Evaluation of Lipid Profile in Patients with Cardiovascular Diseases Receiving Simvastatin in Palu Indonesia

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Abstract: Cardiovascular diseases (CVDs) are the leading cause of death worldwide which results from the impaired function of the heart and blood vessels. The most common CVDs are coronary heart and stroke. The main clinical manifestation of these diseases is the formation of atherosclerosis which is associated with the change of blood lipid levels. Simvastatin is widely used in patients with impaired lipid levels in the blood. The study was a descriptive research with a retrospective approach on medical record data (n=64) taken from Palu City, Central Sulawesi, Indonesia. The variables included in this study were gender, age, diagnosis, co-medication, lipid profile including total cholesterol, LDL, triglycerides, and HDL in patients with CVDs receiving simvastatin. In the study, sixty-four patients of CVDs met the inclusion and exclusion criteria. This study suggested that simvastatin achieved to normalize the blood lipid levels, including total cholesterol in forty-four patients (68.75%), LDL in forty-nine patients (80.3%), triglycerides in fifty-nine patients (92.19%), and HDL in fifty-two patients (81.25%). The use of simvastatin in patients with CVDs managed to lower total cholesterol, LDL, and triglycerides, as well as increase the HDL level.

Keywords: Lipid profile, Simvastatin, Cardiovascular diseases.

1. INTRODUCTION

Cardiovascular diseases (CVDs) are illnesses with symptoms that include cardiac and artery disorders. Coronary artery disease and stroke are the most common type of CVDs found [1]. According to World Health Organization (2016) [2], CVDs are the leading determinant of mortality worldwide. It has caused approximately 31% of deaths all over the world (82% in developing countries, and 37% in developed countries). An estimated 17.5 million people die from these diseases each year.

Increasing levels of LDL Cholesterol is correlated with rises in coronary artery risk, while high HDL cholesterol appears to act as a protective factor against coronary artery disease [3]. Metabolic abnormalities involving an increase in plasma lipoprotein concentration are called hyperlipoproteinemia or hyperlipidemia. One of the major clinical manifestations of hyperlipidemia is atherosclerosis that may lead to serious health illnesses such as coronary heart disease and stroke [4]. The prevalence of hyperlipidaemia increases with age. According to the data from the National Health and Nutrition Examination Survey (NHANES), 52.9% of people with Hiperlipidemia among whom 11.7% of adults aged 20-39, and 41.2% of adults aged 40 to 64, had increased low-density lipoprotein cholesterol (LDL-C). But only 10.6% of

adults aged 20-39, and 47.7% of adults ages 40 to 64 with hyperlipidemia are on treatment.

According to the Ministry of Health (2013) [5], the prevalence of CHD in Indonesia based on the clinical diagnoses was 0.5% or an estimated 883,447 people; based on a clinical and/or symptom-related diagnoses, 1.5% or 2,650,340 people had CHD. In Central Sulawesi, a diagnosis of 0.8% is estimated or approximately 14,888 cases, based on a clinical and/or symptom-related diagnoses it was 3.8% or 70,719 cases.

Statin is one of the lipid-lowering agents available to treat the disease. Statin can reduce LDL levels which is believed can effectively reduce the risk of coronary artery disease [6]. The most common statin drug used to decrease plasma lipids is simvastatin.

In Palu City, the incidence of patients with CVDs each year increases vividly. Therefore the evaluation of lipid profiles of CVDs patients receiving simvastatin is a very important indicator in assessing the effectiveness of therapeutic outcomes of the drug.

2. METHODS

The study was a descriptive study in which data was collected retrospectively on medical record data of CVDs from patients in a private hospital in Palu City, Central Sulawesi, Indonesia.

We collected data of patients with any CVDs who were receiving single antihyperlipidemic agent or

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combinations. Patients included needed to have a complete laboratory data including blood lipid profile (total cholesterol, trygliserides, HDL dan LDL). The variables included in this study were gender, age, diagnosis, co-medication, lipid profile including total cholesterol, LDL, triglycerides, and HDL in patients with CVDs receiving simvastatin.

3. RESULT

3.1. Demographic Characteristics

Based on the data in Table **1**, as many as 116 medical records all patients diagnosed with cardiovascular diseases, 64 medical records of patients that met the inclusion criteria and 52 medical records of patients did not meet this criteria, there by discharge because not adequate as be sampled. Results showed that of 64 patients with cardiovascular diseases were male ie 48 people (75%) and female 16 people (25%), that was evidence that patients suffering from the highest cardiovascular diseases are experienced by men. In this study, the highest cardiovascular diseases patients in patients entered the age range was 55-64 years, ie 23 people (35.4%) and age group 45-54 were 18 people (29.2%).

Table 1:   Characteristic of Cardiovascular Diseases Patients in Palu City

Patient Characteristic	Amount (n=64)	Percentage (%)
Sex		
Male	48	75
Female	16	25
Ages		
15-24	1	1,5
25-34	1	1,5
35-44	3	4,6
45-54	18	29,2
55-64	23	35,4
≥ 65	18	27,7

3.2. Clinical Characteristic

3.2.1. Diagnoses

In Table **2**, a main diagnosis of the biggest cardiovascular diseases suffered in a Palu city hospital is CHF (32.81%), followed by STEMI (20.31%) and CHD (15.63%).

3.2.2. Co-Medication

The co-medication given to cardiovascular patients were presented in Table **3**, the treated of statin group ie

simvastatin was the most widely used drug, which was 10.4% which simvastatin was treated in patients to provide a protective effect on cardiovascular disease patients followed by isosorbit dinitrate (10.2%) treated for antiangina and the use of clopidogrel and aspirin (9.06%) used as antiplatelet. Then the use of furosemide (8.9%) treated extensively for the treatment of CHF (Congestive Heart Failure).

Table 2:   The Main Diagnoses of CVDs in Palu City

Primary diagnosis	Number of Patients (n=64)	Presentation (%)
ACS	2	3.13
STEMI	13	20.31
STEMI Inferior	2	3.13
CHD	10	15.63
CHF	21	32.81
NSTEMI	4	6.25
HT GR II	2	3.13
CAD	3	4.69
IMA	2	3.13
Aritmia Cardis	2	3.13
UAP	2	3.13
OMI Inferior	1	1.56

Notes: ACS=Acute Coronary Syndrome, STEMI=ST-Elevation Myocardial Infarction, CHD=Congenital Heart Diseases, CHF=Congestive Heart Failure, HTN= Hypertension, CAD=Coronary Artery Disease, AMI=Acute Myocardial Infarction, UAP=Unstable Angina Pectoris, OMI= Old Infark Miokard.

3.2.3. Evaluation of Blood Lipid Profile

Table **4** showed that of 7 people of patients undergoing <1 month, all baseline cholesterol examinations of patients were elevated, and all patients had hyperlipidemia. Furthermore, from the evaluation of total cholesterol examination found as many as 3 people decreased cholesterol levels. The same happened in patients who do 1-2 months checks as many as 57 people, found all the baseline examination of total cholesterol patients increased and all also experienced hyperlipidemia. However, after the evaluation of total cholesterol examination more than 41 people had decreased level of total cholesterol. For LDL examination data of patients who do <1 month of examination that is as many as 7 people, all of whom have hyperlipidemia with baseline examinations of elevated LDL levels. Then the evaluation examined the decrease in LDL levels in patients as many as 5 people. In patients who performed a 1-2 month check up with baseline LDL levels of patients who had elevated and those with hyperlipidemia were 40. After the evaluation examined there was a decrease LDL

Table 3:   Concomitant Medications Received by the Patients

Therapy Class	Class	Drugs	Number of Patients (n=618)	Percentage (%)
CVDs Treatments	Statin	Simvastatin	64	10.4
	Salicylate	Aspirin	56	9.06
	ADP antagonis	Clopidogrel	56	9.06
	Nitrate	Isosorbide dinitrate	63	10.2
	Heart digitalis	Digoxin	2	0.32
	(Calcium Chanel Bloker) CCB	Amlodipin	26	4.21
		Dlitiazem	1	0.16
	(Angiotensin Converting Enzim Inhibitor) ACE inhibitor	Kaptopril	13	2.1
		Lisinopril	6	0.97
	(Angiotensin ReseptorBloker)	Candesartan	15	2.43
	ARB	Valsartan	4	0.65
	Beta blocker	Bisoprolol	8	1.29
	Aldosterone antagonist	Spironolactone	16	2.59
	Solid Diuretics	Furosemide	55	8.9
	Tiazid Diuretics	Hydrochlorothiazide	1	0.16
Antipyretic and Anti-inflammatory Analgesics	Antitussive	Codeine	3	0.49
	Non opioid analgesics	Paracetamol	5	0.81
	Non-steroidal anti-inflammatory	Meloxicam	8	1.29
		Ketolorac	1	0.16
		Diclofenac Sodium	2	0.32
	Corticosteroid	Methyl prednisolone	1	0.16
Antireflux and antiulseration	Antacids	Antacids	4	0.65
	Histamine Antagonists 2	Ranitidine	5	0.81
		Cimetidine	2	0.32
	Proton Pump Inhibitors	Omeprazole	40	6.47
		Lansoprazole	28	4.53
	Mucoprotector	Sucralfate	2	0.32
Mucolitics		Ambroxol	7	1.13
Colagogum		Lactulose	9	1.46
Antiemetics	Antagonis reseptor dopamine	Domperidon	1	0.16
	5-HT3 serotonin antagonists	Ondensentron	2	0.32
Antidiabetic	Insulin	Insulin Aspart	8	1.29
	Biguanida	Metformin	11	1.78
	Sulfonylureas	Glipirid	1	0.16
Antianxietas	Benzodiazepines	Alprazolam	29	4.69
Antibiotics	Cephalosporins	Sefixim	1	0.16
		Ciprofloxacin	1	0.16
		Ceftriaxone	5	0.81
Anticlips		Fondaparinuks sodium	20	3.24
Herb	Hepatoprotector	Curcuma	2	0.32
		Fructuss chizandra ekstract	2	0.32
Antivertigo		Betahistin mesilate	4	0.65
Bronchodilator	Agonisreseptor β2	Salbutamol	1	0.16
Antigout		Kolkisin	2	0.32
		Allopurinol	1	0.16
Purgative		Phenolphthalein, paraffin liquidum, glycerine	1	0.16
Agen inotropic		Dobutamin	5	0.81
Suplements	Vitamin	Vit B com + Vit C	8	1.29
		Vit B1 + B6 + B12	1	0.16
	Electrolites	Potassium chloride	10	1.62

Table 4:   Evaluation of Blood Lipid Components of Patients

Time of Examination	Examination	Reference Value	Category	Baseline	Evaluation
				N	N
<1 Month (n=7)	Total Cholesterol	<200	Normal	0	3
		>200	Hyperlipidemia	7	4
	Trygliceride	<200	Normal	5	6
		>200	Hyperlipidemia	2	1
	HDL	Male : 35-45	Normal	6	6
		Female : 45-55		1	1
		Male : <35	Hyperlipidemia	0	0
		Female : < 45		0	0
	LDL	<130	Normal	0	5
		>130	Hyperlipidemia	7	2
1-2 Month (n=57)	Total Cholesterol	<200	Normal	0	41
		>200	Hyperlipidemia	57	16
	Tryglicerides	<200	Normal	37	53
		>200	Hyperlipidemia	20	4
	HDL	Male : 35-45	Normal	40	41
		Female : 45-55		15	4
		Male : <35	Hyperlipidemia	2	1
		Female : < 45		0	0
	LDL	<130	Normal	17	44
		>130	Hyperlipidemia	40	13

Notes: n: Numbers of Patients, KT: total cholesterol, TG: triglycerides, HDL: high density lipoprotein, LDL: low density lipoprotein, M: Men, WM: Women.

Table 5:   The Average Lipid Profile Score (Before/Baseline and After/Evaluation)

Category	Averages		
	Baseline	Evaluation	Deviation
1 Month (n=7)			
Cholesterol Total	219	197	21.57
TG	158	119.7	38.28
HDL	50.4	54.57	-4.14
LDL	141	120.5	20.7
1-2 Month (n=57)			
Cholesterol Total	232	189.67	42.68
TG	173	129.75	43.85
HDL	50.6	53.33	-2.76
LDL	144	117.67	26.19

levels in 44 patients. For HDL examination data showed that HDL levels of CVD patients with

hyperlipidemia were men 2 people of 48 patients, who performed <1 month checks with 7 patients (6 male)

and 1-2 months with patients as many as 57 people (22 male patients) and those with hyperlipidemia were 2 people. This decrease in HDL levels causes the patient to have hyperlipidemia. For triglyceride examination data showed that triglyceride levels in patients with CVDs with hyperlipidemia were 22 people of 64 patients, patients who performed <1 month checks as many as 7 people and those with hyperlipidemia were 2 and 1-2 months with 57 patients and those with hyperlipidemia were 20.

Table **5** showed the average lipid values of total cholesterol, triglycerides, HDL and LDL patients of cardiovascular diseases before and after treated a statin ie simvastatin. The results of this study showed decreased levels of total lipid cholesterol, LDL and triglycerides and increased levels of HDL lipids.

4. DISCUSSION

In the last decade, antihyperlipidemic drugs, especially statins have become standard treatments for patients with heart disease or at risk of CVDs. This can happen because statins can make a significant reduction in the risk of death or cardiovascular events through decreased levels of low-density lipoprotein (LDL) cholesterol. Statins are widely used because they can stabilize plaque, reduce thrombus formation, is anti-inflammatory, and reduce lipid oxidation that has a pleotrophic effect by increasing LDL receptors. Statin utilization should be continued to gain benefit like long-term survival [7].

In the study, we found that the used simvastatin on the mean values of the lipid profile of patients with CVDs before and after using simvastatin showed that there was a decrease in total cholesterol levels, triglycerides, LDL and increased HDL levels.

Simvastatin lowers lipids by inhibiting 3-hydroxy-3-methylglutaryl co-enzyme A (HMG-CoA) reductase. HMG-CoA reductase releases precursors of mevalonik acid cholesterol from coenzyme A. Competitive inhibition by simvastatin results in cellular compensatory responses such as elevated HMG-CoA reductase enzyme and Low Density Lipoprotein (LDL) receptor. Due to the increase in HMG-CoA reductase, synthesis of cholesterol cellular only decreased slightly, but mechanism of cholesterol clearance through LDL receptor increased significantly [8]. Simvastatin is very effective to reduce LDL levels and increase HDL levels [9].

Statins can increase LDL receptor activity in the liver as a counter-regulatory mechanism and thus accelerate the clearance of LDL in the blood resulting in a decrease in dose-dependent plasma LDL cholesterol levels. The magnitude of LDL reduction associated with statin therapy in each person varies, but once the patient gets statin therapy, multiplication statin dose will result in a decrease of plasma LDL cholesterol levels up to 6% and it is also effectively decrease plasma triglycerides depending on the dose usage and this drugs possess slight effect in increasing HDL (5-10%) which is generally not affected a usage dose [10]. Statins are the most effective lipid-lowering drugs to lower LDL cholesterol (18-55%), triglycerides (7-30%), and increase HDL (5-15%) and this drug is proven safe without significant side effects [11].

Co-medication with use of drugs other than simvastatin must be done so that the treatment becomes more optimal. Combination therapy with several other classes of drugs such as the used of anti-platetet namely clopidogrel and aspirin which can inhibit platelet aggregation resulting in inhibition of thrombus formation especially in the arterial system. In addition, therapy is needed to treat other risk factors or co-morbidities such as isosorbid dinitrate as anti-angina which has an effect on the dilatation of both normal and atherosclerotic coronary arteries [12].

5. CONCLUSION

The use of simvastatin drugs reached normal cholesterol levels of 44 patients (68.75%) of 64 patients, LDL 49 patients (80.3%) of 64 patients, triglyceride 59 patients (92.19%) of 64 patients and HDL lipid levels 52 patients (81.25%) of 64 patients. The usage of simvastatin can lower total lipid cholesterol, LDL and triglyceride levels and increase HDL lipid levels.

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