

Relationship between Body Mass Index and Cholesterol Levels Total Employees of PT KAI Divre IV Tanjung Karang, Indonesia

Sumarsih¹, Sutanto Priyo Hastono²

¹Masters Program in Public Health, Public Health Faculty, Indonesian University

²Biostatistics Department of the Faculty of Public Health, University of Indonesia

Abstract: Cholesterol from animals that humans eat is useful for building cells, and forming various hormones. Cholesterol in foods that are eaten increases cholesterol levels in the blood. Normal blood total cholesterol levels <200 mg / dl, high threshold = 200-239 mg / dl, high > 240 mg. Excess body fat or obesity is measured by anthropometry examination of Body Mass Index (BMI), calculated from body weight in kilograms size divided by height square in the form of meters values 18-25 ideal, values > 25 excess body weight \geq 30 obesity. The research objective was to determine the relationship of body mass index with total cholesterol levels in employees of PT KAI Divre IV Tanjung Karang in 2018. This study was a cross-sectional study using secondary health examination PT KAI Divre IV. Population is 2143 people, sample size 722 is calculated based on different two proportions. Dependent variable: total cholesterol level. Independent variables: BMI, gender and age. Results of analysis 1). There was a significant relationship between BMI and total cholesterol levels, the value of $p = 0,0001$, OR = 1,870, this was possible because of unhealthy eating patterns (more like eating fatty foods and eating with high carbohydrates) and unhealthy lifestyles smoking (most employees are male who have the potential to become smokers) and lack regular physical activity 2). There is no relationship between sex with an increase in total cholesterol levels with a value of $p = 1$. it is possible because in this study most of them were male sex so that the sample of female sex was not representative. 3). There is a significant relationship between age and increase in total cholesterol levels with a value of $p = 0.004$ ($p < 0.05$), OR = 1.975, possible because the older a person's body organs function will decrease so that it will affect the process of cholesterol metabolism in the body

Keywords: individual characteristics; BMI; total cholesterol

1. Introduction

Cholesterol is one form of fat that is naturally present in animal-based foods which are useful for building cells, and forming various hormones. Cholesterol originates from animal organs, especially the brain, egg yolk and snares(1) Likewise the products come from it, such as real milk, cheese, butter and others. While food from plants, for example fruits and vegetables do not contain cholesterol. Cholesterol in foods that are eaten increases cholesterol levels in the blood, insofar as income is balanced with the body's needs to stay healthy. Abnormal cholesterol levels are a major risk factor for chronic heart disease. According to the National Cholesterol Education Program (NCEP) ATP-IV in 2014 the total cholesterol figures recommended were as follows: normal blood total cholesterol levels = 200 mg / dl, or less, moderate blood cholesterol levels or high thresholds (borderline high) = 200-239 mg / dl, high cholesterol level = 240 mg / dl and above(2). According to Basic Health Research (Riskesdas) data(3) the national prevalence of high cholesterol in residents aged \geq 15 years in Indonesia is 15.8% (men 5.4% and women 9.9%).

One of the consequences of changes in pattern and lifestyle is the occurrence of excess fat in the body or obesity / obesity. Overweight and Obesity is a chronic condition that is very closely related to the increased risk of a number of degenerative diseases. Diseases included in this group are Type II Diabetes Mellitus, Stroke, Hypertension, Cardiovascular Disease, Dyslipidemia, etc. The degenerative diseases that most often accompany Obesity are Diabetes Mellitus Type II, Hypertension and Hypercholesterolemia

(Dyslipidemia)(4).

In 1997 the World Health Organization (WHO) officially declared obesity as a global epidemic. The obesity rate also increases with the age of at least 50 or 60 years. Overweight and obesity is a risk of death. At least 2.8 million adults die each year as a result of being overweight or obese (5)

Obesity can be measured by examining Anthropometry Body Mass Index (BMI) is one of the calculation indicators for anthropometry related to adult body fat. BMI is calculated from body weight in terms of kilograms divided by height squares in meters. BMI in the range of 18-25 is considered ideal and above 25 can be considered excessive weight while 30 is considered obese(4). Basic Health Research (Riskesdas)(3) states the prevalence of obesity or obesity in adults over 18 years continues to increase from year to year since 2007. Based on the results of the 2018 Riskesdas the Ministry of Health Research and Development Agency showed the prevalence of obesity increased since the three periods of Riskesdas namely 2007 10.5 percent, 2013 14.8 percent, and 2018 21.8 percent.

Research conducted by Musdalifa, et al(6) in Kendari shows that there is a significant relationship between obesity and total cholesterol levels in teachers and staff of Kendari 1 High School with p -value = 0.004 and degree of significance $\alpha = 0.05$ while research by Nugraha (7) in Surakarta shows that there is no relationship between body mass index and total cholesterol levels in teachers and employees of Muhammadiyah 1 and 2 high schools in Surakarta.

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PT Kereta Api Indonesia (Persero) (PTKAI) is a state-owned national transportation company (BUMN) which provides land transportation services in the form of trains. PT KAI Tanjung Karang Regional Division IV with the working area of the Province of South Sumatra and part of Lampung Province (8). PT KAI in the company's regulations periodically conducts Medical Check-Up for all employees. The purpose of the study was to know the relationship between body mass index (BMI) and total cholesterol levels in employees of PT. KAI Divre IV Tanjung Karang based on secondary data from the results of employee Medical Check-Up (9).

2. Methode

This study was an observational analytic study (10) with a cross sectional study design (11) using secondary data sourced from the results of the medical check-up of PT KAI Divre IV Tanjung Karang employees in 2018 with a population of 2143 employees and the sample size was 722 calculated based on the sample calculation of two different proportions (12), the sample of this study was data of employees who were examined with complete results and women who were not pregnant. The dependent variable is total cholesterol level, the independent variable is Body Mass Index (BMI) Gender and age.

3. Results

From the data analysis, the following results were obtained:

Table 1: Distribution of Gender, Age, BMI and Cholesterol Levels

Variabels	Category	Amount	(%)
Total cholesterol levels	not normal (>200)	284	39,3
	Normal (≤200)	438	60,7
BMI	Not normal (>23,0 kg/m ²)	297	41,1
	Normal (18,5-22,9 g/m ²)	425	58,9
Gender	Male	709	98,2
	female	13	1,8
Age	>35 years	350	48,5
	< 35 years	372	51,5

Based on Table 1 shows the amount of cholesterol from 722 samples where the total abnormal cholesterol level was 284 (39.4%) and normal cholesterol levels were 438 (60.7%). Abnormal BMI totaled 297 (41.1%) and a normal BMI was 425 (58, 9%). According to sex, male sex was 709 (98.2%) and female gender as many as 13 (1.8%). Whereas according to age, age more than 35 years as many as 350 (48.5%) and age less than 35 as many as 372 (51.5%).

Table 2: Analysis of the Relationship Between BMI and Total Cholesterol Levels

BMI	Total Cholesterol Levels				Total		OR (95%CI)	P-Value
	Not Normal		Normal		N	%		
	n	%	N	%				
Not Normal	143	48.1	154	51,9	297	100	1,870 (1,380-2,535)	0,0001
Normal	141	33,2	284	66,8	425	100		
Amount	284	39,3	438	60,7	722			

Based on table 2 the results of the analysis of the relationship between BMI and total cholesterol levels

obtained from 722 samples, in abnormal BMI, the abnormal total cholesterol levels were 48.1% whereas, in normal BMI, the abnormal cholesterol levels were 39.3%. The chi-square test results obtained a p-value of 0,0001 and an OR value of 1,870 so it can be concluded that there is a relationship between BMI and total cholesterol levels. Employees with abnormal BMI have a risk of 1.87 times higher to have abnormal cholesterol levels than employees with a normal BMI.

Table 3: Analysis of GenderThe Relationship Between with Total Cholesterol Levels

Gender	Total Cholesterol Levels				Total		OR (95%CI)	P Value
	Not Normal		Normal		N	%		
	N	%	N	%				
Male	279	39,4	430	60,6	709	100	1,038 (0,336-3,206)	1
Female	5	38,5	8	61,5	13	100		
Amount	284	39,3	438	60,7	722	100		

Based on table 3, the results of the analysis of the relationship between BMI and total cholesterol levels obtained from 722 samples, the male and female employees had total abnormal cholesterol levels of 39.4% and 38.5%, respectively. The chi-square test results obtained a p-value of 1 so that it can be concluded that there was no relationship between gender and total cholesterol levels.

Table 4: Analysis of Age with Total Cholesterol Levels

Age	Total Cholesterol Levels				Total		OR (95%CI)	P Value
	Not Normal		Normal		N	%		
	N	%	N	%				
>35 years	137	48,6	145	51,4	182	100	1,883 (1,386-2,558)	0,0001
<35 years	147	33,4	293	66,6	440	100		
Amount	284	39,3	438	60,7	722	100		

Based on table 4, the results of the analysis obtained from 722 samples were as follows. The abnormal cholesterol levels of the people with the age > 5 were 48.6%. The abnormal cholesterol levels for the people with the age < 35 were 33.4%. The p-value and OR value obtained by the chi-square test were 0,0001 and 1,883, respectively. So it can be concluded that there is a relationship between age and total cholesterol levels. The employees with age > 35 years have a risk 1.88 times higher of experiencing abnormal cholesterol levels than employees with normal BMI.

4. Discussion

There was a significant relationship between BMI and total cholesterol levels in PT KAI Divre IV Tanjung Karang employees, this was indicated by the value of p = 0,0001, OR 1,870. The employees with an abnormal BMI has 1.87 times higher of suffering from abnormal cholesterol levels compared to the employees with normal BMI. The results of this study are in line with the research of Musdalifa, et al (6). which examined the relationship of BMI with total cholesterol levels in staff and teachers of Kendari 1 Public High School, She stated that there was a significant relationship between BMI and cholesterol levels with p = 0.001 (p <0.05).

Whereas, Nugraha's study on staff and teachers of the Muhammadiyah 1 and 2 high school Surakarta, the results of

$p = 0.773$ ($p > 0.05$). it showed that there was no significant relationship between BMI and total cholesterol levels(7). Likewise, the research conducted by Rizki (13) who studied the relationship between total cholesterol levels and triglyceride levels with body mass index of patients in the clinical pathology installation in the Adam Adam Hospital in Medan at 2011, the results of the study were $p = 0.092$ ($p > 0.05$) and there was no correlation between BMI and total cholesterol levels.

The increasing in BMI or obesity indicates enough fat is stored in the body and it can be ascertained that there will also fat which found in the blood (14). Excess weight can cause high cholesterol, heart disease, diabetes, and other serious diseases. Obesity is an abnormal number of lipids in the blood, one of the factors which increases cholesterol levels. the increasing of total cholesterol in the blood by > 240 mg/dl is referred as hypercholesterolemia (13). Cholesterol levels in the body are one of the most important factors for determining the risk of a person suffering the cardiovascular disease. There are several factors that can affect the cholesterol levels in the blood such as age, weight, diet, physical activity, diet, stress and heredity(15).

Fat people have a higher risk to have high cholesterol because their bodies have a higher risk of developing insulin resistance. Insulin resistance is a condition when the body cells become less sensitive to the effect of decreasing glucose on the insulin hormone. Obesity is one of the causes of insulin resistance. Insulin resistance is one of the triggers of cholesterol metabolic disorders, which cause high cholesterol levels in the blood (16). However, it is often found thin people with abnormal cholesterol levels. The increasing of the total cholesterol levels are not always related to the person's weight, there are several factors that play a role in increasing blood cholesterol such as genetics, unhealthy eating patterns such as eating fatty foods, drinking an alcohol, foods with high carbohydrate and unhealthy lifestyles such as smoking and lack of regular physical activity.

There was a significant relationship between age and increase in total cholesterol levels in PT KAI Divre IV Tanjung Karang employees with $p = 0.004$ ($p < 0.05$) and OR = 1.975. The people with age > 35 years had a risk of 1.975 times higher to have total abnormal cholesterol levels compared to the employees of the age < 35 years (CI 1,299-2,523).

This is in line with the Musdalifa study, et al. (6) which stated that the people with age of 30-59 years had a higher risk to suffer cardiovascular disease. Natural risk factors for coronary heart disease that cannot be prevented are heredity, gender and age. Some experts argue that the older a person is, the less ability or activity of his LDL receptor. This causes LDL in the blood to increase. The increase of LDL can also be caused by the person who gets older, the obesity or body fat percentage rises. This is also due to the aging of a person which decreases the function of the organs so it will affect the process of cholesterol metabolism in the body (17).

5. Conclusions

From the test results it can be concluded that:

- 1) There is a relationship between BMI and total cholesterol levels of PT KAI Divre IV Tanjung Karang's employees in 2018. This is possible because of unhealthy eating patterns (eating fatty foods and eating foods with high carbohydrates) and unhealthy lifestyles such as smoking (some employees are male who has the potential to become smokers) and lack of regular physical activity.
- 2) There is no relationship between gender and total cholesterol levels of PT KAI Divre IV Tanjung Karang's employees in 2018. It is possible because in this study most of them were male so the sample of gender variables was not representative.
- 3) There is a relationship between age and total cholesterol level in employees of PT KAI Divre IV Tanjung Karang in 2018, it is possible because the organs function of older people will decrease so that it will affect the process of cholesterol metabolism in the body

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Author Profile

Sumarsih, received an SKM degree from Stikes Umitra Lampung, until now working in RSUD Pesawaran, Lampung, Indonesia and also as a Student Of Public Health Master's Program At The Indonesian University's Public Health Faculty

