

# Exercise as Determinant Prevention of High Blood Pressure in Container Crane Operator

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**Abstract**— *Metabolic syndrome (Mets) is a multiple risk factor for coronary heart disease, diabetes, and several organ malfunctions that comes up from insulin resistance and metabolic dysfunctions caused of abnormal adipose deposition. One of the component criteria of metabolic syndrome is elevated blood pressure. Unhealthy lifestyle and sedentary physical activity are considered to have relationship with metabolic syndrome incidents in workers. This study aimed to analyze smoking habit, regular exercise and family's medical history associated with blood pressure using International Diabetic Federation Criteria for Mets in a container crane operator's population. The study was explored in a cross sectional study of 40 container crane operator. Using logistic regression for analyzing, the study found that regular exercise had significant association with blood pressure in worker adjusted with age.*

**Keywords**— *Blood Pressure, Exercise, Metabolic Syndrome*

## I. INTRODUCTION

Healthy worker will make the whole work process and productivity optimal. Potential health problems in workers are occupational accidents, occupational diseases, non-communicable diseases and infectious diseases. Metabolic syndrome is a collection of symptoms that consist of glucose intolerance, insulin resistance, central obesity, dyslipidemia, and hypertension. All of them can be risk factors for cardiovascular disease and diabetes mellitus<sup>[1, 2]</sup>. Cardiovascular disease and diabetes mellitus are part of non-communicable disease on workers. Metabolic syndrome can be a health threat to workers. A cross-sectional study in Brazil getting the prevalence of metabolic syndrome in workers amounted to 48.6%<sup>[3]</sup>. One of the criteria for metabolic syndrome according to International Diabetic Federation (IDF) is elevated blood pressure systolic blood pressure  $\geq 130$  mmHg or diastolic blood pressure  $\geq 85$  mmHg. Blood pressure is the pressure generated by the blood against the blood vessel. Blood pressure is affected by blood volume and blood vessel elasticity. The increase in blood pressure due to increased blood volume or elasticity of blood vessels<sup>[4]</sup>. Genetics, lifestyle or other diseases such as

kidney or cardiovascular disease can cause hypertension or high blood pressure.

Container crane is lifting equipment that serves to move the containers from the ship to a truck head or vice versa. An activity of container crane is one of the company core businesses in a container terminal around the world. Considering the important of container crane operator's task, his health must be maintained in good condition. A container crane operator has several health requirements including sufficient physical strength, endurance, agility, coordination, and reaction speed to meet the demands of working as a container crane operator. It is important for the business owner to make sure that there was no history of heart disease and vascular disorders that can interfere with container crane operator's work.

## II. METHODS

This study was designed as an observational study and conducted by cross sectional method. Forty container crane operators were obtained by using simple random sampling technique from 68-container crane operator as total population. The dependent variable in this study was blood pressure, while the independent variables were characteristics of workers (age, family medical history, smoking habit, and exercise habit). This study was assembling data through questionnaires and direct measurements of blood pressure. All blood pressure was measured during the morning shift, when operator was having their break time. The ethics committee for Research Project in Airlangga University, Surabaya, Indonesia approved the study. The study was held in an international company that provides container terminal facilities in Surabaya, Indonesia.

## III. RESULT

The study found that the average age of container crane operator was 39,68 years old with a standard deviation of 5,88 years. The youngest age was 30 years old and the oldest was 53 years old (Table 1.). Data of family medical history showed 67,5% respondent having no risk related to family medical history, 60% respondents having regular exercise habit and 50% of them did not ever have

smoking habit while other 40% still be a smoker and 10 % were an ex-smoker(Table 2.)

Table 1. Distribution Frequency of Age

Variabl e	Mea n	Media n	Modu s	SD	Min - Max	95% CI
Age	39.68	39.50	40	5.88	30 - 53	37.79 – 41.56

Table 2. Distribution Frequency of Variable Family Medical History, Exercise dan Smoking habit

Data	Frequency	Percentage (%)	
Family medical History	Risk	13	32,5
	no	27	67,5
	total	40	100
Exercise habit	No	16	40
	Yes	24	60
	total	40	100
Smoking Habit	Yes	16	40
	Ex-Smoker	4	10
	No	20	50
	total	40	100

Systolic blood pressure of the respondents were in the range of 100 mmHg to 180 mmHg with an average of 121 mmHg and diastolic blood pressure were in the range of 70 mmHg to 130 mmHg with an average of 82 mmHg. The result of 95% confidence interval showed that the systolic blood pressure of the population was in the range of 116.19 to 125,81mmHg and diastolic blood pressure was in the range of 78.02 to 85.98 mmHg. This might imply that the blood pressure of container crane operator was not included in the criteria for metabolic syndrome.

Table 3. Distribution Frequency of Blood Pressure

Data	Mea n	Medi an	Modu s	SD	Min - Max	95% CI
systole	121,0	120,0	110,0	15,03	100 - 180	116,19 – 125,81
diastol e	82,0	80,0	70,80	12,44	70 – 130	78,02 – 85,98

Next step, researchers divided the respondents' blood pressure reading result into two parts, namely "risk" and "normal" corresponding to IDF criteria for metabolic syndrome. This division can be seen in table

Table 4. Distribution Frequency of Blood Pressure

Risk blood pressure	19	47,5%
Normal blood pressure	21	52,5%

Biner logistic regression with  $\alpha$  0,05 between all independent variables and risk blood pressure as dependent variable had the result showed in Table 5.

Table 5. Multivariate Analysis

Variables	B	Exp (B)	Sig
Age	0,149	1,161	0,045
Exercise (1)	2,402	11,045	0,004

Note: Exercise (1) means do not have regular exercise habit. Age variable was using ratio data.

#### IV. DISCUSSION

From the estimation interval Table 1. can be concluded that the average age of container crane operators in the population at the age interval 37.79 to 41.56 years old. It means that the population is in productive age since in Indonesia, the regulation of worker age is in interval 15 years old to 64 years old. Exercise habit and smoking habit indicated that this population came under good life style habit group, because 60% of respondent have exercise habit and only 40 % still be a regular smoker.

The blood pressure of respondents also met the criteria of no syndrome metabolic related to the cut off for metabolic syndrome are for systole >130 mmHg and diastole>85 mmHg. Using biner logistic regression with backward like hood method, the study found that age and exercise having significant correlation with risk blood pressure. Container crane operator that has no regular exercise will have 11 times higher probability to have risk blood pressure than his co-worker who has regular exercise habit, adjusted with age. Meanwhile, every 1-year-old addition to their age, the container crane operator will have risk 1,2 times bigger to have elevated blood pressure.

Lifestyle changes such as regular physical activity , not smoking , reducing the amount of sodium ( salt) in the diet , reducing stress , limiting alcohol and achieve a healthy weight can help treat high blood pressure. This study result is congenial with James A. Blumenthal, *et al* study<sup>[5]</sup> that bring up conclusion the important of exercise and weight loss to the DASH diet to achieve blood pressure reductions, although their study was in overweight or obese persons with above-normal BP.

Related to metabolic syndrome, aerobic workouts will improve the flow of oxygen to the muscles, causing an increase in the use of large amounts of fat stores (glycogen) and increases insulin sensitivity. Skeletal muscle is the most sensitive tissues to insulin in the body, and a major target of insulin resistance.

Suggested workouts that are best to be carried out, are done for 30 minutes in 5 days per-week. The physical exercise will decrease body weight of 0.5 kg / month. To optimize weight loss, physical exercise can be increased up to 60 minutes for 5 days a week. Options of Workouts that can be done are such as walking, cycling or climbing stairs. The intensity of the workouts recommended for a person varies between 60-80 percent of maximum heart rate and 70 percent of maximum oxygen capacity (VO<sub>2</sub> max). Weight loss is beneficial to all components of the metabolic syndrome including hypertension.

In the population, element sport should focus on aerobic exercise, endurance, muscle strength and joint flexibility. Strategies sports program of the company should be able to accommodate all the needs of workers according to age, type of work / activity and each worker sports limitations. The workers should be recommended to increase their moderate physical activity at every opportunity, such as more walking than drive on vehicle, doing stretching after sit 2-3 hours and so on<sup>[6]</sup>. Studies Atlantis *et al* <sup>[7]</sup> found that through the intervention of physical activity (last 6 months) there is a positive relationship between the numbers of total aerobic-based exercise is completed and a decrease in waist circumference as well as an increase in maximal oxygen consumption at 73% of the participants involved in the night work.

Training and physical fitness can play a role to help workers to achieve the level of health for the better. In addition to physical improvements, fitness activities to give effect to reduce stress and bring a sense of personal responsibility for maintaining the health of the other lifestyle aspects such as nutrition, weight control, control the intake of alcohol and drug abuse as well as helping the desire to quit smoking<sup>[8]</sup>.

Since blood pressure is influenced by many conditions and mechanism, it needs more studies to reveal how specific and what the best “dose” of exercise to be a therapy for elevated blood pressure.

## V. CONCLUSION

There is a significant association between exercise, age and risk blood pressure (using elevated blood pressure IDF criteria for Mets). The highest correlation showed by regular exercise. Every container crane operator that does not have regular exercise will have more possibilities to have elevated / risk blood pressure.

The company owner and the worker themselves should encourage the awareness of the importance having regular exercise habit, not only for reducing blood pressure but also for healthy life in general and the optimal working productivity.

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