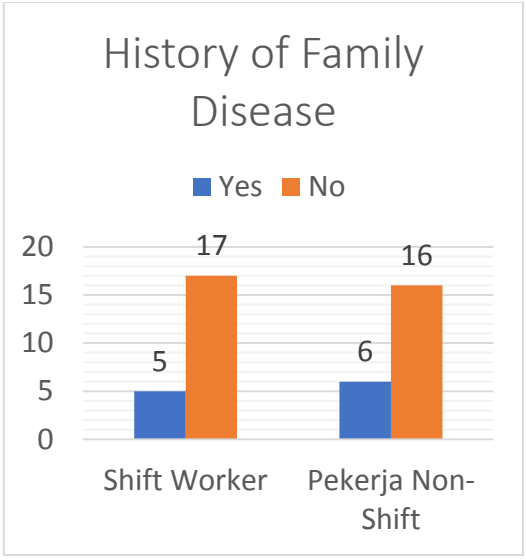


Average of blood pressure have systole and diastole pressure on shift workers were 124.64 mmHg and 77.32 mmHg, while non-shift workers have systole and diastole were 123.64 mmHg and 76.27 mmHg. Maximum and minimum values of systole pressure at 159 mmHg and 91 mmHg, while diastole pressure at 96 mmHg and Min TD 56 mmHg.

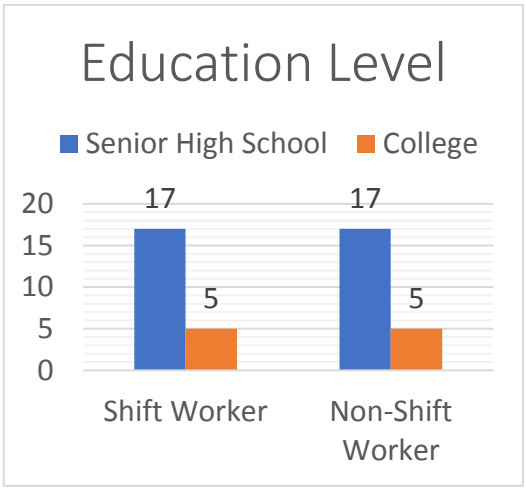


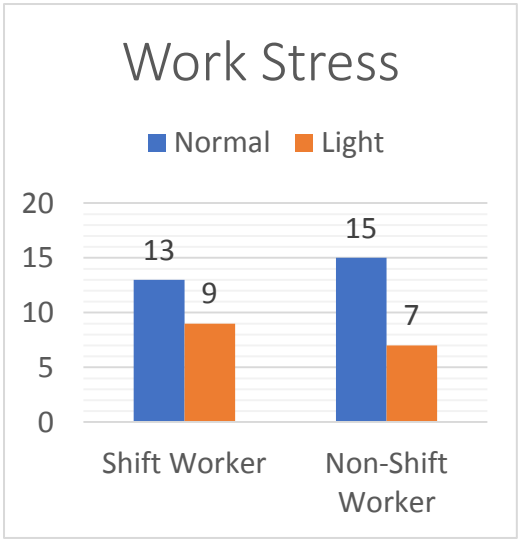
Average of age on shift workers are 27 year, at the same time on non-shift workers are 44 year and who have youngest at 22 year and oldest 55 year.



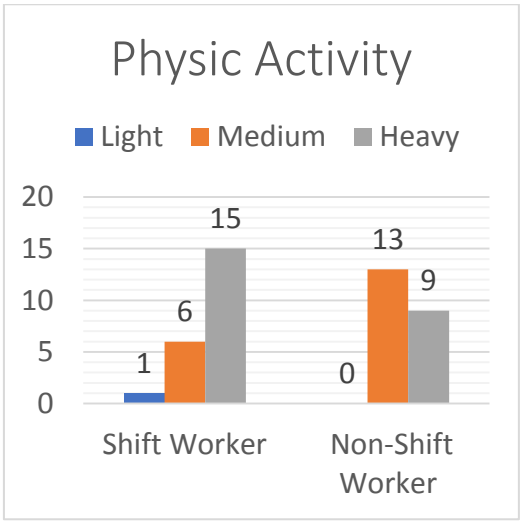


Means of Shift Workers and Non-Shift Worker have body mass index are 23.15 and 24.4. The lowest of Body Mass Index have 16.55 and the heightest 29.41 with maximum of body weight 90 kg and minimal 45kg, that maximum of body height 183 cm and minimal 157 cm.



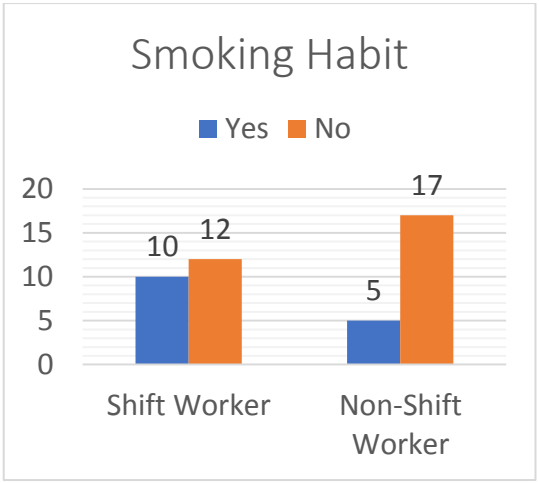


Mean score of stress work on shift worker 11.09 and non-shift worker 9.13 which lowest score 2 and highest score 17.

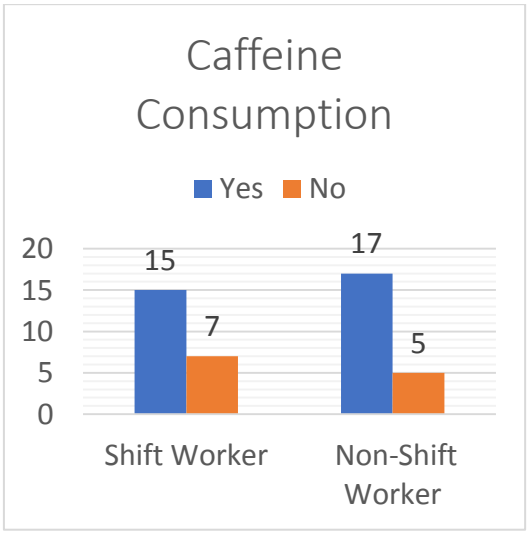


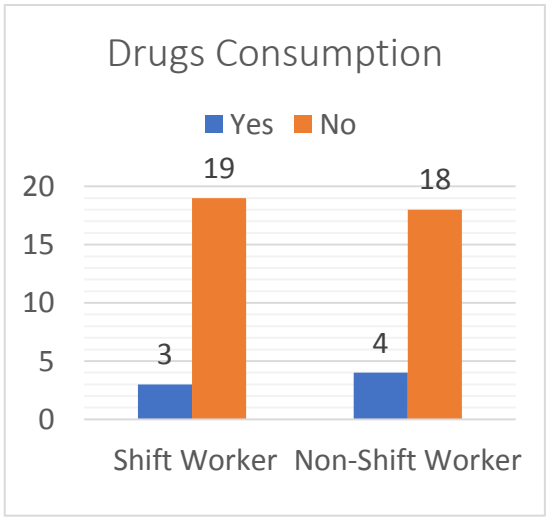
The average of physic activity on shift worker having score 8.33 included of heavy category, meanwhile on non-shift worker own score 7.86 in medium category, which physic activity having lowest score 5.125 and upset score 10.

The rate of consumption of caffeine on shift worker approximately one cup per day, while non-shift worker caffeine consumption having round a half of cup per day.



On shift worker have sucking the rate of smoking habit five cigarettes per day, and non-shift worker three cigarettes per day. In which plentiful of smoking habit are minimum five cigarettes per day and maximal twenty cigarettes per day.





Tabel 2. Bivariate Analysis

Variabel	Blood Pressure						P value
	Shift worker n(%)			Non-shift worker n(%)			
	Normal	Pre hypertention	Hypertention stage 1	Normal	Pre hypertention	Hypertention stage 1	
Age							
<40 Year	8 (38.1)	10 (47.6)	3 (14.3)	2 (28.6)	5 (71.4)	0	
≥40 Year	0	0	1 (100)	2 (13.3)	11 (73.3)	2 (13.3)	0.291[b]

Variabel	Blood Pressure						P value
	Shift worker n(%)			Non-shift worker n(%)			
	Normal	Pre hypertention	Hypertention stage 1	Normal	Pre hypertention	Hypertention stage 1	
Family history of disease							
Yes	1 (20)	1 (20)	3 (60)	2 (33.3)	3 (50)	1 (16.7)	0.039[a]
No	7 (41.2)	0 (52.9)	1 (5.9)	5 (31.3)	10 (62.5)	1 (6.3)	
Body mass Index							
Thin	2 (66.7)	1 (33.3)	0	3 (100)	0	0	0.006[b]
Normal	6 (60)	3 (30)	1 (10)	2 (28.6)	4 (57.1)	1 (14.3)	
Overweight	0	4 (66.7)	2 (33.3)	2 (33.3)	4 (66.7)	0	
Obesity	0	2 (66.7)	1 (33.3)	1 (16.7)	4 (66.7)	1 (16.7)	
Education level							
Senior High School	5 (29.4)	9 (52.9)	3 (17.6)	5 (29.4)	11 (64.7)	1 (5.9)	0.521[b]
College	3 (60)	1 (20)	1 (20)	2 (40)	2 (40)	1 (20)	
Work Stress							
Normal							
Light	4 (14.3)	7 (25)	2 (7.1)	6 (21.4)	7 (25)	2 (7.1)	0.873[b]
	4 (25)	3 (18.8)	2 12.5)	1 (6.3)	6 (37.5)	0	
Phisical Activity							
Light	0	0	1 (100)	0	0	0	0.338[b]
Medium	3 (50)	1 (16.7)	2 (33.3)	4 (30.8)	7 (53.8)	2 (15.4)	
Heavy	5 (33.3)	9 (60)	1 (6.7)	3 (33.3)	6 (66.7)	0	
Caffein Consumption							
Yes	5 (33.3)	8 (53.3)	2 (13.3)	6 (35.3)	10 (58.8)	1 (5.9)	0.383[a]
No	3 (42.9)	2 (28.6)	2 (28.6)	1 (20)	3 (60)	1 (20)	
Drugs Consumption							
Yes	1 (14.3)	1 (14.3)	1 (14.3)	0	3 (75)	1 (25)	0.308[a]
No	7 (36.8)	9 (47.4)	3 (15.8)	7 (38.9)	10 (55.6)	1 (5.6)	
Smooking Habit							
Yes	4 (40)	5 (50)	1 (10)	3 (60)	1 (20)	1 (20)	0.425[a]
Nn	4 (33.3)	5 (41.7)	2 (25)	4 (23.5)	12 (70.5)	1 (5.9)	

[a] Chisquared (Contingency Coefisien) test be based on nominal scale
[b] Spearman correlation test be based on ordinal scale

STUDY OF RESEARCH

Result of stastistic test between age with blood pressure on shift workers and non-shift workers can be concluded there is no significant relationship (p = 0.291). The results unappropriate the theory of Bustan (1997) mentions a tendency to increase prevalence by age and usually at age ≥ 40 years. This is because the arterial pressure increases with age, the occurrence of aortic regurgitation, and the more frequent generative in old age.

Another theory said that in general hypertensive people are people aged over 40 years, but did not rule out suffered by young age. Most prehypertension occurs at the age of 25-45 years and only in 20% occurs under the age of 20 years and above 50 years. This is because productive age rarely pays attention to health, such as unhealthy diet and lifestyle such as smoking (Dhaningtyas & Hendrati 2006).

The assosciation between family history of disease with blood pressure on shift workers and non-shift workers, it can be concluded that there is a significant relationship (p = 0.039). This is in accordance with the theory that family history is a congenital factor that triggers the onset of hypertension, especially primary hypertension. If in a person's family of hypertension, there is a 25% chance of the person getting attacked by hypertension. If both parents develop hypertension, the chances of hypertension rise to 60% (Iskandar, 2010).

The correlation of body mass index and blood pressure on shift workers and non-shift workers, it can be concluded that there is a significant correlation (p = 0.006). In line with the study (Korneliani and Meida 2012) that obesity risk of hypertension by 4.02 times compared to people who are not obese. When weight gain, most of which are fatty tissue, this tissue relies on oxygen and nutrients in the blood to survive. The more blood that passes through the arteries, the more pressure the artery walls receive. Almost all people who are overweight as much as 20% will eventually suffer from high blood pressure.

The average education level of shift and non-shift workers are dominant in the high school education category. Based on statistical test between education level and blood pressure on shift workers and non-shift workers it can be concluded that there is no correlation (p = 0.521). That is contrary research by Anggara and Nanang on 2012 that have relation between education with the incidence of hypertension (p = 0.042). This is not due to different levels of education, but the level of education affects the healthy lifestyle by not smoking, not drinking alcohol, and more often exercise (Yuliarti, 2007). High risk of hypertension in low education, probably due to lack of knowledge on workers with low education on health and difficult or slow to receive the information given so that impact on the behavior or healthy lifestyle (Anggara and Nanang 2012).

Based on statistical test result between work stress with blood pressure on shift workers and non-shift workers, it can be concluded that there is no significant correlation (p = 0.873). In contrast to the research in Bantul, it was found that work stress, particularly severe stress, was significantly related to hypertension (p = 0.04), workers with severe work stress were 1.54 times as likely to suffer from hypertension as compared to non-stress workers (Rundengan, 2005). The observation of PT. X Gresik about working relationship psychologically enough to have an ethos work interaction. In addition, there is a fitness program that is regular gymnastics held every Tuesday and Friday, indirectly the program can help reduce stress when working.

Spearman correlation statistic test result in between physical activity with blood pressure in shift workers and non-shift workers can be concluded that there is no significant relationship (p = 0.338). Based on less physical activity literature will increase the risk of increased blood pressure / hypertension, and vice versa (Lewa, et al, 2010). In contrast to the results of existing research Khairani (2003) where there is a significant relationship between physical activity with hypertension. Respondents with low physical activity had a risk of hypertension of 3,154 times compared with respondents who had high activity. Differences are different on the definition of operations, where physical activites are divided into two categories namely high and low but by using the score. While in this research divide physical activity into 3 categories that is light, medium, and heavy.

Next, statistical test between caffeine consumption with blood pressure, it can be concluded there is no significant correlation (p = 0.383). As mentioned by Bertrand et al., In the Uiterwaal, (2007) there is no relation between coffee and hypertension. The relationship between drinking caffeine, especially coffee as a cause of hypertension, requires a long period of research. Although there is also based on the results of experimental studies that show results that caffeine

contained in coffee can raise plasma levels some stress hormones are known to increase blood pressure (Winkelmayer 2005). So to conduct research on daily consumption well done with experimental research compared with cross sectional research.

The statistic test between the consumption of drugs with blood pressure, it is no significant relationship (p = 0.308). As Kristanti's study (2015) proved that patients given similar antihypertensive drugs Hydrochlorothiazide, Kaptopril, Amlodipine, expe rienced a significant decrease in blood pressure between day 1 and day 30. It still can not describe the incidence of increased blood pressure crossectional, because to find out it takes a long time and experimentally in sustainability.

Based on statistical test between smoking habit and blood pressure, it can be concluded there is no significant corellation (p = 0.425). Based on other studies in line, where no significant results were found between smoking habits and hypertension as have been done by Wahyuni, (2000) who only used a sample of 72 respondents. In Fatmaningsih's research, (2008) found that the results are not significant as well, although the sample used is larger as 313 respondents. Thus differences in the size or size of the varied samples can not show significant results of between smoking habits and hypertension. It is possible to do experimental research and long time.

CONCLUSION

Based on the results of a discussion of factors association blood pressure on shift workers and non-shift workers at PT. X Gresik, it can be conclusion that shift workers have a prehypertension blood pressure percentage of 44.5% lower than non-shift workers of 59.1%, otherwise the percentage of hypertensive blood pressure in shift workers is twice higher than non-shift workers. In addition, there was a correlation in family history with blood pressure having significant relationship (p = 0.006) and body mass index with blood pressure had significant relationship (p = 0.039). Meanwhile there were no significant correlation in age, education level, work stress, physical activity, caffeine consumption, consumption of drugs, and smoking habits on blood pressure.

SUGGESTION

For the company to create mini clinics that are handling by special health care workers as routine health services, such as blood tension services, weight scales, providing medication, providing nutrition counseling with balanced menu settings and so on. And for workers to keeping a balanced diet or eat more vegetables and fruits than carbohydrates to control nutritional status in relation to more weight and obesity while lack of nutrition or skinny IMT category can increase the intake of nutrients contain protein. It is advisable to always control regularly and monitor blood pressure for shift workers and non-shift workers especially who have a family history of hypertension and attention to diet early.

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