

Hypolipidemic Effects Of Aloe Vera (*Aloe Vera L.*)Roy Sukbir Singh¹, Hendrika A Silitonga²

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Abstract

Background: Chronic hyperlipidemia is a trigger factor for serious diseases, one of which is atherosclerosis. Lipid profile disorders in the form of increased total cholesterol, LDL and decreased HDL levels are believed to be one of the major triggering factors for cardiovascular disease. One of the treatments for hyperlipidemia in addition to using conventional therapy can also be with traditional treatments such as aloe vera (*Aloe Vera L.*). The content of glucomannan in aloe vera is believed to act as a hypolipidemic agent. **Method:** This paper uses a literature study or literature review of research articles. Search articles through Google Scholar and Pubmed with keywords used hypolipidemia and Aloe vera. The criteria for the articles used were published in the last 5 years, namely from 2016 to 2021.

Results: Based on the literature search, there were 8 studies related to the effect of aloe vera on lipid profile levels, of which there were 7 studies on experimental animals and 1 study on humans. Aloe vera used varies from extract form, gel and powder form in capsules.

Conclusion: Based on the literature study, it was found that aloe vera is an herbal plant that has a fairly effective hypolipidemic effect.

Keywords: Hypolipidemic, Aloe Vera L

INTRODUCTION

Chronic hyperlipidemia is a trigger factor for serious diseases, one of which is atherosclerosis. Lipid profile disorders in the form of increased total cholesterol, LDL, and decreased HDL levels are believed to be one of the major triggering factors for cardiovascular disease. [1]

The leading cause of death in the adult population in the United States is cardiovascular disease. Patients with hyperlipidemia have twice the risk of suffering from CVD (cardiovascular disease) than those who have normal cholesterol levels. [2]. In the United States, more than 100 million adults, or about 53% have elevated LDL levels and about 31 million adults have total cholesterol levels exceeding 240 mg/dl. [1] According to WHO in 2008, the prevalence of hyperlipidemia in Southeast Asia was around 30.3%, which is lower than the incidence in Europe (53.7%) and America (47.7%). In Indonesia, the prevalence of hyperlipidemia in adults aged 25 years is around 36%, of which 33.1% in men and 38.2% in women. The prevalence of cardiovascular disorders related to hyperlipidemia in Indonesia is around 37%. [3][4]

One of the treatments for hyperlipidemia is lifestyle modification with exercise and a low-

fat diet. If these efforts fail, it is necessary to consider starting the use of drugs that function to lower blood lipids. [5] Statins are the first-line drugs for hypercholesterolemic patients because they are effective monotherapy in hyperlipidemia with comorbid coronary heart disease. However, statins have the main effect on myalgia (muscle pain or muscle weakness), especially when used in combination with fibrates [5][6]. There are side effects from conventional treatment so that complementary therapy is needed in dealing with hypercholesterolemia, which is derived from natural ingredients that are relatively safe and easy to cultivate, one of which is found in aloe vera (*Aloe vera* L.). [7]

Aloe vera (*Aloe vera* L.) is a plant that is widely used for various nutritional products, pharmaceutical products, and cosmetics. The pharmacological effects of *Aloe vera* L include: antitumor, anti-inflammatory, antiviral, anxiolytic, hypolipidemic, hypoglycemic, antiatherogenic, antifungal, antioxidant, anti-bacterial, nephroprotective, and helps wound healing. [7] The biologically active substances contained in *Aloe vera* L. are more than 200 kinds. This plant is rich in anthraquinones/anthrones, vitamins, amino acids, plant sterols (campesterol, cholesterol, -sitosterol),

and polysaccharides. Types of polysaccharides contained in Aloe vera L. including glucomannan which has excellent properties in absorbing bile acids and will be carried out with feces, as a result, the cholesterol bound by the glucomannan fiber does not enter the blood vessels. Glucomannan also accelerates the degradation of the enzyme HMG-CoA reductase so that the conversion of mevalonate to cholesterol is inhibited. [8]

METHODS

1. Study Design

This research is a research using literature study method or literature review. A literature review is a comprehensive overview of the research that has been done on a specific topic to show the reader what is already known about the topic and what is not known, to seek rationale from research that has been done or for further research ideas.

The data used in this study comes from the results of research that has been carried out and published in national and international online journals. In conducting this research, the researchers searched for research journals published on the internet using the Google Scholar and PubMed search engines. The keywords used in the search are Hypolipidemic, *Aloe Vera*

2. Population and Sample

This study uses a literature study where Google Scholar and Pubmed search engines are used. From the search results, 20 articles were identified, but only 8 journals entered the criteria and were discussed in this study. Inclusion and exclusion criteria can be seen in table 1.

3. Study Variabel

The dependent variable in this study was hyperlipidemia while the independent variable was aloe vera extract (*Aloe Vera* L).

4. Operational Definition of Variables

Hyperlipidemia is a lipid metabolism disorder characterized by increased levels of total cholesterol, LDL cholesterol, triglycerides and/or decreased levels of HDL cholesterol. In the process of atherosclerosis, everything has an important role and is very closely related to one another.

Aloe vera is a plant native to Africa, specifically Ethiopia, which belongs to the *Liliaceae* group. Aloe vera plant is known to have many uses such as anti-inflammatory, antifungal, antibacterial, and cell regeneration and is believed to have a hypolipidemic effect in the form of extracts, gels and other processed forms.

5. Study Instruments

The strategy used to find articles is using the PICOS framework. *Population/problem* that is population or problem to be analyzed in accordance with the themes that have been determined in the literature review. *Intervention* which is a management action on individual or community cases as well as an explanation of the management of the study in accordance with the themes that have been determined in the book literature review. *Comparison* intervention or other management used as a comparison, if not there can use the control group in the selected study. *Outcome* namely the results or outcomes obtained in previous studies that are in accordance with the themes that have been determined in the literature review.

In this study the problem was hyperlipidemic patients, there was no

intervention in this study, the comparison in this study was aloe vera, and the expected outcome was the hypolipidemic effect of aloe vera. which then analyzed using the table for analyzed from tree discussion, results from studies so that know the similarities and differences of these journals (Table 2)

6. Data Analysis

This research uses literature review method design with identification, evaluation, and interpretation of all research results related to certain topics. Method literature review, summarizes the results of primary research in a more comprehensive presentation of facts comprehensive and balanced

7. Research Ethics

There is no ethical clearance in this study because it only uses literature study.

Table 1. Inclusion and Exclusion Criteria in *Literature Review*

Inclusion Criteria	
Period	The maximum time for publishing journals is the last 5 years from 2016 to 2021
Language	Indonesian and English
Subject	Hyperlipidemic Patients
Article Type	<ol style="list-style-type: none"> 1. Original article 2. Not in abstract form 3. Full-text publication
Search time limit	<ol style="list-style-type: none"> 1. The deadline starts from 17 July to 06 August 2021
Search location	<ol style="list-style-type: none"> 1. PubMed 2. Google Scholar

Keywords	Hypolipidemic, Aloe Vera
Exclusion Criteria	
Article Type	The research method is not descriptive because researchers need to identify relationships, not just descriptions.
Results	Research results that have been published and must have a p-value or must be read by statistics because researchers need to see whether there is a relationship.

Table 2. Study Description *Literature Review*

Name, Year, Title	Design	Sample	Measuring instrument	Results
Devi, 2019 <i>Hypolipidemic effect of ethanolic extract of aloe vera (aloe vera l) on male white rat hypercholesterolemia model</i>	The research design uses laboratory experiments with pre and post-test methods with control group design	The study involved 25 male white Rattus norvegicus induced by a high-fat diet for 14 days. Subjects were divided into 5 groups: negative control (aqua dest), positive control (cholestyramine 0.2g/200gBW/day), Aloe vera ethanol extract L dose I (0.3g/200gBW/day), Aloe vera ethanol extract L dose II (0.6g/200gBW/day), ethanol extract of Aloe vera L dose III (1.2g/200gBW/day). Measurement of lipid profile levels was carried out on day 7, day 21, and day 35.	Rats Lipid profile kit	The results of the Shapiro-Wilk test and the Lavene test showed that all data groups were normal and homogeneous. Paired T-Test results obtained p value = 0.000 for both triglycerides, LDL cholesterol, and total cholesterol. Furthermore, the One Way Anova parametric test results p<0.05 for the three lipid profiles. LSD test on triglyceride levels in the aquades group with 70% ethanol extract of Aloe vera L doses of 0.3g/200gBW/day, 0.6g/200gBW/day, and 1.2g/200gBW/day respectively, p=0.012, p=0.000 and p=0.000. LSD test on LDL cholesterol and total cholesterol in the distilled water group with 70% ethanol extract of Aloe vera L only at a dose of 1.2g/200gBW/day which was significantly different with p=0.006 and p=0.001. 70% ethanol extract of Aloe vera L at a dose of

				1.2g/200gBW/day can reduce lipid profiles in the form of triglyceride levels,
Prabha Verma, 2016 <i>Hypolipidemic Activity of Aloe Vera in Hyperlipidemic Mice</i>	<i>Experimental studies on experimental animals</i>	The hypolipidemic activity of Aloe vera extract (Family: Liliaceae) was studied in two models of hyperlipidemia. First acute model: hyperlipidemia was induced by injecting a single dose of triton WR-1339 (400mg/kg, BW) intraperitoneally in rats then administration of aloe vera extract at a dose of 500 mg/kg BW. In the chronic model, hyperlipidemia was induced by feeding with HFD rich cholesterol in mice. Treatment with aloe vera seed extract (500 mg/kg BW) for 15 days. Hypolipidemic activity of Aloe vera was compared with the standard drug guggulipid (200 mg/kg, BW) in both models.	Rats Lipid profile kit	Treatment with aloe vera extract at a dose of 500mg/kg BW, caused a decrease in the levels of TC, PL, and TG by 28, 25, and 26%, respectively, along with reactivation of PHLA by 22%. Treatment with aloe vera extract for 15 days reversed plasma levels of TC, PL, and TG by 25, 21, and 31%, respectively, along with reactivation of PHLA by 21%. The hypolipidemic action of aloe vera at a dose of 500 mg/kg BW is comparable to that of guggulipid at a dose of 200 mg/kg BW.
Imaga, 2016 <i>Evaluation of the therapeutic effect of aloe vera gel on alloxan-induced diabetes rats</i>	<i>Experimental studies on experimental animals</i>	Rats were divided into six groups, each group consisting of six rats. Then it was induced with alloxan monohydrate (170 mg/kg BW) intraperitoneally after 12 hours of fasting. Groups I and V similarly received isotonic saline. Diabetes was confirmed by fasting blood glucose (GDP) levels above 350mg/dl using GlucoMetre (AccuChek Active). Aloe vera Gel (AVG) extract was administered for 14 days	Rats Lipid profile kit	The lipid profile showed increased levels of total cholesterol (TC), triglycerides (TG), and low-density lipoprotein (LDL) in the diabetes group that was not treated compared to the normal control group and the group that was treated with Aloe Vera. The AVG group showed a decrease in the lipid profile and an increase in HDL levels.

along with metformin and alloxan. Blood samples were taken from fasting rats to assess the effect of AVG on biochemical, hematological, oxidative stress parameters as well as the histological examination of the liver, kidneys, and pancreas.

<p>Louay, 2019 <i>Hypoglycemic and Hypolipidemic Effects of Aloe Vera on Patients with Type 2 Diabetes</i></p>	<p><i>Test on humans</i></p>	<p>Forty-five patients with type 2 diabetes mellitus participated in this study. Participants were divided into 3 groups, each group consisted of 15 patients. Group I was given capsules containing AV 100 mg powder, group II was given capsules containing AV 200 mg powder while group III was considered as a control. Glycated hemoglobin (HbA1C) and lipid profiles (Total Cholesterol (TC), LDL/C, HDL/C, and triglycerides) were measured at baseline and the end of the 12-week study.</p>	<p>Lipid profile ELISA</p>	<p>There was a significant decrease ($p < 0.05$) in the HbA1c values in groups I and II. The reduction was 11.1% and 25% in groups I and II respectively and the decrease was not significant ($p < 0.05$) between the subjects of group III. There was a significant decrease ($p \leq 0.05$) in total cholesterol 6.5% and 7.11%, triglycerides 10.4% and 12.6%, Low-Density Lipoprotein (LDL-C) 7.5% and 11.9%, and a significant increase in High-Density Lipoprotein (HDL-C) 8% and 25% was observed in the subjects of groups I and II, respectively. The ratio of LDL-C to HDL-C decreased from 3.71 to 3.2 and 3.9-2.7 in group I and II subjects after the study, respectively.</p>
<p>Autumn, 2017 <i>Hypolipidemic Effects of Aloe Vera Gel Extract in Adult Male Rats Given a High-Fat</i></p>	<p><i>Experimental studies on experimental animals</i></p>	<p>In this experimental study, 40 adult male rats were included in the control group (without treatment), the sham group (treated with a 10 ml/kg high-fat diet), and three experimental groups receiv-</p>	<p>Rats Lipid profile kit</p>	<p>The results showed that a high-fat diet significantly increased serum cholesterol, triglycerides, LDL ($p < 0.001$), and weight gain ($p < 0.01$) but did not significantly affect serum HDL levels. How-</p>

<i>Diet</i>		ing a high-fat diet (10ml/kg) along with 150, 300 and 600 mg/kg aloe vera gel extract. The test was carried out for 60 days. In the end, after being anesthetized, the rat heart phlebotomy was performed and then the serum cholesterol, triglyceride, LDL, and HDL levels were measured. The results obtained were analyzed by ANOVA and Duncan tests		ever, in the group receiving Aloe-vera gel and a high-fat diet, there was a significant reduction in body weight and serum cholesterol, triglycerides (p<0.05), and LDL (p<0.01) levels.
Ramesh, 2016 <i>Comparative Evaluation of Anti-Obesity Effects of Aloe Vera and Gymnema Sylvestre Supplementation in Rats Given a High-Fat Diet</i> C57BL/6J	<i>Experimental studies on experimental animals</i>	Twenty-four male C57BL/6J mice (aged 5-6 weeks) were obtained from the National Institute of Nutrition, Hyderabad (Andhra Pradesh, India). After 1 week of acclimatization, the mice were divided into four groups: control diet, HFD, HFD + AV (1% w/w) (HFD + AV) and HFD + GS (1% w/w) (HFD + GS), and fed for 12 weeks. At the end of the experiment, different parameters such as body weight, feed intake, organ weight, fasting blood glucose, oral glucose tolerance test, plasma lipid level, and adipocytokine analysis expression were evaluated.	Rats Lipid profile kit	At the end of the experimental period, oral administration of both herbs showed a significant reduction (P < 0.05 and P < 0.001) in plasma glucose and lipid levels in HFD-fed mice
Rahoui, 2018 <i>Beneficial Effects Of Aloe Vera Gel On Lipid</i>	<i>Experimental studies on experimental animals</i>	48 male Wistar rats aged 4 weeks were used in this study. Rats were randomly divided into two groups with	Rats Lipid profile kit	Plasma glucose, cholesterol, and triglyceride levels were significantly higher in obese rats compared to control

Profile, Lipase Activity And Oxidant/Antioxidant Status In Obese Rats

the same mean weight. The first group (control, n=24) was fed a standard diet (330 kJ/100 g), the second group (obese, n=24) was fed the diet for 4 weeks before starting AVG. After that, the mice in each group (control or obesity) were divided into three groups after treatment. Control and obesity groups (C or O, n = 8) were orally treated every two days with a physiological solution at 0.9% NaCl (1 ml per mouse) to eliminate any variation due to gavage-induced stress. AVG (100 mg/kg/day) was administered to the Aloe control group (C100: n=8) and the Aloe Obese group (O100: n=8). AVG (200 mg/kg/day) was administered to the Aloe control group (C200:

rats. AVG treatment had no effect in the control group. In obese rats treated with AVG, there was a significant reduction in glucose, triglyceride, and cholesterol levels in obese rats given AVG 100 mg/kg/day. AVG at a concentration of 200 mg/kg/day restored LDL- and HDL-C levels in obese rats to be similar to those in the control group.

<p>Mandeep, 2018 <i>Improvement of Diabetes with aloe vera in rats Induced Diabetic Nephropathy By Implications Of Oxidative Stress And Hyperlipidemia</i></p>	<p><i>Experimental studies on experimental animals</i></p>	<p>Six groups were employed in this study and each group consisted of seven mice. Group I (normal control): rats were reared with standard food and water and were not given any treatment. Group II (diabetic control): rats were given STZ (55 mg/kg, i.p., once) dissolved in citrate buffer (pH 4.5). Group III (Aloe vera): normal rats were given Aloe vera (300 mg/kg po) for seven weeks. Group IV (Treated with</p>	<p>Rats Lipid profile kit</p>	<p>Plasma glucose, cholesterol, and triglyceride levels were significantly higher in obese rats compared to control rats. AVG treatment had no effect in the control group. In obese rats treated with AVG, there was a significant reduction in glucose, triglyceride, and cholesterol levels in obese rats given AVG 100 mg/kg/day. AVG at a concentration of 200 mg/kg/day restored LDL- and HDL-C levels in obese rats to be similar to those in</p>
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aloe vera): diabetic rats, after 1 week of STZ administration, were given Aloe vera 150 mg/kg po) for seven weeks. Group V (aloe vera-treated): diabetic rats, after one week of STZ administration, were treated with Aloe vera (300 mg/kg [double group IV] po) for seven weeks. Group VI (treated with lisinopril)

the control group.

RESULT

Based on the literature search, there were 8 studies related to the effect of aloe vera on lipid profile levels, of which there were 7 studies on experimental animals and 1 study on humans. All these journals are international and national journals which are searched from the Database PubMed and Google Scholar by typing the keyword *Hypolipidemic and Aloe Vera L.* comparison in this study was aloe vera, and the expected outcome was the hypolipidemic effect of aloe vera. which then analyzed using the table for analyzed from tree discussion, results from studies so that know the similarities and differences of these journals (Table 2).

DISCUSSION

Hyperlipidemia is a lipid metabolism disorder characterized by increased levels of total cholesterol, LDL cholesterol, triglycerides, and/or

decreased levels of HDL cholesterol. Several risk factors for hyperlipidemia include obesity, diabetes, excessive alcohol consumption, kidney disorders, and drugs. Management of hyperlipidemia consists of non-pharmacological management and the use of lipid-lowering drugs. In addition to conventional therapy, there are also traditional treatments, one of which is by using aloe vera. Glucomannan is a polysaccharide contained in aloe vera. Glucomannan can lower cholesterol and blood sugar levels, lose weight, and affect intestinal activity and immune system function. [9]

Research conducted by Devi (2017) on the Hypolipidemic effect of ethanolic extract of aloe vera (aloe vera l) on hypercholesterolemic male white rats, the results showed that the results of the Shapiro-Wilk test and Lavene test showed that all data groups were normal and homogeneous. Paired T-Test results obtained p-value = 0.000

for both triglycerides, LDL cholesterol, and total cholesterol. Furthermore, the One Way ANOVA parametric test results $p < 0.05$ for the three lipid profiles. LSD test on triglyceride levels in the aqua dest group with 70% ethanol extract of Aloe vera L doses of 0.3g/200g BW/day, 0.6g / 200g BW/day, and 1.2g/200gBW/day, respectively, $= 0.012$, $p = 0.000$ and $p = 0.000$. LSD test on LDL cholesterol and total cholesterol in the distilled water group with 70% ethanol extract of Aloe vera L only at a dose of 1.2g /200gBW/day which was significantly different with $p = 0.006$ and $p = 0.001$. Ethanol extract of Aloe vera L dose of 1.2g/200gBW/day can reduce lipid profiles in the form of triglyceride levels, LDL cholesterol, and total cholesterol from hypercholesterolemic male white rats. [9]

Research conducted by Prabha Verma (2016) Regarding Hypolipidemic Activity of Aloe Vera in Hyperlipidemic Rats. Research results Aloe vera extract treatment with a dose of 500mg/kg BW, caused a decrease in the levels of TC, PL, and TG respectively by 28, 25, and 26%, along with reactivation of PHLA by 22%. Treatment with aloe vera extract for 15 days reversed plasma levels of TC, PL, and TG by 25, 21, and 31%, respectively, along with reactivation of PHLA by 21%. The hypolipidemic action of aloe vera at a dose of 500 mg/kg BW is

comparable to that of guggulipid at a dose of 200 mg/kg BW. [10]

Research conducted by Image (2016) Regarding the Evaluation of The Effects of Aloe Vera Gel Therapy on Alloxan-Induced Diabetes Rats. The results of the lipid profile study showed an increase in the levels of total cholesterol (TC), triglycerides (TG), and low-density lipoprotein (LDL) in the diabetes group that was not treated compared to the normal control group and the group that was treated with Aloe Vera. The AV group showed a decrease in the lipid profile and an increase in HDL levels. [11]

Research conducted by Louay (2019) Regarding the Hypoglycemic and Hypolipidemic Effects of Aloe Vera on Patients with Type 2 Diabetes. Results There was a significant decrease ($p < 0.05$) in the HbA1c values in groups I and II. The reduction was 11.1% and 25% in groups I and II respectively and the decrease was not significant ($p < 0.05$) between the subjects of group III. There was a significant decrease ($p \leq 0.05$) in total cholesterol 6.5% and 7.11%, triglycerides 10.4% and 12.6%, Low-Density Lipoprotein (LDL-C) 7.5% and 11.9%, and a significant increase in High-Density Lipoprotein (HDL-C) 8% and 25% was observed in the subjects of groups I and II, respectively. The ratio of LDL-C to HDLC decreased from 3.71 to 3.2

and 3.9-2.7 in group I and II subjects after the study, respectively. [12]

Research conducted by Autumn (2017) regarding the Hypolipidemic Effects of Aloe Vera Gel Extract on Adult Male Rats Given a High-Fat Diet. The results showed that a high-fat diet significantly increased serum cholesterol, triglycerides, LDL ($p < 0.001$), and weight gain ($p < 0.01$) but did not significantly affect serum HDL levels. However, in the group receiving Aloe-vera gel and a high-fat diet, there was a significant reduction in body weight and serum cholesterol, triglycerides ($p < 0.05$), and LDL ($p < 0.01$) levels. [13]

Research conducted by Ramesh (2016) regarding the Comparative Evaluation of Anti-Obesity Effects of Aloe Vera and Gymnema Sylvester Supplementation in Rats Given a C57BL/6J High-Fat Diet. The results of the study at the end of the experimental period, oral administration of both herbs showed a significant reduction ($P < 0.05$ and $P < 0.001$) in plasma glucose and lipid levels in HFD-fed mice. [14]

Research conducted by Rahoui (2018) Regarding the Beneficial Effects of Aloe Vera Gel on Lipid Profile, Lipase Activity and Oxidant/Antioxidant Status in Obese Rats. The results showed that plasma glucose, cholesterol, and triglyceride levels were significantly higher in obese rats compared to control rats. AVG treatment

had no effect in the control group. In obese rats treated with AVG, there was a significant reduction in glucose, triglyceride, and cholesterol levels in obese rats given AVG 100 mg/kg/day. AVG at a concentration of 200 mg/kg/day restored LDL- and HDL-C levels in obese rats to be similar to those in the control group. [15]

Research conducted by Mandep (2018) Regarding Diabetes Improvement with aloe vera in rats Induced Diabetic Nephropathy: Implications of Oxidative Stress and Hyperlipidemia. The results showed that treatment with Aloe vera (300 mg/kg/day orally) prevented the development of diabetic nephropathy by lowering the lipid profile, reducing renal oxidative stress, and providing direct renoprotective action. [16]

CONCLUSION

By the background of the problem and the purpose of the literature review from several journals, it can be concluded that there is a significant relationship between aloe vera and hyperlipidemia, wherefrom several studies that have been previously described the hypolipidemic effect of aloe vera (*Aloe Vera L.*).

CONFLICT OF INTEREST

The author declares that there is no conflict of interest in this study.

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