THE RISK FACTORS OF CENTRAL OBESITY IN INDONESIAN MEN: A CROSS-SECTIONAL DATA STUDY OF THE INDONESIA FAMILY LIFE SURVEY 5 (IFLS 5)

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THE RISK FACTORS OF CENTRAL OBESITY IN INDONESIAN MEN: A CROSS-SECTIONAL DATA STUDY OF THE INDONESIA FAMILY LIFE SURVEY 5 (IFLS 5)

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ABSTRACT

Obesity is one of the leading health problems in both developed and developing countries. Central obesity can be defined as a condition where excess fat has accumulated in the abdominal area. There are several risk factors that may cause central obesity in men such as smoking habits, physical activity, and dietary habits. This study aimed to analyse the risk factors of central obesity in Indonesian men. This was an analytical observational study using a cross-sectional design. It used secondary data from the Indonesia Family Life Survey (IFLS 5) with a sample size of 4,648 respondents. The variables studied here were smoking status, type of smoker, type of cigarette, physical activity, and meat consumption frequency. Logistic regression analysis was used. The results of this study showed that the mean age of the respondents was 51 years old. There was a relationship between smoking status (p=0.000), type of smoker (p=0.002), type of cigarette (p=0.000), physical activity (p=0.000), and meat consumption frequency (p=0.024) and the incidence of central obesity. The conclusion of the study was that there was a relationship between smoking status, type of smoker, type of cigarette, physical activity, meat consumption frequency, and the incidence of central obesity, all of which were risk factors of central obesity in Indonesian men. A low level of physical activity was the most prominent risk factor associated with central obesity among Indonesian men. From this study, we suggested controlling the risk factors of central obesity by providing education on the dangers of smoking and the importance of physical activity and a balanced nutritional diet.

***Keywords**: Central obesity; cigarette smoking; physical activity; indonesia family life survey; obesity*

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INTRODUCTION

Obesity is one of the leading health problems in both developed and developing countries (Ng et al. 2014). This is also the case in Indonesia. Obesity happens due to an excess fat accumulation in the adipose tissue. It might happen due to interactions between genetic, environmental, and behavioral factors (Flores-Dorantes et al. 2020). Meanwhile, central obesity is a health condition caused by fat accumulation in the abdominal area, specifically in the visceral adipose tissue. In men, it is characterized by a waist circumference of more than 90 cm. It is also referred to as the apple body shape due to the excess fat accumulation in the abdominal area. The number of people with central obesity is increasing, especially in developing countries (Owolabi et al. 2017).

In Indonesia, the incidence of diabetes has increased in obese people (18.0%-20.1%). Most of the increase has led to the rise of obesity prevalence (Johan et al. 2022). On the other hand, the prevalence of obesity has increased based on the data from the 2018 Riskesdas where obesity cases for those aged over 18 years old have reached 21.8%. This number was much higher than the 2013 Riskesdas data, which was 15.4%. Central obesity cases in Indonesia in 2018 had exceeded the number of cases of total obesity, which was 31%. Based on age, central obesity was mostly observed in the population aged 45-54 years old. Untreated central obesity can also cause various other health problems, such as type II diabetes mellitus, cardiovascular disease, hypertension, cancer, sleep apnoea, and metabolic syndrome (Tehernof & Després 2013). Several behavioral factors cause central obesity, including low levels of physical activity, unhealthy dietary habits, and smoking habits. This study aimed to analyze the risk factors for central obesity in Indonesian men.

MATERIALS AND METHODS

This was an analytical observational study using a cross-sectional design. It was conducted from June to October 2019. A cross-sectional study design is an observational study type in which the researcher measures the outcome and exposure of the study participants at the same time. It is used to assess the disease prevalence using population-based surveys in clinic-based samples (Setia 2016). The study used secondary data from the Indonesia Family Life Survey (IFLS 5).

The Indonesia Family Life Survey is a general-purpose survey designed to provide data for the purpose of studying many different behaviors and outcomes. IFLS collects a rich set of information on health outcomes through self-reporting and including both biomarkers such as the wealth of information collected at the individual and household levels, including indicators of economic and non-economic well-being: migration, consumption, assets, income, education, labour market outcomes, fertility, marriage, processes underlying household decision-making, contraceptive use, use of health care and health insurance, relationships among co-resident and non-resident family members, transfers among family members, and participation in community activities (Witoelar et al. 2012). It had been approved by the Institutional Review Board of RAND Corporation (USA) and the Ethics Committee of Universitas Gajah Mada, Indonesia. The population in this study followed the population in the Indonesia Family Live Survey 5 (IFLS5) in 2014-2015. The case population was all 16,430 male respondents. Based on this population, the sample in this study was 4648 respondents. Sampling was based on the inclusion criteria, that the respondents had complete data on the required variables in this study and the respondents were men aged over 40 years old (middle-aged).

The data analysis was performed in a univariate, bivariate, and multivariate manner. The univariate analysis was performed to identify the frequency (number of proportions) of each study variable, namely the smoking status, type of smokers, type of cigarette, physical activity, and meat consumption frequency. The bivariate analysis in this study used logistic regression to determine the relationship between the dependent variable and the independent variable which in this case was the relationship between smoking status, type of smoker, type of cigarette, physical activity, meat consumption frequency, and central obesity. The multivariate analysis was performed to determine the relationship between several variables (more than one) and one or more dependent variables.

RESULTS

The results of this study were presented descriptively and in the form of a logistic regression. The descriptive presentation was used to describe the characteristics of the respondents according to each variable in the study by presenting the frequency and percentage. Logistic regression tests were performed to account for the relationship between smoking status, type of smoker, type of cigarette, physical activity, meat consumption frequency, and central obesity. Multivariate tests were performed to determine the variables that were the significant risk factors for central obesity. The results of this study were presented in succession with a description of the respondent characteristics, logistic regression tests, and multivariate tests.

The characteristics of the respondents based on smoking status, type of smoker, type of cigarette, physical activity, and meat consumption frequency are presented in Table 1. Table 1 shows that the sample size studied was 4,648 respondents. Based on the inclusion criteria, the respondents studied were men aged 40 years and over, and based on the results of the study, the youngest respondent's age was 40 years and the oldest was 89 years old. The average age of the respondents studied was 51 years old with a standard deviation of 9.41. There were more smoking respondents than non-smoking ones; 72.87% or 3387 respondents were smokers while 27.13% of them were non-smokers. The most prominent type of smokers was moderate smokers, totalling 1,620 respondents or 34.85%. The most prominent type of cigarettes smoked were unfiltered cigarettes (*kretek*) with 2,803 respondents or 60.31%. Most of the respondents (1929 [41.50%]) had a high level of physical activity. Most respondents (92.45%) consumed meat at a low frequency which was less than 4 days a week.

The next results were from the logistic regression tests to account for the relationship between smoking status, type of smoker, type of cigarette, physical activity, meat consumption frequency, and the incidence of central obesity. The results are presented in Table 2.

Table 1. Respondents' characteristics

Variable	n	Mean	Standard deviation	Min	Max
Age	4,648	51.48236	9.41171	40	89

Smoking status	Frequency	Percentage (%)
Non-smoker	1261	27.13
Smoker	3387	72.87
Total	4648	100

Type of smoker	Frequency	Percentage (%)
Heavy smoker	414	8.91
Moderate smoker	1620	34.85
Light smoker	1353	29.11
Non-smoker	1261	27.13
Total	4648	100

Type of cigarette	Frequency	Percentage (%)
White cigarette	584	12.56
Unfiltered cigarette	2803	60.31
Non-smoker	1261	27.13
Total	4648	100

Physical activity	Frequency	Percentage (%)
Low (<300 MET)	1264	27.19
Moderate (300-2999 MET)	1455	31.30
High (>3000 MET)	1929	41.50
Total	4648	100

Meat consumption	Frequency	Percentage (%)
High	351	7.55
Low	4297	92.45
Total	4648	100

Table 2. Logistic regression tests

Variable	Central obesity		Non-central obesity		Total		p-value
	n	%	n	%	n	%	
Smoking status							
Non-smoker	859	68.12	402	31.88	1261	100	0.000
Smoker	1965	58.02	1422	41.98	3387	100	

Variable	Central obesity		Non-central obesity		Total		p-value
	n	%	n	%	n	%	
Smoking respondents (3387 people)							
Type of smoker							
Heavy smoker	259	62.56	155	37.44	414	100	0.002
Moderate smoker	969	59.81	651	40.19	1620	100	
Light smoker	737	54.47	616	45.53	1353	100	

Variable	Central obesity		Non-central obesity		Total		p-value
	n	%	n	%	n	%	
Smoking respondents (3387 people)							
Type of cigarette							
While cigarette	378	64.73	206	35.27	584	100	0.000
Unfiltered cigarette	1587	56.62	1216	43.38	2803	100	

Physical activity	Central obesity		Non-central obesity		Total		p-value
	n	%	N	%	n	%	
Low	809	64	455	36	1264	100	
Moderate	923	63.43	532	36.57	1455	100	0.000
High	1092	56.60	837	43.40	1929	100	

Meat consumption frequency	Central obesity		Non-central obesity		Total		p-value
	n	%	N	%	n	%	
High	233	66.38	118	33.62	351	100	0.024
Low	2591	60.30	1706	39.70	4297	100	

Table 2 shows that from the Chi-square test, we obtained the results for smoking status (p=0.000) which indicated a relationship between smoking status and the incidence of central obesity. For the smoking status variable, the analysis of the risk was carried out and yielded a Prevalence Ratio (PR) of 1.54 with 95% CI = 1.34 <PR <1.77. This meant that the non-smoking respondents were 1.54 times more at risk of central obesity than those who smoked.

The Chi-square test yielded a result for the type of smoker (p=0.000), meaning that there was a relationship between smoking status and the incidence of central obesity. On the type of smoker variable, between light smokers and moderate smokers, the Prevalence Ratio (PR) was 1.24 with 95% CI = 1.07<PR<1.44. The results indicated that moderate smokers were 1.24 times more likely to develop central obesity than light smokers.

The Chi-square test yielded a result for the type of cigarette (p=0.000) which meant that there was a relationship between smoking status and the incidence of central obesity. The analysis of the risk of the type of cigarette resulted in a Prevalence Ratio (PR) of 1.40 with 95% CI = 1.16 <PR < 1.69. That was, smokers who used white cigarettes were 1.40 times more likely to develop central obesity than smokers who used unfiltered cigarettes.

The Chi-square test yielded a result for physical activity (p=0.000) which meant that there was a relationship between smoking status and the incidence of central obesity. Based on the analysis of the risk between moderate levels of physical activity and high levels of physical activity, the Prevalence Ratio (PR) was 1.32 with 95% CI = 1.15 <PR <1.53. These results showed that people with moderate levels of physical activity were 1.32 times more likely to develop central obesity than people with high levels of physical activity. Based on the analysis of the risk between low and high levels of physical activity, the Prevalence Ratio (PR) was 1.36 with 95% CI = 1.17 <PR <1.58. These results showed that people with low levels of physical activity were 1.36 times more likely to develop central obesity than people with high levels of physical activity.

The Chi-square test yielded a result for meat consumption frequency (p=0.000) which meant that there was a relationship between smoking status and the incidence of central obesity. Based on the analysis of the risk, the Prevalence Ratio (PR) was 1.30 with 95% CI = 1.02<PR<1.65. These results showed that people who frequently consumed meat were 1.30 times more likely to develop central obesity than people who rarely consumed meat.

Table 3. Risk factors that influence central obesity in men

Variables	PR	95% Conf. interval	
		Lower	Upper
Type of smoker			
Heavy smoker	1.36	1.08	1.71
Moderate smoker	1.24	1.07	1.44
Light smoker (*reference*)	1.00		
Type of cigarette			
White cigarette	1.37	1.14	1.66
Unfiltered cigarette (*reference*)	1.00		
Physical activity			
Low	1.43	1.21	1.70
Moderate	1.32	1.12	1.56
High (*reference*)	1.00		
Meat consumption frequency			
High	1.25	0.95	1.67
Low (*reference*)	1.00		
Constant	0.93		

Table 3 shows that there are 3 variables that have become significant risk factors for central obesity in men aged above 40 years old. The constituent variables included the type of smoker (heavy smoker, moderate smoker), the type of cigarette (white cigarette), and physical activity (low, moderate). The variable presenting the highest risk was physical activity with a prevalence ratio = 1.43 (95% CI 1.21-1.70).

DISCUSSION

The results of the study showed that there was a relationship between smoking status and the incidence of central obesity with a p-value of 0.000. For the smoking status variable, non-smoking respondents were 1.54 times more likely to develop central obesity than smoking respondents. This was in line with several studies stating that smokers tend to lose weight due to the effect of nicotine that suppresses the appetite which in turn reduces their food intake and metabolism stimulation (Dare et al. 2015). Smokers involved in weight loss interventions will experience a weight loss comparable to non-smoking individuals where smoking can control diet and appetite (Murphy et al. 2018). Several epidemiological studies have shown that the cessation of smoking leads to weight gain (Oh 2019). The results of the study by Zhao in China in 2021 stated that smoking was negatively associated with the risk of central obesity in adult men (Zhao et al. 2021). However, several studies have reported that smoking status is not significantly associated with body mass index, despite an association with central obesity. Therefore, smokers tend to have a lower body mass index than non-smokers. Smoking can stimulate the accumulation of body fat in the stomach. Multiple mechanisms of action, such as cortisol, sex hormones,

insulin resistance, and chronic inflammation may explain the various effects of smoking status on central obesity (Kim et al. 2016).

The results of the study showed that there was a relationship between the type of smoker and the incidence of central obesity with a p-value of 0.002. It was found that among smokers, heavy smokers who smoke more than 20 cigarettes a day and moderate smokers who smoke around 11-20 cigarettes a day tend to have a waist-hip ratio greater than those of light smokers. The more cigarettes smoked in one day, the higher the risk of central obesity. These results were in line with the study by Zhao in 2021 stating that in China from 1991 to 2015, the prevalence of central obesity in adult men showed a significant increasing trend among non-smokers, light smokers, moderate smokers, and especially heavy smokers (Zhao et al. 2021). There are several explanations for the increased risk among heavy smokers. First, smoking stimulates the sympathetic nervous system which leads to an increase in cortisol, the stress hormone, and the deposition of belly fat (Direk et al. 2011). Smoking can have an anti-estrogenic effect. This can cause an imbalance of sex hormones in men, namely a decrease in the hormone testosterone. Smokers also tend to have unhealthy lifestyles, such as a low fruit and vegetable intake, a higher likelihood of depression, and sleep disturbances that can increase the risk of central obesity (Kim et al. 2016).

The results of this study showed that there was a relationship between the type of cigarette and the incidence of central obesity with a p-value of 0.000. It was known that smokers who used white cigarettes were 1.40 times more likely to develop central obesity than those who used unfiltered cigarettes. This is of particular interest because even though unfiltered cigarettes contain more tar and nicotine than white cigarettes, white cigarettes pose more of a risk of central obesity. White cigarettes are often called light cigarettes because of their low tar content and most light cigarette smokers believe that low-tar cigarettes are safer and provide substantial health benefits (Kiviniemi & Kozlowski 2015).

The results of this study showed that there was a relationship between physical activity and the incidence of central obesity with a p-value of 0.000. Based on the analysis of the risk, the lower the level of physical activity, the higher the risk of central obesity in men. Physical activity has a major effect on the total energy expenditure. Excessive energy without appropriate use or expenditure of energy, such as for basal metabolism, physical activity, disposal of food waste, and growth, will cause an increase in fat cell accumulation. Energy needs to be expended with a variety of high or low-volume and intensity physical activities because the amount of energy expended can reduce the risk of fat accumulation in the body (Banks 2011). A study in Korea revealed there to be a more significant relationship between physical activity and obesity measured using waist-to-height ratio rather than body mass index (Lee et al. 2016). Another study also echoed similar results, demonstrating the risk of central obesity and moderate or low levels of physical activity (PR=1.70–1.74) (de Costa et al. 2014).

The results of this study showed that there was a relationship between meat consumption frequency and the incidence of central obesity with a p-value of 0.024 and a PR of 1.30 and 95% CI = 1.02<PR<1.65. These results showed that people who frequently consumed meat were 1.30 times more likely to develop central obesity than those who rarely consumed meat. Meat contains fat which, if consumed in excess, can be a risk factor for central obesity. The results of this study were also in line with the study conducted by Wang et al. (2014) which stated that the consumption of large amounts of fatty red meat was significantly associated with a higher waist circumference and the risk of central obesity in adult men in China. Another study asserted that meat in modern dietary habits is just as bad as sugar since both cause obesity (You & Henneberg 2016).

CONCLUSION

There was a relationship between smoking status and the incidence of central obesity, between the type of smoker and the incidence of central obesity, between the type of cigarette and the incidence of central obesity, between physical activity and the incidence of central obesity, and between meat consumption frequency and the incidence of central obesity. Low levels of physical activity are the major risk factor of central obesity among Indonesian men.

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