The Indonesian Journal of Occupational Safety and Health
2023, 12 SI(1): 52-57
p ISSN: 2301 8046, e ISSN: 2540 7872
http://doi.org10.20473/ijosh.v12iSI1.2023.52-57

ORIGINAL ARTICLE

Eating Habit as Lifestyle Predictors of Metabolic Syndrome in Coal Mining Workers

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ABSTRACT

Introduction: Previous study was carried out in a company, obtaining the prevalence of metabolic syndrome cases by 21.58% with non-communicable diseases as the indicator. The cause of the metabolic syndrome is critical to understand in order to reduce the impact of acute non-communicable diseases. Excessive food consumption and low physical activity in office workers and coal mining workers are two risk factors that contribute to the development of metabolic syndrome. Therefore, current research was conducted aiming to identify the lifestyle aspects related to metabolic syndrome in coal mining companies in South Kalimantan. **Methods:** This study was carried out through analytical observational cross-sectional research. In this case, the data were collected using questionnaires. Exercise routines, cigarette smoking, and meal frequency were the research factors. In South Kalimantan, there are up to 70 employees of mining company, and 22 people of them were selected as the research subjects through purposive random sampling and inclusion criteria. **Results:** The indicators of metabolic syndrome in most of the respondents showed normal state. However, a small number of respondents were at risk of having the indicators of metabolic syndrome. Meanwhile, based on the statistical analysis, there is a lifestyle factor that correlates with the frequency of eating coconut milk-based chicken curry (1-2 times/week) with metabolic syndrome (p=0.045). **Conclusion:** Types of food cooked using coconut milk can trigger a person to have a risk of experiencing one or several of the metabolic syndrome indicators. Things that can be done to reduce the risk of metabolic syndrome associated with the frequency of habit of eating high-fat animal side dishes, including reducing the frequency of such food at night.

Keywords: exercise, fruit, lifestyle, metabolic syndrome, steamed rice

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INTRODUCTION

The prevalence of metabolic syndrome in Chinese oil industry workers was discovered to be 40.67% (Wang *et al*, 2020). The prevalence of metabolic syndrome has also been discovered among workers in Indonesia through a previous study conducted in companies with administrative work characteristics. This type of work requires little physical activity and is aided by cutting-edge technology, despite the fact that the prevalence of metabolic syndrome cases is 21.58%. The age group of above 50 years old is the most age group affected by metabolic syndrome, and the majority of them are male. The most common metabolic syndrome indicators is abdominal circumference that exceeds the normal circumference (Zahtamal *et al*., 2014). Based on data from Indonesia's Basic Health Research (Riskesdas) in 2018, the percentage of obese adults older than 18 is 21.8%. Furthermore, particularly, 31% of people over the age of 15 have central obesity (Ministry of Health Republic of Indonesia, 2018).

Abdominal circumference or central obesity, elevated blood pressure, elevated fasting blood sugar, elevated triglyceride levels, and lowered High Density Lipoprotein (HDL) cholesterol levels are five indicators of metabolic syndrome. Numerous non-communicable disorders, including central obesity, hypertension, and hypercholesterolemia, are metabolic syndrome markers. Such non-communicable disease is a combination of signs and symptoms of conditions that increase risk for more severe illnesses like cardiovascular and type 2 diabetes (Nisa, Martiana and Wahyudiono, 2018).

Cite this as: Nisa, M. A., Setyaningrum, R. and Fitria, F. (2023) 'Eating Habit as Lifestyle Predictors of Metabolic Syndrome in Coal Mining Workers', *The Indonesian Journal of Occupational Safety and Health*, 12(SI1), pp. 52-57.

 doi:10.20473/ijosh.v12iSI1.2023.52-57
Received September 22, 2022; 1st revision December 07, 2022; 2nd revision December 19, 2022; Accepted July 12, 2023, Published: July 2023. Published by Universitas Airlangga.

Since metabolic syndrome involves several fairly complex mechanisms, its pathophysiology has not been fully elucidated. One of them is whether this metabolic syndrome pathology is formed independently from other pathologies or is the result of a common pathogenic process. Genetics, epigenetics, and lifestyle factors such as overeating (high in calories) and lack of physical activity are considered to be major contributors to the metabolic syndrome (Fahed *et al*., 2022).

Several risk factors for metabolic syndrome, including hypertension, have been identified in East Kalimantan coal mining operators. According to the study's findings, 70% of operator employees had grade 1 hypertension (systolic blood pressure of 140-159 mmHg and diastolic blood pressure of 90-99 mmHg), while the remaining 30% had grade 2 hypertension (systolic blood pressure range 160 mmHg and diastolic blood pressure in the range 100 mmHg) (Ismiati, 2021).

Another study found that most coal mining employees engaged in relatively light physical activity on weekdays (56.8%) and weekends (40%), with a weekday Physical Activity Level (PAL) of 1,400,244 and a weekend PAL of 1,630,33. It occurs because the work done does not require a lot of physical activity. Workers are no longer needed to be active while working due to the use of technology (Zahra and Riyadi, 2022).

Other markers of metabolic syndrome, such as lifestyle, have not been specifically studied in coal miners. Therefore, the goal of this study was to identify the lifestyle factors associated with metabolic syndrome in South Kalimantan coal mining workers. This is significant because worker managers can prevent metabolic syndrome or control its severity by controlling the causal factors associated with it if they know the specific factors.

METHODS

The study was analytical observational cross-sectional research. The study was conducted on November 2021 at a coal mining company in South Kalimantan, with a population of 70 employees and a sample of 22 male employees who were selected by purposive random sampling based on inclusion criteria. In this case, the inclusion criteria are employees who have attended a medical check-up and are willing to become the research respondents.

Metabolic syndrome is chosen as the dependent variable in this study, which was based on its indicators, such as abdominal circumference, blood pressure, fasting blood sugar levels, triglyceride levels, and HDL cholesterol levels, as confirmed by secondary data from employee medical check-ups. Meanwhile, the independent variables in this study were metabolic syndrome-related lifestyle factors including exercise routines, cigarette smoking, and meal frequency. A questionnaire was used to collect the data. In this case, questionnaire from previous research was used (Nisa, Martiana and Wahyudiono, 2018) and a validation test has been performed (α 0.72). We used statistic tool (IBM SPSS) to analyze the correlation between dependent and independent variables using pearson correlation test. The ethics committee of the Faculty of Medicine, University of Lambung Mangkurat, has also declared this research as ethically feasible (922/ KEPK-FK-ULM/EC/ XI/2021).

RESULT

The findings revealed that the majority of respondents had normal metabolic syndrome indicators. However, a small percentage of respondents (36.4%) were at risk of having metabolic syndrome indicators such as abdominal circumference/central obesity, blood glucose levels (18.81%), triglyceride levels (27.72%), HDL

Table 1. Distribution of Metabolic Syndrome Indicators

Metabolic Syndrome Risk Factors	N	%
Waist Circumference		
Normal Waist Circumference	14	63.6
Waist Circumference at Risk	8	36.4
Blood Glucose Level		
Normal Blood Glucose Level	18	81.81
Blood Glucose Level at Risk	4	18.18
Triglyceride Level		
Normal Triglyceride Level	17	77.27
Triglyceride Level at Risk	5	22.72
Cholesterol Levels (HDL)		
Normal Cholesterol Levels (HDL)	17	77.27
Cholesterol Levels (HDL) at Risk	5	22.72
Blood pressure Level		
Normal Blood pressure Level	20	90.90
Blood pressure Level at Risk	2	9.09

cholesterol levels (27.72%), and blood pressure. blood (9.09%).

Table 2. Predictors of Metabolic Syndrome

Metabolic Syndrome Risk Factors	Sig. 2 tailed
Characteristics of Respondents	0.377
Age ≥ 40 years	
Age < 40 years	
Smoking Habits	0.349
Non Smoker	
Smoker (active)	
Smoker Type	0.323
Light Smoker (< 10 cigarettes/day)	
Moderate Smoker (10-20 cigarettes/day)	
Long Smoking Duration	
Exercise Habits	
Exercise Frequency Per Day	
Exercise habits <2 times a week	0.636
Exercise habits 2 times a week	
Exercise Frequency minutes/day	
Exercise habits <30 minutes/day	0.651
Exercise habits 30 minutes/day	
Food Frequency	
Staple food	
Steamed rice (>3 times/day)	0.533
Bread (1-2 times/week)	0.686
Noodles (1-2 times/week)	0.317
Animal side dishes	
Habang Cooked Chicken (1-2 times/week)	0.431
Coconut curry chicken (1-2 times/week)	0.045*
Pentol/meatballs (1-2 times/week)	0.122
Vegetable side dishes	
Tofu (3-6 times/day)	0.877
Tempe (3-6 times/day)	0.961
Peanuts (2 times a month)	0.061
Vegetable	
Kale (1-2 times/week)	0.304
Carrots (1-2 times/week)	0.077
Cucumber (1-2 times/week)	0.095
Fruit	
Apples (2 times a month)	0.162
Pears (2 times a month)	0.613
Melon (2 times a month)	0.365
Other	
Fried food (1-2 times/week)	0.101
Sweet tea (1-2 times/week)	0.762
Sweet coffee (1 time/day)	0.117

Since the data were not normally distributed, bivariate analysis was performed on the collected data using the Pearson correlation statistical test. The Pearson correlation test results revealed that several risk factors for metabolic syndrome were associated with the incidence of metabolic syndrome in coal mining workers respondents, including exercise habits, specifically the length of exercise per day (0.003), the frequency of eating staple foods, specifically steamed rice (0.033), and the frequency of eating fruit, specifically apples (0.026).

DISCUSSION

Based on the study findings, we discovered the characteristics showing a link between lifestyle and metabolic syndrome, which could be the indications of the initial cause of metabolic syndrome.

The frequency of eating habits, particularly animal side dishes, such as coconut milk curry chicken, is a lifestyle variable associated with the discovered metabolic syndrome. Coconut curry chicken is not a local dish, yet it is very popular throughout Indonesia. Coconut curry chicken is an Indonesian dish made with chicken cooked in coconut milk. The savory and salty flavor of coconut milk curry indicates that it contains salt. Chicken coconut milk curry was determined to be the most popular animal side dish in this study, with the second greatest eating frequency among other types of animal side dishes (habang chicken and pentol/ meatballs).

It is believed that eating this kind of processed coconut milk-based animal side dish is linked to an increased risk of belly obesity, hypertension, and triglycerides. This occurrence was mostly brought on by the processed coconut milk's high fat content. Coconut milk is a product made from coconuts. To make coconut milk in the right thickness, an emulsifier is typically added to make the emulsion more stable. A fat-in-water emulsion with a milky white hue, protein, and other nutrients, coconut milk is sometimes referred to as a natural stabilizer made of phospholipids and protein (globulin and albumin). Pure coconut milk naturally contains about 54% water, 35% fat, and 11% non-fat solids (± 6% carbohydrates, ± 4% protein, and other solids) which are categorized as oil-in-water emulsions. Coconut milk also contains a number of vitamins and minerals. The nature of the source material (coconut), the technique used for extraction, and the quantity of water added all have a significant impact

on this composition. Thin coconut milk has 122 kcal of calories per 100 grams (Tim dokteranda, 2012).

This is consistent with earlier studies on mining workers, which found that 82.40% of the food consumed contains saturated fat in a category that is not in alignment with the diet (Zahtamal *et al*. 2014). It was also noted in other research that compared to acceptable fat consumption, fat intake over the adequate rate was associated with a higher frequency of metabolic syndrome. According to earlier studies' findings (Wiardani, Kusumajaya, and Arsana . 2018), there was a strong correlation between the amount of fat consumed and the presence of the metabolic syndrome (p=0.02). However, some research projects have found the opposite, showing that carbohydrate intake is a predictor of the metabolic syndrome (p=0.03). However, this predictor was accompanied by gender as another predictor (Driyah, *et al*. 2019).

Previous studies indicated an association between a high-fat diet and obesity (Novela, 2019). Foods made with processed coconut milk are one source of fat in the diet. Particularly when heating coconut milk for longer than three minutes. Foods prepared in Indonesia using coconut milk are often cooked for longer than three minutes and are frequently heated. If coconut milk consumption is frequent enough, this could turn the fat content into an obesity trigger. Coconut milk curry chicken is one dish created with coconut milk that is frequently offered.

Around 98% of saturated fatty acids are present in pure coconut milk. Medium Chain Fatty Acids (MCFAs) found in coconut milk are supposed to be protective fats that ward against disease. However, processing coconut milk by heating or frying it for longer than three minutes can have the opposite effect (Tim dokteranda, 2012). This is in line with studies on the association between the frequency of boiling and the amounts of unsaturated fatty acids in coconut milk (ANOVA, p=0.01). These studies looked at the amount of unsaturated acid content (PUFA) and the frequency of boiling. According to studies, ingesting coconut milk up to four times its boiling point is safe (Setyowati. 2013). If it is cooked for too long until it boils, the coconut milk will turn into a source of saturated fat. Second, do not heat food containing coconut milk, because this can cause an oil layer to form which then makes cooking dangerous because it has turned into a source of bad fats (Tim dokteranda, 2012).

In addition, coconut milk dishes that contain high fat also have the potential to increase blood pressure (hypertension). Several studies conducted in Indonesia have shown that there was a relationship between the frequency of consuming foods containing fat and the incidence of hypertension. A study on the Malay tribes in Indonesia revealed the Chi Square Test results on the correlation between the consumption of foods containing coconut milk and the incidence of hypertension. The results of the Chi Square table (21.87 > 5.99) with a margin of error of 5% showed that people who frequently consume foods containing coconut milk will be at risk for hypertension. Therefore, it can be stated that there is a connection between the incidence of hypertension and the varied amount of coconut milk food consumption. The body does require fat-containing foods like coconut milk as a building and protecting component. However, excessive use can lead to more blood vessel plaque formation. In time, plaque will combine with protein, become coated by muscle cells, and form atherosclerosis. In addition to being inelastic, coronary blood arteries that have atherosclerosis also experience constriction, which increases blood flow resistance and ultimately leads to hypertension (Simatupang and Siregar, 2017).

Increased triglycerides are another health danger brought on by coconut milk consumption. Increased triglycerides, one of the metabolic syndrome's indications, have been linked to a high-fat diet, particularly one that includes foods that have been processed with coconut milk, according to research conducted in Malaysia on participants who are at risk for developing the condition. Saturated fatty acids and dietary energy density will rise when fast food, rice, salt, and processed foods are added to a diet that is processed with fat (Abu Bakar *et al*, 2022). However, since the diet in this study included other food types, such as fast food, which is also high in fat and high-carbohydrate foods (rice), and high in salt, it is still necessary to review the conclusion that food processed with coconut milk is a definite indicator of rising triglycerides. An increase in triglycerides may also result from a diet that combines high-fat, high-carbohydrate, and high-salt foods.

This is due to the findings of other investigations, which varied. They came to the conclusion that coconut fat in the form of coconut milk had no association to lipid profile (HDL and LDL), while examining the impact of coconut milk on a group of healthy respondents in Indonesia.

According to Ekanayaka, *et al* (2013), it genuinely helps because it decreases Low Density Lipoprotein (LDL) and raises High Density Lipoprotein (HDL). Based on these investigations, there is a chance to look into how different processed foods including coconut milk affect triglyceride levels in Indonesia. Furthermore, future research can measure the amount of fat and other nutrients in coconut milk-based foods and look at the impact of fat content on the risk of other illnesses that are also indicators of metabolic syndrome to recommend a maximum amount of coconut milk-based foods that should be consumed.

The indicators of metabolic syndrome include a number of previously mentioned disorders, such as abdominal obesity, hypertension, and elevated triglycerides. An individual might be considered exhibiting metabolic syndrome symptoms if three of them are felt or noticed in them. In other words, a person may be more likely to have one or more symptoms of the metabolic syndrome after consuming this particular type of coconut milk curry. The research we conducted, including the use of the cross-sectional approach, which was unable to establish the disease's causality, is inseparable from research restrictions, thus it is important to keep this in mind once more. Additionally, the researchers used food frequencies questionnaire (FFQ) tools, which allowed for bias in respondents' FFQ reporting. By assisting researchers' complete surveys and offering explanations for reporting eating frequency (FFQ), we have attempted to reduce this, though. In order to select instruments with a less potential for bias, these restrictions can be taken into account by future researchers who are interested in examining similar variables.

An earlier study on dinner habits revealed that people who had the habit of eating dinner right before bed and snacking thereafter are more likely to develop abdominal fat than those who do not (Yoshida, *et al*. 2018). Therefore, cutting these two behaviors can lower your likelihood of developing abdominal obesity, which is an indicator of the metabolic syndrome. Additionally, a prospective cohort study (Wennberg, *et al*. 2016) found a link between skipping breakfast starting at a young age (since 16 years) and the development of metabolic syndrome by the time you are 43 years old. Therefore, this should be avoided. Instead, we should establish the habit of having breakfast each day as doing so is linked to a lower prevalence of metabolic syndrome (Ha and Song, 2019).

CONCLUSION

According to the findings of this study, eating habits, particularly those involving animal side dishes such chicken coconut milk curry, are a risk factor for metabolic syndrome and are linked to the prevalence of the condition among coal mining worker respondents. In order to lower the risk of metabolic syndrome, it is envisioned that mining firms shall use this information as a starting point to limit the processed food menu that includes coconut milk for their employees.

ACKNOWLEDGEMENTS

Our sincere gratitude is extended to Lambung Mangkurat University's Research And Community Service Institution (LPPM) for the funding of this study as well as to each respondent for their cooperation.

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