



Evaluation of the Suitability of Using Anticholesterol Drugs in Cholesterol Patients at Sekip Public Health Centre Palembang

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Abstract

Dyslipidemia is a condition that increases plasma cholesterol, LDL, and triglyceride levels, decreases HDL levels, or causes a combination of abnormalities. In amounts sufficient for what the body needs, cholesterol works to produce hormones, vitamin D, and other components. Cholesterol is produced by the liver and can also be found in animal products. This study aims to determine the profile of treatment and the suitability of the use of anticholesterol drugs in patients with high cholesterol at Sekip Public Health Centre Palembang. This research is non-experimental, using quantitative methods and 40 samples. The demographic results of the total cholesterol levels of patients who experienced a decrease were 100 patients (100%). Demographics of patients by gender: mostly female, as many as 30 patients (75%). Demographics of patients by age: mostly in the age category 56–65 years, as many as 16 patients (40%). Demographics of patients based on comorbidities: the most common was diabetes mellitus, with as many as 12 patients (30%) The highest use of anticholesterol drugs is in the statin group, namely simvastatin (100%). The suitability of the selection of anticholesterol drugs was 100% for 100 patients. The suitability of the selection of the anticholesterol dose in 100 patients (100%)

Keywords: Cholesterol, Cholesterol Dugs, Dyslipidemia, Public Health Centre, Drug Rationality

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1 Introduction

Cholesterol is a fat that our body needs. Cholesterol is a component whose consistency is similar to candle wax or fat and that can be found in all cells in the body [1]. Cholesterol belongs to the group of steroids and is a type of lipid. Steroids are complex molecules that can be soluble in fat. The most commonly found steroid is sterol, which is an alcoholic steroid. Consuming 25–30 grammes of soluble fibre per day can lower LDL cholesterol levels by 5% [2,3].

Lipids are biomolecules that are naturally insoluble in water, so lipids require a transport compound called lipoprotein. Lipoprotein plays a role in the absorption and transportation of lipids. Lipoprotein also plays a role in the process of transporting lipids from the liver to peripheral tissue. Lipoprotein composition consists of kilomicon, VLDL, LDL, and HDL with a protein content of 2%, 10%, 22%, and 50% [4].

Dislipidemia is a condition that increases levels of plasma cholesterol, low-density lipoprotein (LDL), triglycerides, or low-density lipoproteins (HDL), or a combination of these abnormalities. Dislipidemia is one of the factors that play a role in cardiovascular disease [5].

Over the next 35 years, deaths from cardiovascular disease will increase by about 85%. This decline in population is caused by cholesterol disease. Increased cholesterol is estimated to cause 2.6 million deaths each year. In 2008, the prevalence of total cholesterol increases in the adult age group was 37% for men and 40% for women. The WHO Africa region and the WHO Southeast Asia region showed the lowest percentages of 23% and 30%, respectively. Over 4.4 million deaths are caused by hypercholesterolemia, or as much as 9% of the total number of deaths in young people. An estimated 9 million people die and more than 75 million people lose a healthy life due to unfavourable cholesterol levels [6,7,8].

The proportion of total cholesterol levels in the Indonesian population in 2018 was 21,2%. The prevalence of cholesterol tends to be higher in women (24,0%), compared to men (18,3%). According to the report on non-communicable diseases in 2016, the prevalence of cholesterol tended to be higher in women (54,3%) compared to men (48%). The percentage of high cholesterol based on the age of the majority of the age group over 60 years was 58,7%, and the prevalence of incidents in South Sumatra Province was 24,5%. The prevalence of dyslipidemia in Indonesia is still high; in 2018, data showed an increase in total cholesterol of 43%, triglyceride levels of 26%, LDL levels of 83%, and HDL levels of 23% [9,10,11].

Sekip Public Health Centre was selected as the research site because, according to the 2018 Health Profile of the Palembang City Health Department, the number of road care patients visits is 42.180. In 2019, the number of road care visits was 28,891. The number of cases of cholesterol in Sekip Public Health Centre Palembang in 2017 was 230, and it will be 255 in 2019 [12,13]. Therefore, Sekip Public Health Centre Palembang was chosen as the research site by taking age, gender, cholesterol levels (total cholesterol, LDL, HDL, triglyceride levels), and accompanying diseases from January to December 2021 in the medical records of cholesterol patients from January to December 2021 using the SOAP method carried out in May 2022. The desired conclusion of this study is to know the anti-cholesterol drugs used as well as the rationality of the selection of drugs and the dose of anti-cholesterol drugs in Sekip Public Health Centre Palembang.

2 Experimental section

This research is observational, using quantitative methods and a descriptive research design, while the approach used is retrospective. The method of collecting data for

this study is done by recording the data necessary for this research that is taken from the medical records of patients who are treated at Sekip Public Health Centre Palembang. The data collection for this study was carried out over a month, in May–June 2022. This study was conducted at the Sekip Public Health Centre in Palembang. The medical data collected is the data of patients who underwent treatment in the period January–December 2021. The medical records used as samples in this study were medical records of patients who had checked their total cholesterol levels at least 3 times. The sample of this study is all populations that have complete medical records data and are patients who are routinely treated at Sekip Public Health Centre Palembang during the period January–December 2021, with a total of 100 medical records.

3 Results and Discussion

The results of this study are presented in a descriptive manner by describing the characteristics of cholesterol patients including cholesterol patient demographics and the use of anti-cholesterol drugs in the table 1.

Table 1. Classification of Plasma Lipid Levels

Total Cholesterol (mg/dl)	
Acceptable	< 200
Borderline	200-239
High	≥240
LDL-C (mg/dl)	
Optimal	<100
Close to optimal	100-129
Borderline	130-159
High	160-189
Very High	≥190
HDL-C (mg/dl)	
Low	<40
High	>60
Triglycerides (mg/dl)	
Normal	<150
Borderline	150-199
High	200-499
Very High	≥500

3.1 Characteristics of the patient

3.1.1 Cholesterol profile of sample

Data obtained from cholesterol patients at the Sekip Palembang Community Health Center showed a decrease in the total cholesterol levels

of patients, namely 100 patients (100%). The initial total cholesterol level of patients in the upper threshold cholesterol level category was 2 patients (5%), while 38 patients (95%) were in the high total cholesterol level category. The final total cholesterol levels of patients who fell into the upper threshold total cholesterol level category were 6 patients (15%), while the patients who fell into the high overall cholesterol category were 34 patients (85%). According to PERKENI (2021) [14], a person can be said to suffer from cholesterol if his total cholesterol level reaches ≥ 240 mg/dl. HDL, LDL, or Triglyceride levels could not be found in the patient's medical records. This is because the results of the cholesterol examination are handed over to the patient and the health center only records total cholesterol levels as a control.

3.1.2 Demographics of patients by age

Demographics of cholesterol patients by age in Sekip Public Health Centre Palembang in 2021 can be seen in the table 2.

Table 2. Demographics of cholesterol patients in Sekip Public Health Centre Palembang in 2021 based on age

Age	Total Patients	Percentage (%)
36-45	5	5
46-55	30	30
56-65	35	35
>65	30	30
Total	100	100

The results of this study are consistent with Nur [15], who found that the age category 56–65 was the age group with the highest number of patients with cholesterol, namely 35 patients (35%), followed by the age category 46–55 years and >65, 30 patients (30%), and age category 36–45, 5 patients (5%).

Compared to adults, the elderly have a smaller liver, and the pancreas on the body will shrink, causing a decrease in blood flow to liver organs. Cholesterol levels in older women are much higher than in men; this is due to the occurrence of a decrease in postmenopausal oestrogen levels, which will go back down after the age of 70. The accumulation of atherosclerosis caused by cholesterol in the elderly occurs in childhood and adolescence, which then accumulates in the intima of the arteries. The atheroma will increase by the age

of 55 years, so when the already formed plaque breaks, it will be the cause of cardiovascular disease. Age is one of the most significant risk factors for increased cholesterol levels in the blood. Increased cholesterol in the blood will increase the risk of ischemic stroke. As we age, the incidence of cerebral ischemia increases regardless of ethnicity and gender. After the age of 55, the incidence will double every decade [16,17].

3.1.3 Demographics of patients by sex

Demographics of patients with cholesterol based on gender in Sekip Public Health Centre Palembang year 2021 can be seen on the table 3.

Table 3. Demographics of cholesterol patients in Sekip Public Health Centre Palembang in 2021 based on gender

Sex	Total Patients	Percentage (%)
Male	30	30
Female	70	70
Total	100	100

This is in accordance with the results of the study conducted by Prastiwi [18], which found that in Health Centre I South Denpasar, the majority of respondents who suffer from cholesterol were female: 72 people, or 62.6%, while 43 men, or 37.4%,

This is due to a decrease in oestrogen in the menopausal phase that affects the lipid profile of the elderly. The decrease in oestrogen is strongly associated with age. The oestrogen hormone inhibits the activity of the enzyme lipase in the liver organs. In premenopause, women have lower cholesterol levels than men. However, at the time of menopause, women's cholesterol levels will increase compared to men at the same age [19]. The changes in female physiology differ from the changes in male physiology. This difference is influenced by hormones; in women, there is the hormone oestrogen, while in men, there are the hormones androgens. In women, a decrease in the hormone oestrogen during menopause can cause the distribution of body fat to increase, resulting in an increase in total cholesterol [20].

3.1.4 Demography of patients based on accompanying diseases

Demographics of cholesterol patients based on the disease accompanying Sekip Public Health Centre Palembang in 2021 can be seen in the table 4.

Table 4. Demographics of cholesterol patients in Sekip Public Health Centre Palembang in 2021 based on the disease of the participants

Accompanying Diseases	Total Patients	Percentage (%)
Without Accompanying Diseases	10	10
With Accompanying Diseases		
Diabetes mellitus	30	30
Hypertension	25	25
Hypertension + Diabetes mellitus	21	21
Hypertension + Uric Acid	4	4
Hypertension + dyspepsia	2	2
Hypertension + Osteoarthritis	2	2
Hypertension + Diabetes mellitus + Uric Acid	2	2
Diabetes mellitus + Uric Acid	2	2
Diabetes mellitus + Uric Acid + Diarrhea	2	2

Glucose and lipids are important components of energy metabolism. Thus, people with diabetes can be said to have a close relationship with cardiovascular diseases such as dyslipidemia. However, when triglyceride levels are above the normal limit and HDL levels are in the low category, it can also cause disruption of glucose metabolism and lead to hyperglycemia. Liver lipase is also responsible for cleaning HDL particles from circulation, which will indicate increased activity when insulin resistance occurs and causes HDL levels to decrease. Therefore, people with high cholesterol and concomitant diabetes due to insulin resistance will experience increased triglyceride levels and decreased HDL levels. Low HDL levels are an important risk factor for cardiovascular disease [21,22].

When cholesterol levels exceed normal limits, it can lead to atherosclerosis. Atherosclerosis will block the arterial blood vessels. The walls of the arterial tract undergoing arteriosclerosis will become thicker and stiffer due to the presence of a stack of cholesterol. The artery tract experiences processes of narrowing, hardening, loss of elasticity, and stiffness. When the arterial muscle cells are thickened by fat, their flexibility will disappear and their ability to regulate blood

pressure will decrease, so that various diseases such as hypertension, arrhythmias, stroke, etc. will occur. Hypertension is associated with abnormalities in total cholesterol lipids, and the presence of hypertension will increase the risk of dyslipidemia [23].

3.2 Profile of Treatment and Appropriation of Medications

3.2.1 The Use of anti-cholesterol drugs

According to PERKENI 2021, based on the way anti-cholesterol drugs work are divided into seven groups of them are the statin drugs groups such as Simvastatin, Bile Acid Sequestrant, Fibratic acid. The drug group Nikotinate Acid, the drug group Ezetimibe, drug group PCSK inhibitor 9, drug group Omega-3 fatty acids and the latest drug group such as Microsomal Transfer Protein Inhibitor (MTP), Thyroid Hormone Mimetic, Apo B Antisense Oligonucleotide (mipomersen) and LDL Apheresis. Demographics of the use of the drug in cholesterol patients in Sekip Public Health Centre Palembang in 2021 can be seen in the table 5.

Table 5. Demographic Types of Anticolesterol Drugs Based on Drugs Groups in Cholesterol Patients in Sekip Public Health Centre Palembang in 2021

Drug	Drug Class	Frequency	Percentage (%)
Simvastatin	Statin	100	100
Total		100	100

Simvastatin is used as a dyslipidemia drug to prevent cardiovascular disease. Simvastatin also has high concentrations that can lower total cholesterol and LDL levels. In addition to lowering cholesterol levels, the statin group also functions as an antioxidant, anti-inflammatory, antifungal, immunomodulator, antimalaria, and bone-building agent. It is a semi-synthetic derivative of lovastatin, the first statin approved by the FDA. Simvastatin helps reduce cholesterol production and the associated complications of dyslipidemia. High concentrations of LDL cholesterol can cause damage to the arteries, which can potentially lead to heart complications and strokes. Statin therapy is prescribed to lower cholesterol concentrations. Simvastatin targets the

production of cholesterol. This molecular biosynthesis consists of a multi-stage pathway. Speed-limiting steps on this pathway involve the 3-hydroxy-3-methylglutaryl-KoA reductase enzyme (HMG-CoA). Using acetyl-CoA as a substrate, mevalonic acid is formed, and the subsequent reaction leads to the formation of cholesterol. Simvastatin is approved for oral administration and is available in 5 mg, 10 mg, 20 mg, 40 mg, and 80 mg tablets. The preparation form of the suspension is also available for patients who have difficulty swallowing. The recommended dose for hypercholesterolemia disease is 10 to 20 mg once every night; the maximum dose is 40 mg once each night. Common side effects of simvastatin include headaches, myalgia, abdominal pain, constipation, and upper respiratory tract infections. Rarer but more severe causes include cardiovascular effects, jaundice, and potential liver failure. Patients contraindicated to simvastatin pharmacotherapy include those with active liver disease, pregnant women, and women who may be pregnant or are breastfeeding [24,25].

3.2.2 Use of anti-cholesterol drugs

a. Appropriate use of medicines category selection

Appropriation of drug administration is the suitability of the selection of a drug among several types of drugs that have appropriate therapeutic effects for cholesterol disease, based on the PERKENI 2021 standard (Table 6).

Table 6. Appropriate selection of anti-cholesterol drugs in cholesterol patients in Sekip Public Health Centre Palembang in 2021

Appropriate use of medication	Total	Percentage (%)
Appropriate use of Medicine	100	100
Inappropriate use of Medicine	-	-
Total	100	100

According to the standard by Perkumpulan Endokrinologi Indonesia [14], patients are said to be diagnosed with cholesterol disease if the cholesterol test results are >200 mg/dL. In this study, the administration of anti-cholesterol drugs to cholesterol patients in Sekip Public Health Centre Palembang in 2021 was determined according to the criteria that as

many as 100 patients diagnosed with cholesterol disease had cholesterol levels >200 mg/dL. Based on the results of the study in Table 6, it can be seen that the suitability of the use of anti-cholesterol drugs in cholesterol patients in Sekip Public Health Centre Palembang in 2021, according to the guidelines by Perkumpulan Endokrinologi Indonesia [14], meets the criteria of 100% suitability to use anti-cholesterol drugs. Statins are recommended as the first therapeutic option in people with cholesterol to achieve the LDL-C target. For patients with hypertriglyceridemia with high cardiovascular risk, statins are also the first choice to lower cardiovascular risk. The choice of medication can be said to be appropriate when the decision to carry out therapy is made after the diagnosis is correctly established. Thus, the chosen medication should have a therapeutic effect in accordance with the spectrum of the disease [27]. The medication selected and administered to the patient should have a therapeutic effect corresponding to the type of disease. Some considerations in the selection of medicines according to the WHO, namely the benefit (efficacy), the usefulness and safety of the medicines with proven safety (safety), the least or minimum risk of treatment but balanced with the same benefits and safety and affordable for the patient (affordable), and suitability (cost) [28].

b. Appropriate use of medication category selection of dosage

Dosage adjustment is the use of medicines that must be compatible with the range of drug therapy. Adequacy of dosage use was assessed by considering the dosage written in the medical records of cholesterol patients in Sekip Public Health Centre Palembang and compared with the standards of the Endocrinology Society of Indonesia in 2021 (Table 7).

Table 7. Anti-cholesterol dosage for cholesterol patients in Sekip Public Health Centre Palembang in 2021

Appropriate use of medication	Total	Percentage (%)
Appropriate use of dosage	100	100
Inappropriate use of dosage	-	-
Total	100	100

The dose of anti-cholesterol drugs administered by Sekip Public Health Centre Palembang to cholesterol patients is 10 mg with a frequency of 1 tablet per day. This is in line with a study by Tjay *et al.* [29], which says that the recommended initial dose of simvastatin is 10 mg/day. The use of an 80 mg/day dose of simvastatin increases the risk of myopathy or muscle trace side effects, so it is not recommended to be given at the initial treatment, except for patients who have taken a dose of 80 mg for 12 consecutive months without myopathy side effects [30].

4 Conclusions

Based on the results of the study, it can be concluded that the Cholesterol profile of sample decreased by 100 patients, patient demographics by age, most in the age category of 56-65 years (35%), patient demographics by gender, most of whom are women (70%), and patient populations based on accompanying diseases, mostly diabetes mellitus (30%). The most common use of anti-cholesterol drugs is the stati group. The suitability of the selection of anti-cholesterol drugs, the suitability of the choice of doses of anti-cholesterol drugs with the appropriate category as many as 100 people (100%). The results of this study may differ if known data on HDL-C, LDL-C, and Triglycerides.

5 Declarations

5.1 Author Contributions

Dhiny Zsa Zsa Aulia ; compile and design analyses; collect data; conduct analysis; write the manuscript. Tahoma Siregar and Ritha Widyapratwi ; revise papers and approve manuscript.

5.2 Funding Statement

Not Available.

5.3 Conflicts of Interest

The authors declare no conflict of interest.

5.4 Ethic

Ethical has been approved by the Commission on Health Research Ethics Committee STIKES PRIMA Indonesia No.190/EC/KEPK/STIKES-PI/VII/2022.

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