

## The Dominant factor of metabolic syndrome among office workers

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### Abstract

The prevalence of metabolic syndrome in workers is high. Its impact can lower health status and disrupt work productivity. This research aimed to identify the dominant factor of metabolic syndrome among workers in government agencies of the Tanjung Priok port, Jakarta. The research method used descriptive-analytic with a cross-sectional design. The study used secondary data from medical check-up records of 256 workers in Port of Tanjung Priok. The inclusion criteria was all employees who had a medical check-up. Exclusion criteria was pregnancy and individuals with too much missing or poorly recorded information. The chi-square test and binary logistic regression were applied for analysis. The study found that metabolic syndrome prevalence was quite high in workers (38.7%). The results of a multivariate analysis showed physical activity ( $p = 0,003$ , OR = 2,238), total energy ( $P = 0,038$ , OR = 1,960), and carbohydrate intake ( $p = 0,014$ , OR = 0,490), together became the risk factor of the metabolic syndrome among workers. The dominant factor of metabolic syndrome was physical activity. The worker was susceptible to low physical activity so that the risk of metabolic syndrome was quite high. The company should improve the health promotion program in the workplace with regular screening, improved physical activity and provide a healthy meal to prevent metabolic syndrome in workers.

## 1

### Introduction

Metabolic syndrome is a set of metabolic disorder characterized by obesity, insulin resistance, dyslipidemia, and hypertension, as well hyperglycemic (1). According to the National Cholesterol Education Programs Adult Treatment Panel III in 2001, a person is recognized to have metabolic syndrome if there are at least three out of the five criteria, including central obesity, high triglyceride levels, low high-density lipoprotein (HDL) levels, high blood pressure, and high blood sugar (2). The prevalence of metabolic syndrome worldwide ranges from less than 10% to 84%, depending on the country area, urban or rural environment, population characteristics (gender, age, race, and ethnicity), and the defining criteria used. The prevalence of metabolic syndrome worldwide according to NCEP ATP III criteria varies between 8% - 43% in men, and 7% - 56% in women. There is an increasing prevalence of metabolic syndrome at the age of 20 years to the sixth and seventh decades of life for men and women. Metabolic syndrome sufferers are at five times the risk of type 2 diabetes mellitus and three times the risk of cardiovascular disease. Furthermore, patients with metabolic syndrome have 2 to 4 times the risk of suffering from a stroke, 3 to 4 times the risk of developing myocardial infarction (MI), and 2 times the risk of death than those who do not suffer from metabolic syndrome (3,4).

Research results over the past 10 years have shown that metabolic syndrome has become a problem worldwide. At the present, metabolic syndrome is experienced by many groups of workers who generally live in urban areas (5–8). In Spain, from the results of research on 23,729 workers, it was found that cases of overweight (38.6%) and obesity (18.4%) were quite high among workers. The prevalence of diabetes mellitus, hypertension, dyslipidemia, and metabolic syndrome, were 7.6%, 20.1%, 31.3%, and 7.5% respectively (9). Meanwhile, the results of research conducted in Iran revealed that of 419 workers in the city center, as many as 17.3% shift workers and 14.9% daily workers had metabolic syndrome. The components of the syndrome most commonly experienced by workers were low HDL levels and central obesity (10).

Meanwhile in Indonesia, a study conducted by Zahtamal (11) showed the prevalence of metabolic syndrome cases among workers was 21.98%, mostly affecting men. Central obesity and high blood pressure were the most common components found in the metabolic syndrome criteria. In a study conducted in Jakarta, the prevalence of metabolic syndrome was 21.6% (6). The impact of metabolic syndrome as a degenerative disease on workers is the annual costs on companies with an estimated more than US \$ 2.8 trillion (12).

The lifestyle and work patterns of workers made them prone to metabolic syndrome. One of the factors that contribute to the presence of metabolic syndrome is sedentary behavior, in which workers carry out less physical activity during work time. Also, workers tend to have poor and unhealthy eating behavior complemented with smoking habits, and stress (13).

Work stress plays a role in the onset of metabolic syndrome in workers. Studies indicated that there is a significant relationship between high blood pressure in workers with occupational stress. In general, ages 25–45 years with a high workload are at risk of developing metabolic syndrome. Workers with a high average workload also have lower physical activity (14).

Low levels of physical activity are a risk factor for metabolic disease (13). In most cases, the nature of work for office workers does not require high physical activities and most of the working time is spent in a sitting position. Based on research in 97 office workers, 119 civil servants, 77 employees of the bank, low levels of physical activities occur in about 70% of office workers, 35% of workers employed in the civil administration, and 50% of bank employees (15). In another study conducted by Yusfita (16), the prevalence of workers with low levels of physical activity with metabolic syndrome status was 26 workers (66.7%), having sedentary behavior of more than or equal to 6 hours per day.

Another factor associated with the incidence of metabolic syndrome is food intake. Workers often do not aware that consuming snacks between work times or during meetings, causes excessive calorie intake. Some experts have agreed that a high intake of fat can increase total energy intake and obesity. The results showed that most workers tended to consume high carbohydrate and low fiber intake (11).

Metabolic syndrome can be caused by irreversible risk factors such as age and genetics, gender, education, and occupational factors. Additionally, it can be caused by modifying factors such as unhealthy lifestyles, for instance, low levels of physical activity, poor eating habits, stress, smoking, and alcohol consumption habits (8). It has been previously described that the prevalence of metabolic syndrome among workers is quite high in urban areas. This study aimed to identify the dominant factors causing metabolic syndrome in office workers, specifically government agency workers in the Port of Tanjung Priok, Jakarta.

## Methods

This study applied a cross-sectional study. The study was conducted on a representative sample of the population of workers in Port of Tanjung Priok. This study utilized secondary data including the health assessment database of the workers in the Port of Tanjung Priok, which is under Tanjung Priok Class I Port Health Office. A health assessment on the workers was conducted in 2016. The inclusion criteria were all workers who had undertaken medical check-ups. Exclusion criteria were workers who were in the state of pregnancy, having diabetes mellitus, had cardiovascular disease, and individuals with too much missing or poor recorded information. Pregnant women were not included in the analysis, because it impacts the waist circumference measurement. A total of 256 employees (174 men and 82 women), aged 20–58 who attended the medical check-up were recruited to the study. The sample was distributed into five workplace areas. This research obtained 55 samples from the Class I Tanjung Priok Port Health Office, 49 samples from Tanjung Priok Port Authority, 51 samples from Port of Tanjung Priok Police Office, 60 samples from the Commission Customs and Excise Type A Tanjung Priok, and 41 samples from Agricultural Quarantine of Tanjung Priok.

The medical check-up recorded blood pressure (mmHg), triglycerides level (mg/dL), high density lipoprotein level (mg/dL), fasting plasma glucose level (mg/dL). Blood samples were collected after fasting for at least 8–12h.

The diagnosis of metabolic syndrome was defined as a subject presenting at least 3 of the 5 factors described by the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III)

criteria. The diagnostic criteria were defined as follows: (1) high blood pressure (a systolic blood pressure  $\geq 130$  mm Hg and/ or diastolic pressure  $\geq 85$  mm Hg; (2) high triglyceride ( $\geq 150$  mg/dL); (3) decreased HDL ( $<40$  mg/dL for men and  $<50$  mg/dL for women); (4) high fasting plasma glucose ( $\geq 100$  mg/dL), and abdominal obesity.

Food intake, physical activity, and stress variables were obtained from the database of workers' health examination. Variable food intake was created by following guidelines from the recommended dietary allowances with five-level categories of total energy, carbohydrate, protein, fat, and fiber. Food intake measurement used semi-quantitative Food Frequency Questionnaire. The physical activity variable was defined into a two-level category including high levels of activity ( $\geq 600$  MET minutes per week) and low levels of activity ( $<600$  MET minutes per week). Physical activity measurement used Global Physical Activity Questionnaire - WHO). Stress was categorized into two-levels, including mild to moderate (score  $<24$ ) and moderate to severe (score 25-30). Age, educational level, marital status, and work position were also included as socio-demographic variables using available data components from the database.

Bivariate (chi-square) and multivariate (binary logistic regression) analyses were employed to examine the relationship between variables.

## Results

The results revealed that the respondents with metabolic syndrome as much as 38.7%. A total of 157 out of 256 respondents (61.3%) did not experience metabolic syndrome. Metabolic syndrome is characterized by 5 components including central obesity, hypertension, hyperglycemia, hypertriglyceridemia, and low HDL levels. The majority of respondents (31%) had 2 out of 5 components of the metabolic syndrome. This was followed by the proportion of 1 of 5 components with as much as 25%, 3 of 5 components with as much as 20%, 4 of 5 components with as much as 13% respondents, and 5 of 5 components as much as 6% of respondents, and the least was the respondents with zero components present as much as 5%.

### 1. Metabolic Syndrome Components

Based on the distribution of the components of the metabolic syndrome, it can be seen that the most common component found in respondents was low HDL levels at 81%, followed by central obesity at 57%, hyperglycemia at 41%, hypertension 28%, and hypertriglyceridemia 21.5%. However, the most common component found in respondents with metabolic syndrome was central obesity at 35.2%, followed by low HDL levels, hyperglycemia, hypertension, and hypertriglyceridemia, each with a proportion of 34.8%, 29.3%, 22.7%, and 18.8 respectively (Table 1).

Table 1. Distribution of Metabolic Syndrome Components

Variable	Category	Metabolic Syndrome				Total	
		Yes (N = 99)		No (N = 157)		N = 256	%
		N	%	N	%		
Central Obesity	Yes	90	35.2	55	21.8	111	43
	Not	9	3.5	102	39.5	145	57
Hyperglycemia	Yes	75	29.3	29	11.7	104	41
	Not	24	9.4	128	49.6	152	59
Hypertriglycerides	Yes	48	18.8	7	2.7	55	21.5
	Not	51	19.9	150	58.6	201	78.5
Low HDL	Yes	89	34.8	119	46.2	208	81
	Not	10	3.9	38	15.1	48	19
Hypertension	Yes	58	22.7	13	5.3	71	28
	Not	41	16.0	144	56	185	72

### 2. Individual Characteristics of Metabolic Syndrome

Based on the age variable, male respondents in the age group  $\geq 41$  years were found to have higher metabolic syndrome. There was a relationship between age and metabolic syndrome in male respondents. However, the higher number of female respondents in the age group  $\geq 41$  years did not suffer from metabolic syndrome. There was no relationship between age and metabolic syndrome in female respondents.

Based on educational variables, neither male respondents nor female respondents with a low level of education suffered from metabolic syndrome. There was no relationship between education level and metabolic syndrome in male and female respondents.

Based on the variable of marital status, the number of married male respondents with metabolic syndrome was higher than those unmarried, with the same findings found on female respondents. There was a relationship between marital status and metabolic syndrome in male respondents. There was no relationship between marital status and metabolic syndrome among female respondents.

Based on occupational variables, male respondents did not differ in the number of metabolic syndrome incidents in both structural and non-structural working positions. There was no relationship between occupation and metabolic syndrome in male respondents. In the female respondents, the incidence of metabolic syndrome was more common in the group of non-structural working positions compared with the group of the structural position. There was no relationship between occupation and metabolic syndrome in female respondents.

Based on the results of the individual characteristics test for metabolic syndrome, marital status and age were risk factors for metabolic syndrome in male respondents. For female respondents, variables of age, education, marital status, and working position were not associated with metabolic syndrome (Table 2).

Table 2. The Relationship of Individual Characteristics to Metabolic Syndrome

Variable	MS in Male (n = 174)					p-value	MS in Female (n = 82)					p-value
	Yes		Not		Yes		Not					
	N	%	N	%	N		%	N	%			
<b>Age</b>												
≥41 years	39	68.4	18	31.6	* 0,000	14	29.8	33	70.2	0.212		
<41 years	30	25.6	87	74.4		16	45.7	19	54.3			
<b>Education</b>												
Low	30	35.3	55	64.7	0.320	12	40.0	18	60.0	0.803		
High	39	43.8	50	56.2		18	34.6	34	65.4			
<b>Marital status</b>												
Yes	62	50.4	61	49.6	* 0,000	25	41.7	35	58.3	0.187		
No	7	13.7	44	86.3		5	22.7	17	77.3			
<b>Position</b>												
Structural	15	50.0	15	50.0	0.285	4	25.0	12	75.0	0.434		
Non-Structural	54	37.5	90	62.5		26	39.4	40	60.6			

### 3. Food Intake, Physical Activity, Stress, and Metabolic Syndrome

Based on the food intake variable in terms of total energy intake, male respondents with metabolic syndrome were more prevalent in the group with excess total energy. There was no relationship between total energy intake and metabolic syndrome in male respondents. However, among female respondents with excess total energy intake, there were fewer people with metabolic syndrome compared with female respondents who did not suffer from metabolic syndrome. There was no relationship between total energy intake and metabolic syndrome in female respondents.

According to the food intake variable, in terms of carbohydrate intake, there were fewer male respondents with metabolic syndrome in the excess carbohydrate group compared with male respondents who did not suffer from metabolic syndrome. There was a relationship between carbohydrate intake and metabolic syndrome in male respondents. Among female respondents in the group of excess carbohydrate intake, there were fewer female respondents with metabolic syndrome compared with female respondents who did not suffer from metabolic syndrome. There was no relationship between carbohydrate intake and metabolic syndrome in female respondents.

According to the dietary intake variable, in terms of protein intake, there was a lower incidence of metabolic syndrome of male respondents in the group of excess protein intake, as was the case with female respondents. There was no relationship between protein intake and metabolic syndrome in male respondents, as well as in female respondents.

According to the food intake variable, in terms of fat intake, there was a fewer number of male respondents with metabolic syndrome in the excess fat group compared with those who did not suffer from metabolic syndrome, with the same case as in the female group. There was no relationship between fat intake and metabolic syndrome in both male and female respondents.

According to the dietary intake variable, in terms of fiber intake, there were fewer male respondents with metabolic syndrome in the low fiber intake group compared with those who did not suffer from metabolic syndrome, the same result was for the female respondents. There was no relationship between fiber intake and metabolic syndrome in both male and female respondents.

According to the physical activity variable, there was a higher number of male respondents with metabolic syndrome in the low levels of physical activity group compared with those who did not suffer from metabolic syndrome. There was a relationship between physical activity and metabolic syndrome in male respondents. Among female respondents in the low levels of physical activity group, there were fewer female respondents with metabolic syndrome compared with female respondents who did not suffer from metabolic syndrome. There was no relationship between low physical activity and metabolic syndrome in female respondents.

According to the stress variable, there was a higher number of male respondents with metabolic syndrome in the severe stress group compared with respondents who did not suffer from metabolic

syndrome. There was no relationship between stress and metabolic syndrome in male respondents. Among female respondents in the severe stress group, there were fewer respondents with metabolic syndrome compared with respondents who did not suffer from metabolic syndrome. There was no relationship between stress and metabolic syndrome in female respondents.

The conclusion, for male respondents, the variables associated with metabolic syndrome were carbohydrate intake and physical activity. Among female respondents, there was no relationship between the variables of intake, physical activity, and stress on metabolic syndrome (Table 3).

Table 3. Relationship of Food Intake, Physical Activity, Stress and Metabolic Syndrome

Variable			MS in Male (n = 174)				MS in Female (n = 82)					
			Yes		No		p-value	Yes		No		p-value
			N	%	N	%		N	%	N	%	
Food intake												
Total Energy	Low	21	51.2	20	48.8	0.121	6	35.3	11	64.7	1,000	
	Sufficient	48	36.1	85	63.9		24	36.9	41	63.1		
Carbohydrate	Low	39	33.6	77	66.4	* 0.033	20	34.5	38	65.5	0.717	
	Sufficient	30	51.7	28	48.3		10	41.7	14	58.3		
Protein	Low	61	38.6	97	61.4	0.536	28	38.4	45	61.6	0.475	
	Sufficient	8	50.0	8	50.0		2	22.2	7	77.8		
Fat	Low	50	37.0	85	63.0	0.259	20	33.3	40	66.7	0.453	
	Sufficient	19	48.7	20	51.3		10	45.5	12	54.5		
Fiber	Low	67	39.4	103	60.6	0.649	30	37.0	51	63.0	1,000	
	Sufficient	2	50	2	50		0	0	1	100		
Physical Activity	Low	47	52.8	42	47.2	* 0.001	21	37.5	35	62.5	0.995	
	Active	22	25.9	63	74.1		9	34.6	17	65.4		
Stress	Severe	5	55.6	4	44.4	0.486	1	33.3	2	66.7	1,000	
	Mild	64	38.8	101	61.2		29	36.7	50	63.3		

#### 4. Dominant Factors of Metabolic Syndrome

To determine the dominant factor of the metabolic syndrome, a binary logistic regression test was performed on 256 samples. Based on the regression logistic binary, the variables significantly associated with metabolic syndrome in a respondent were total energy, carbohydrate intake, and physical activity. The variable with the most dominant influence on metabolic syndrome was physical activity with OR = 2.238. Respondents who low levels of physical activity were 2.238 times more likely to experience metabolic syndrome compared with respondents with adequate physical activity, after being controlled by the variables of carbohydrate intake, total energy, protein intake, fat intake, fiber intake, and stress (Table 4).

Table 4. Final Model of Binary Logistic Regression Test of Dominant Factors of Metabolic Syndrome.

Variable	p-Value	OR	95% CI	
			Lower	Upper
Total Energy	0.038	1,960	1,037	3,704
Carbohydrate	0.014	0.490	0.277	0.868
Physical Activity	0.003	2,238	1,308	3,831

## Discussion

Recently the incidence of metabolic syndrome is quite high in workers (8,17,18). A person is recognized to have metabolic syndrome when there are at least 3 (three) risk factor components present out of 5 (five) factor components according to the criteria NCEP ATP III that have been modified for the Asian race (2). In this study, 38.7% of respondents had metabolic syndrome. Based on gender, metabolic syndrome was more common in men than in women. This finding is similar to a study in Iran conducted on 1488 office workers, which revealed that 35.9% of workers had metabolic syndrome, with a higher number in men (37.2%) than in women (20.6%) (17).

Most of the respondents who suffered from metabolic syndrome had central obesity (35.2%). These data findings are also supported by research on 33,149 workers in China, which found that obesity is the most common component of metabolic syndrome. The study shows that of all respondents who suffered from metabolic syndrome, 54.7% of male respondents were having the body mass index (BMI) category above normal and 35.9% of female respondents had central obesity (18). Central obesity occurs due to the accumulation of fat located in the visceral tissue. This is indicated by a waist circumference that exceeds the normal limit, namely  $\geq 90$  cm in men, and  $\geq 80$  cm in women (2). The cause of central obesity can be triggered by an unhealthy lifestyle (excessive food intake and sedentary behavior), apart from genetic factors, age, and gender (19).

Central obesity is thought to be closely related to metabolic syndrome, through diabetes mellitus,



hypertension, and dyslipidemia (20). A study carried out by Widastra et al found a significant relationship between central obesity, both through measurement of BMI, abdominal circumference, and sagittal stomach against the incidence of insulin resistance (OR = 9.848), in which insulin resistance is a component of the metabolic syndrome (hyperglycemia). The OR value indicates that people with central obesity are at 9.848 times greater risk of developing metabolic syndrome than people without central obesity (21). The accumulation of fat reserves in the stomach causes the number of fat cells to increase. It leads to increased secretion of excess insulin, which leads to the appearance of insulin resistance. Insulin resistance can contribute to systemic inflammation. The onset of inflammation is associated with metabolic syndrome (22).

Central obesity through measurement of the abdominal circumference or the ratio of waist to hip circumference has a strong association with the incidence of cardiovascular disease (19). The increase in fat cells will form adiposopathy which may interfere with the endocrine system and the immune system. Adiposopathy causes pericardiac and perivascular effects on the heart muscle and blood vessels which directly impact cardiovascular disease. Besides, adiposopathy also causes increased risk factors for diabetes mellitus, hypertension, and dyslipidemia (23). Previous studies found a significant relationship between central obesity through measurement of waist and hip ratios and the incidence of hypertension ( $p=0.007$ ) (20).

Besides, the most common component of the metabolic syndrome in 256 respondents in this study was low HDL levels (81%). This finding is also in line with a study in China (18). Low HDL levels are known to be significantly associated with the incidence of atherosclerosis in both the pediatric and adult groups (24).

The findings of a bivariate analysis on individual characteristics of metabolic syndrome showed that the age variable was a risk factor for male respondents. In line with a study of metabolic syndrome in Thailand on the workforce population, age is associated with metabolic syndrome (OR = 1.02) in male respondents. This shows that men with older age have a 1.02 times greater chance of experiencing metabolic syndrome compared with men with younger age (8). This study found that age 41 and over increased the risk of metabolic syndrome in male respondents, which is also consistent with findings in the male labor force in China (18). However, for female respondents, there was no relationship between age and metabolic syndrome. In line with research in China, metabolic syndrome in female respondents is mostly found at the age of over 60 years. Hormonal factors, namely the menopause phase in women, are suspected to be the cause (18). Apart from age, marital status was associated with metabolic syndrome in male workers in this study. These findings are similar to those of previous studies, which stated age and marital status are the dominant factors for metabolic syndrome in the African-American population (25).

The final model of the multivariate analysis in this study shows that total energy and excess carbohydrate intake, as well as low levels of physical activity, are risk factors for metabolic syndrome in respondents. Based on these findings, workers need to meet the needs of adequate physical activity and control the food intake to avoid the risk of metabolic syndrome. Previous research has suggested that adequate physical activity followed by a good diet can reduce BMI and waist circumference. Besides, other positive effects are lowering high blood pressure, triglyceride levels, blood glucose levels, and increasing HDL levels (26). Adequate physical activity can also relieve stress, increase muscle mass, and control appetite. Physical activity also improves insulin sensitivity after one exercise session because blood glucose is used for muscle movement. However, insulin levels return to normal within 48 hours of exercising. Therefore, regular exercise and good eating behavior are highly recommended to improve insulin sensitivity. The results of previous studies stated that regular exercise can be carried out 30-40 minutes at least 3 times a week. Aerobic exercise such as jogging, swimming, cycling is recommended to correct metabolic disorders and weight loss (26).

Sedentary behavior trends are increasing from year to year, followed by the increasing prevalence of obesity (26). The results of multivariate analysis showed that the dominant factor of metabolic syndrome in this study was low levels of physical activity. Respondents with low levels of physical activity have a 2.238 times higher chance of suffering metabolic syndrome compared to respondents with enough physical activity, once controlled by the variable intake of carbohydrates, total energy, protein intake, fat intake, fiber intake, and stress. In line with a study in Thailand, low levels of physical activity of office workers can be caused by more time and effort spent in work activities and daily mobility, which does not require spending sizeable energy. Also, the group of workers is lacking in recreational and sports activities both after work and on weekends (8).

Most of the respondents who suffered from metabolic syndrome had 2 out of 5 components of the metabolic syndrome (31%). The group can be regarded as a pre-metabolic syndrome category, which needs serious concern through identification (screening) and preventive efforts. As an important part of a company, workers should receive regular medical examinations, especially related to components of the metabolic syndrome. This prevention effort is useful when finding workers with the pre-metabolic syndrome to provide treatment and to avoid the worse effects (27).

Health promotion programs in the workplace can help improve lifestyle factors, such as food intake and

physical activity, thereby reducing rates of metabolic syndrome and its components. Good surveillance and program evaluation through periodic health checks of workers are very useful and important to be carried out to improve the health status of workers. The positive impact of the program is a lower cost of treatment in which the current figure is very high for non-communicable diseases in the general population. The benefits obtained are workers' health and increased work productivity (8). A study was carried out to see the effects of Health Promotion at Work on workers against metabolic syndrome. The study provided a combination of interventions in the form of physical exercise, eating behavior, health education, social support, and advocacy for 12 weeks. The results showed that multilevel Health Promotion at Work interventions improve dietary intake by increasing the amount of dietary fiber and reducing cholesterol intake, as well as increasing physical activity. These interventions are effective in controlling metabolic syndrome in the workplace (28).

The limitations of this study are the potential bias from the subjectivity of the respondents in providing answers to the questions in the questionnaire, in particular, related to physical and food intake. In general, when measuring physical activity researcher employs questions related to physical, transportation, and leisure time. The respondents were generally of the same line of work with no heavy works. The semi-quantitative FFQ was used to answer the food intake. The use of this semi-quantitative FFQ can lead to excessive or even insufficient intake assessments due to inconsistencies in the frequency of intake and number of servings. Therefore, respondents were asked to mention the most frequent conditions, but the potential to forget the frequency and portion of food intake was very large, this is commonly referred to as recall bias.

## Conclusion

The results showed that the prevalence of metabolic syndrome was quite high in workers and male respondents who experienced metabolic syndrome were higher compared to women. The results of the multivariate analysis showed that physical activity, excess carbohydrate intake, and excess total energy are risk factors for metabolic syndrome in the respondents. The dominant factor is an only a physical act. its strategies should follow this finding. Companies should improve health promotion programs in the workplace by regularly checking lipid profiles and anthropometry, increasing physical activity, and controlling or providing good food intake to prevent metabolic syndrome in workers. Companies need to create strategies for dealing with metabolic syndrome and efforts to prevent it. Some of the possible efforts include: 1) Conducting periodic screening for metabolic syndrome; 2) Providing facilities for the provision of Non-Communicable Disease Prevention Posts in companies; 3) Carrying out organized sports activities that support the physical activities of workers at least 2 times a week; 3) Providing space and tools for exercise to encourage the employees to do the personal work out after working hours; 4) Minimizing the use of elevators, which triggers employees to engage in physical activity; 5) Striving for healthy nutritional intake for beginners, for instance by encouraging canteens to provide fiber-rich foods with the principle of balanced nutrition or by providing meeting consumption with healthy foods.

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