

# The Relationship between Nutritional Status and Central Obesity with Low Density Lipoprotein (Ldl) Cholesterol Level in Coronary Heart Disease Patients at Rsudza Banda Aceh

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Abstract: Coronary Heart Disease (CHD) is one of the chronic diseases mainly causing death in developing countries. Obesity is one of the factors predisposing an increase in LDL cholesterol level. General obesity is assessed using body mass index (BMI), while abdominal obesity by waist circumference (WC). This study aims to assess whether nutritional status and abdominal obesity was associated with LDL cholesterol level in patients with CHD at RSUDZA Banda Aceh. This is an analytic observational study with cross-sectional design using quota sampling design of non-probability sampling method. Data collected start from October 16 to October 26, 2017. There were 140 patients that meets the inclusion criteria which have been measured body weight, height, waist circumference, and the LDL cholesterol level obtained from the laboratory results. The respondents consisting of 77 males and 63 females. 57 respondents (89.1 %) of 64 respondents with Obese Class 1 ( $\geq 25$ - $<30$  kg/m<sup>2</sup>) and 120 respondents (88.9%) of 135 respondents with abdominal obesity have high LDL cholesterol level. Using Spearman test, the result of this study reveals a significant association between nutritional status and LDL cholesterol level in CHD patients with p value = 0,000 ( $p < 0,05$ ) and moderate positive relationship ( $r = 0.29$ ) and between abdominal obesity and LDL cholesterol level in CHD patients with p value = 0.000 ( $p < 0,05$ ) and moderate positive relationship ( $r = 0.31$ ). Nutritional status and abdominal obesity are associated with the LDL cholesterol level in CHD patients at RSUDZA Banda Aceh.

## 1 INTRODUCTION

Coronary Heart Disease (CHD) is one of the leading causes of death and one of the chronic diseases in developing countries (Amani R. 2010). According to World Health Organization (WHO), cardiovascular disease is a disease with worldwide death and disability, and each year is estimated at 17.3 million people die from cardiovascular disease where a total of 7.3 million people occurred due to heart disease and 6.2 million people due to stroke (WHO 2011).

Coronary heart disease is a non-communicable disease with impaired heart function because of blood deficiency to the heart muscle due to the constriction of coronary artery. Based on the Basic Health Research Indonesia (RISKESDAS) 2013, the prevalence of CHD in Indonesia is the

seventh of 12 diseases. The prevalence of coronary heart disease based on a doctor's diagnosis is 0.5 percent and based on symptoms is 1.5 percent. Coronary heart disease increases with age (RISKESDAS 2013). The prevalence of coronary heart disease in Aceh Province based on doctor's diagnosis is 0.7 percent and based on symptom is 2.3 percent (Balitbangkes 2013).

Coronary heart disease is characterized by abnormal accumulation of lipids or fatty and fibrous tissue in the walls of blood vessels. High-fat foods (cholesterol) can raise cholesterol in the blood. Cholesterol and other fatty elements are not soluble in the blood, but bind to proteins to form soluble compounds called lipoproteins. The cholesterol contained in the body slightly binds to lipoproteins

are Low Density Lipoprotein (LDL) (AlMatsier S 2007).

Cholesterol is transported to the blood in the form of lipoproteins, 75% LDL cholesterol and 20% HDL cholesterol. Low LDL cholesterol levels have a good role in CHD, but excessive LDL cholesterol will accumulate in the arteries. Cholesterol deposits in the arteries over time cause narrowing and stiffening of the arteries, usually called atherosclerosis, which is a major problem in coronary heart disease (Joewono S 2013).

Based on Ali Cem's research in 2017, there is a relationship between body mass index and waist circumference on coronary heart disease in Uzunköprü State Hospital, Turkey. The relationship between abdominal circumference and coronary heart disease has a stronger correlation. From 292 people with an abdominal circumference > 90 cm, 66 people experienced coronary heart disease. Body mass index, abdominal circumference and dyslipidemia are parameters for pathogenesis of coronary heart disease (Yekdeş 2017).

Research by Karunia in 2015 reveals that there is a relationship between nutritional status with HDL and LDL cholesterol levels. There were 50% of overweight subjects had high serum LDL / HDL levels. The increasing of LDL cholesterol is associated with body fat that resides in the adipose tissue. The adipose tissue will release high levels of free fatty acids into the portal circulation, thus disrupting the liver metabolism and stimulating the liver to produce Very Low Density Lipoprotein (VLDL), then VLDL particles will be converted into LDL particles and affect the LDL / HDL ratio (Agustin K 2015).

Based on research by Medika in 2015, there is a relationship between abdominal circumference with LDL cholesterol. As many as 20 people (54.1%) with abnormal abdominal circumference have high LDL levels. People with abnormal abdominal circumference has a 2.64 chance of having LDL levels (Prasetya M 2015). The main cause of elevated LDL cholesterol in the blood is high saturated fat intake and obesity. Visceral fat (central obesity) is strongly associated with metabolic syndrome disorders than total body fat (general obesity) (Ayu IG 2017).

Obesity has an increased risk of cardiovascular disease and metabolic diseases such as coronary heart disease, atherosclerosis, hypertension, dyslipidemia, diabetes and heart failure (Wilson P 2002). According to the American Heart Association (AHA), obesity is a major modifying risk factor for coronary heart disease (Krauss R 2012). Obesity is a

state of increasing total body fat both or in certain body parts. Obesity can be measured by anthropometric measurements such as Body Mass Index (IMT) and abdominal circumference. The negative effects of excess body weight on blood cholesterol contribute about 45% in increasing the risk of CHD (Wilson P 2002). (Widyastuti 2006).

## 2 METHOD

The study was observational analytic with cross-sectional design in Polyclinic of Cardiology at RSUDZA Banda Aceh in October 2017. The population was all patients with Coronary Heart Disease diagnosis in Polyclinic of Cardiology at General Hospital dr. Zainoel Abidin Banda Aceh 2017, the sample was taken by quota sampling and met the inclusion criteria. The sample was chosen by non probability sampling method. The primary data collected by measuring body weight, height and abdominal circumference, and secondary data obtained from laboratory results of LDL cholesterol levels of CHD patients. Statistical analysis with univariate analysis was used for frequency distribution and Correlation Spearman Test for bivariate analysis.

## 3. RESULTS AND DISCUSSION

Table 1 General Characteristics of CHD Patients

General	n=140	(%)
Characteristics		
Sex		
Men	77	55,0
Women	63	45,0
Age (years)		
17-25	2	1,4
26-35	7	5,0
36-45	19	13,6
46-55	42	30,0
56-65	56	40,0
>65	14	10,0
Educational level		
No school	1	0,7
Elementary school	15	10,7
Junior High School	25	17,9
Senior High School	47	33,6
Bachelor	51	36,4
Magister	1	0,7

Occupational		
Unemployment	1	0,7
Housewife	44	31,4
Entrepreneur	48	34,3
Teacher/Lecturer	5	3,6
Employee	34	24,3
Retirement	7	5
College student	1	0,7

Based on Table 1 the CHD patients was dominantly men were 77 people (55,0%). Group of age 55-65 years were 56 people (40%). Bachelor, dominantly in educational level, were 51 people (36,4%). Entrepreneur was the most patients' occupation, were 48 people (34,3%).

Table 2 The distribution of nutritional status of CHD patients

Nutritional status	(n=140)	(%)
Underweight	1	0,7
Normal	35	25,0
Overweight	37	26,4
Obesity I	64	45,7
Obesity II	3	2,1

Table 5 The relationship between nutritional status and LDL cholesterol level of CHD Patients

Nutritional Status	LDL Cholesterol Level						Total	P-Value	r
	Borderline high		High		Very high				
	n	%	n	%	n	%	n	%	
Underweight	1	100	00	0	0	0	1	100	
Normal	4	11,4	228	80	3	8,6	35	100	
Overweight	0	0	337	100	0	0	37	100	0,000
Obesity I	0	0	557	89,1	7	10,9	64	100	
Obesity II	0	0	22	66,7	1	33,3	3	100	

Based on table 5, indicates from 35 respondents with normal nutritional status, there were 28 people (80%) had high LDL cholesterol level, from 37 people (100%) had high LDL cholesterol level, from 64 respondents with obesity I, there were 57 people (89.1%) had high LDL cholesterol levels and from 3 respondents with obesity II, 2 people (66,7%) had high LDL cholesterol level. The result revealed p value=0.000(p<0,05), there is correlation between nutritional status and LDL cholesterol level of CHD patients in polyclinic of cardiology in RSUDZA Banda Aceh, and correlation coefficient value (r=0,291) means the strength of relation both variable is enough.

Table 2 indicates CHD patients were dominantly have obesity grade 1, were 64 people (45,7%), subject with underweight were 1 people (0,7%).

Table 3 The distribution of Central Obesity of CHD patients

Abdominal Circumference	n=140	(%)
Normal		
Men	2	1,4
Women	3	2,1
Abnormal		
Men	75	53,6
Women	60	42,9

Table 3 reveals that the highest central obesity is found in men, were 75 people (53.6%).

Table 4 Laboratory results of CHD patients, were obtained LDL cholesterol levels.

LDL cholesterol level	n=140	(%)
Near optimal	0	0
Optimal	0	0
Borderline high	5	3,6
High	124	88,6
Very high	11	7,9

Table 4 reveals that 124 respondents (88,6%) have high LDL cholesterol.

Tabel 6 The relationship between central obesity and LDL cholesterol level of CHD patients

Central Obesity	LDL Cholesterol Level						Total	p-value	
	Borderline high		High		Very high				
	n	%	n	%	n	%	n	%	
Normal	1	20.0	4	80.0	0	0.0	5	100.0	
Abnormal	4	3.0	120	88.9	11	8.1	135	100.0	
								0,000	0,31

Based on Table 6, indicates that of 135 central obesity respondents, 120 people (88.9%) had high LDL cholesterol and 11 people (8.1%) had very high cholesterol levels. The result of p value = 0.000 ( $p < 0,05$ ) shows that there is correlation between central obesity and LDL cholesterol level of CHD patients in Polyclinic of Cardiology in RSUDZA Banda Aceh, correlation coefficient value ( $r = 0,31$ ) means the strength of relation both variables is enough.

#### 4. CONCLUSION

The study results obtained 64 people (45.7%) with obesity I and 3 people with obesity II (2.1%). This study coincides with study by Mohammad Ifard 2013 in Iran on 12,416 respondents of CHD patients average on BMI 25.6 kg/m<sup>2</sup> have obesity status. (Mohammadifard N 2013). Obesity is a major modifying risk factor for CHD disease. (Krauss R 2012). The negative effects of excess weight on blood pressure and blood cholesterol contribute about 45% in increasing the risk of CHD and there is an independent increase of significant risk of the factor. Study by Iskandar 2017 also find that although there is a slight increase in body weight above normal, it can increase the risk of CHD (Hadil A 2017).

The study results of the study found that 135 people (96.5%) of CHD patients had central obesity. Central obesity is an indicator of cardiovascular diseases (Sugondo 2009). This The relationship between nutritional status and LDL cholesterol level of CHD patients study is in line with research by Ratih 2015, Women with abdominal circumferences >80 cm will have 1.5 times risk affected by CHD compared to women whose abdominal circumference <80 cm (Oemiati R 2015). Obesity central is influenced by unbalanced energy intake and lack of physical activity so fat accumulation is more prevalent in the abdomen because fat cells in the abdomen are larger. Excess fat is stored in the form of triglycerides in fatty tissue, in addition, lifestyle modernization, high caloric intake, low physical activity is also a result of increased central obesity which is a risk factor of CHD (Dewi A 2013).

The study results obtained 124 people (88.6%) with high LDL cholesterol levels. study coincides Ma'rufi 2014, the percentage of patients with LDL > 130 mg / dL in the CHD group was 65.6% (Ma'rufi 2014). If foods containing saturated fats consumed in excess amounts can cause an increase of blood cholesterol, usually called hypercholesterolaemia (Dewi A 2013). Increased levels of LDL cholesterol is one of the risk factors for coronary heart disease. The high levels of LDL cholesterol that accumulate on the subendothelial layer, LDL cholesterol is atherogenic which can lead to atherosclerosis (Ma'rufi 2014).

The Spearman Correlation test results obtained p value = 0.000 ( $p < 0,05$ ) with correlation coefficient value ( $r = 0,29$ ). This suggests that there is a relationship between nutritional status and LDL cholesterol levels in CHD patients with the strength of relation is enough. From 64 respondents who have obesity I, there were 57 people (89.1%) had high LDL cholesterol levels. It signifies that the increasing of nutritional status in a person tends to affect the increasing of LDL cholesterol levels. This result is in line with the research of Ali Cem 2017 conducted in Turkey, there were 66 respondents who experienced CHD had high cholesterol levels with obesity nutritional status ( $p$ -value = 0,049 (Yekdeş 2017).

Obesity is a state of increased total body fat or in certain body parts. Overweight and obesity have a relationship with other risk factors in CHD, one of them is dyslipidemia. LDL cholesterol will be carried to the tissues including arteries that over time will lead to the accumulation of fatty plaque in the arteries. If the fatty plaques accumulate in coronary artery, often called atherosclerosis, which is the initial cause of coronary heart disease (Blu DI 2012).

This research is not in line with Tracey's research 2012 at BLU / RSUP. Prof. Dr. R.D.Kandao Manado, from 62 cases with normal BMI, there were 5 people normal without CHD (29,4%), and experienced CHD were 12 people (70,6%). Patients with obesity I, There were is 2 people normal without CHD (8.7%) and suffering CHD were 21 people (91.3%). The study showed p value = 0,135 which means  $p > 0,05$ , there is no relationship between obesity and coronary heart disease. The absence of a significant association in this study may be there was the number of other risk factors for unrecoverable CHDs such as heredity or genetics, age and sex factors, as well as other factors related to behaviors such as smoking, alcohol consumption and other history of diseases such as diabetes melitus, hypertension, improper diets or infectious diseases that strike attack the blood and blood vessels (Blood NHL 2011). The relationship between central obesity and LDL cholesterol level of CHD patients.

The study results in Polyclinic of Cardiology in RSUDZA found that there is the relationship between central obesity with LDL cholesterol levels of CHD patients. From 135 respondents who had central obesity, there were 120 people (88.9%) had high LDL cholesterol

levels. The Spearman Correlation test results obtained  $p = 0,000$  ( $\alpha < 0,05$ ) with correlation coefficient value ( $r = 0,31$ ). The result is in line with research by Medika 2015 in Dr. M. Djamil Padang Hospital. It was obtained there were 20 people (54,1%) with abnormal abdominal circumference and high LDL level ( $p = 0,02$ ) which mean there is difference of proportion of high LDL level between abnormal abdominal circumference respondent with high LDL level with  $OR = 2,64$ , meaning people with abnormal abdominal circumference has a 2.64 chance of having high LDL levels compared to respondents with normal abdominal circumference (Prasetya M 2015).

## 5. SUGESTION

The Nutritional status of CHD patients in the Polyclinic of Cardiology in RSUDZA Banda Aceh are more predominantly patients with obese I (45.7%). CHD patients in Polyclinic of Cardiology in RSUDZA Banda Aceh are more dominant had central obesity (96.5%). LDL cholesterol levels of CHD patients were more dominantly high (88.6%). There is a relationship between nutritional status and central obesity with LDL cholesterol levels in CHD patients in Polyclinic of Cardiology in RSUDZA Banda Aceh.

For related institutions, better to always measuring abdominal circumference to patients on a regular basis in order to evaluate LDL cholesterol levels of CHD patients. For other researchers, it is expected to conduct further research on other factors that affect LDL cholesterol levels that also have a high risk for CHD and aggravate CHD with a larger number of respondents.

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The direct effects of excessive fat in the abdomen, causing a person to have central obesity (Ayu IG 2007). High intake of saturated fat diet also increase plasma cholesterol levels with an increase about 15% -25%. This is because there is a fat deposit in the liver which then causing the increase of acetyl-koA in the liver to produce cholesterol (Guyton A 2007). The high levels of LDL cholesterol in the blood can cause the lack of antioxidants in the blood vessels so that endothelias are more susceptible to have endothelial injury that can cause atherosclerosis in CHD patients (Sudoyo A 2009).

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