The Influence of Aloe Vera Juice on Lipid Profile at Prediabetes Patient in East Pontianak Primary Health Care Center, Indonesia

Muhammad Faisal¹, Rahayu Indriasari², Meta Mahendradatta³, Rukman Abdullah⁴, Masrianih⁵, Bohari*⁶

¹Department of Pharmacy, Mulawarman University, Samarinda City, Indonesia
²Department of Nutrition Science, Faculty of Public Health, Hasanuddin University, Makassar City, Indonesia
³Department of Food Technology, Faculty of Agriculture, Hasanuddin University, Makassar City, Indonesia
⁴Sultan Ageng Tirtayasa University, Serang City, Indonesia
⁵Department of Biology Education, Faculty of Teacher Training and Education, Tadulako University, Palu City, Indonesia
⁶Department of Nutrition, Faculty of Public Health, Tadulako University, Palu City, Indonesia

Article History:
Received on: 10 Feb 2020
Revised on: 19 Mar 2020
Accepted on: 20 Apr 2020

Keywords:
Aloe Vera,
Lipid Profile,
Prediabetes

ABSTRACT

Aloe vera is a medicinal plant in Indonesia, which is often used as traditional medicine. The purpose of this study was to find out the influence of Aloe vera juice administration on changes in lipid profile (HDL, LDL, Triglycerides) in East Pontianak Primary Health Care Center. This study used quasi-experimental. This study used purposive sampling on 36 people in 2 groups. In the treatment group, there was Aloe vera juice administration of 250 ml/day for 15 days while in the control group there was no Aloe vera juice administration. HDL level in the intervention group had an increase of 14.89 mg/dl whereas in the control group had an increase of 1.22 mg/dl, where there was no significant difference between the intervention group and control group (p> 0.05), LDL level in the intervention group had a decrease of 10.56 mg/dl while the control group had a decrease of 5.94 mg/dl where there was no significant difference between the intervention group and the control group (p> 0.05) and triglyceride level in the intervention group had a decrease of 8.78 mg/dl whereas in the control group had a decrease of 3.50 mg/dl where there was no significant difference between the intervention group and the control group (p> 0.05) which means intervention group and control group had no significant differences. The mean HDL level had an increase while the LDL level and triglyceride level had a decrease.

INTRODUCTION

Non-communicable diseases (NCD) continue to increase. In 2008, around 58% of deaths worldwide were caused by NCDs. For 15-69 years old, the NCDs that most contribute to death are cardiovascular disease and diabetes, then cancer and other chronic respiratory diseases (Alwan et al., 2010). The results of the report on 23 Primary Health Care Centers in Pontianak City showed that there were 415 cases of Diabetes Mellitus in Pontianak City in
In West Kalimantan, specifically, Pontianak City occupied the highest number of diabetics nationwide as many as 11,226 people in 2012. The high number of diabetics in Pontianak City was accompanied by the number of sufferers with wound complications. In the same year, specifically at the Kitamura Clinic, it was estimated that more than 800 people had diabetes and more than 470 had complications from diabetic sores.

Prediabetes is a condition that precedes DM. The prevalence of prediabetes continues to increase (Tabák et al., 2012). Diabetes mellitus is closely related to lipid profiles (Bhowmik et al., 2018). Lipid profile is influenced by several factors such as high cholesterol intake, low fiber intake, obesity, exercise habits, smoking habits, men, menopausal women, and the presence of comorbidities such as diabetes mellitus (Mahan and Stump, 2000). In addition to drugs, increasing HDL and lowering LDL can be performed by changing healthy lifestyles and diets. Diet is an effective way to reduce LDL and increase HDL. One of the foods that can reduce LDL and increase HDL is Aloe vera (Choudhary et al., 2014). Aloe vera is a medicinal plant in Indonesia which is often used as traditional medicine.

An experiment in mice showed that Aloe vera juice reduced LDL levels by 11.85% (2 ml/day) and increased HDL levels by 32.95% (2 ml/day) (Hermawan, 2006). The 200 g of Aloe vera juice administration on employees over the age of 40 who did not suffer from DM in the Central Java Cooperative and MSME Office showed a significant decrease in LDL levels and increase in HDL levels (p <0.05). LDL level decreased by 20.36% and HDL level increased by 18.87% after Aloe vera juice administration for 14 days. The administration of Aloe vera juice in the Wistar rat group caused a significant decrease in triglyceride levels (p = 0.000) at all doses compared to the control group (McRae, 2017). The purpose of this study was to find out the influence of Aloe vera juice administration on changes in lipid profile (HDL, LDL, Triglycerides) in prediabetes sufferers.

MATERIALS AND METHODS

Research Design and Variables

The research design used in this study was quasi-experimental with a non-randomized pre-test-post-test with control group design. This study used 2 intervention study groups namely group I (Aloe vera administration) and group II (without Aloe vera administration). This study was conducted in the East Pontianak Primary Health Care Center, West Kalimantan working area. The location was chosen because based on the results of observations, Aloe vera plants began to be used by the industry.

Population and Sample

The population of this study was all people in the East Pontianak Primary Health Care Center, West Kalimantan working area. The sample of this study was all people in the East Pontianak Primary Health Care Center, West Kalimantan working area that met the inclusion and exclusion criteria. This study used purposive sampling on 36 people in 2 groups.

Data collection

Primary data were collected directly from the laboratory in the form of a measured lipid profile and a completed checklist sheet. Secondary data were collected from families and from other reference sources that support the study.

Data Analysis

The data were analyzed univariately on each variable to see a general description of distribution and frequency. The bivariate test was conducted by comparing blood pressure results before and after the intervention by using Paired T-Test and Independent T-Test to test the treatment between those groups. Data that were collected, then presented in the form of tables accompanied by narration.

RESULTS AND DISCUSSION

Characteristics of Respondents

The results of the univariate analysis described the distribution of respondents based on the demographic characteristics of respondents (age, gender, education, job, and BMI category). The highest number of respondents was in the 30-39 years old age group of 18 respondents (50.0%), male of 12 respondents (33.3%), education level of senior high school/vocational high school (44.4%), housewife of 16 respondents (44.4%), and the BMI was in overweight category of 15 respondents (41.7%) (Table 1).

Lipid Profile of Respondents

In the intervention group, the mean of HDL level before the intervention was 59.72 and the mean of HDL level after the intervention was 11.82 (p-value = 0.170) and in the control group, the mean of HDL level before the intervention was 58.94 and the mean of HDL level after the intervention was 60.17 (p-value = 0.769). The results of statistical tests showed that there was no significant difference in HDL levels before and after the intervention because of p values > 0.05 (Table 2). In the intervention group, the mean of LDL levels before Aloe...
### Table 1: Distribution of Respondents based on Characteristics di East Pontianak Primary Health Care Center West Kalimantan

| Characteristics of Respondents | Group | Total |
|-------------------------------|-------|-------|
|                               | Intervention | Control |       |
|                               | n     | %     | n     | %     | n     | %     |
| Age Group                     |       |       |       |       |       |       |
| 30-39 years old               | 9     | 50.0  | 9     | 50.0  | 18    | 50.0  |
| 40-49 years old               | 8     | 44.4  | 7     | 38.9  | 15    | 41.7  |
| 50-59 years old               | 1     | 5.6   | 2     | 11.1  | 3     | 8.3   |
| Gender                        |       |       |       |       |       |       |
| Male                          | 6     | 33.3  | 6     | 33.3  | 12    | 33.3  |
| Female                        | 12    | 66.7  | 12    | 66.7  | 24    | 66.7  |
| Education Level               |       |       |       |       |       |       |
| Junior High School            | 6     | 33.3  | 0     | 0.0   | 6     | 16.7  |
| Senior High School            | 4     | 22.2  | 12    | 66.7  | 16    | 44.4  |
| University                    | 8     | 44.5  | 6     | 33.3  | 14    | 38.9  |
| Job                           |       |       |       |       |       |       |
| Housewife                     | 7     | 38.9  | 9     | 50.0  | 16    | 44.4  |
| Civil Servant                 | 8     | 44.4  | 6     | 33.3  | 14    | 38.9  |
| Private Employees             | 1     | 5.6   | 1     | 5.6   | 2     | 5.6   |
| Soldier                       | 2     | 11.1  | 2     | 11.1  | 4     | 11.1  |
| Nutritional Status (BMI)      |       |       |       |       |       |       |
| Normal(18.5 to<23)            | 5     | 27.8  | 2     | 11.1  | 7     | 19.4  |
| Overweight (23 to<25)         | 7     | 38.9  | 8     | 44.4  | 15    | 41.7  |
| Obese I (25 s/d <30)          | 5     | 27.8  | 5     | 27.8  | 10    | 27.8  |
| Obese II (≥30)                | 1     | 5.6   | 3     | 16.7  | 4     | 11.1  |

### Table 2: Changes of Mean Lipid Profile Level before and intervention of Aloe vera juice

| Lipid Profile | Intervention | Control |
|---------------|--------------|---------|
|               | Pre          | Pos     | Pre    | Pos     | Pre    | Pos     |
| HDL           | 59.72 ± 11.82| 74.61 ± 41.11| 58.94 ± 15.61| 60.17 ± 7.43|
|               | 14.89        | 0.170   | 1.22   | 0.769   |
| LDL           | 118.78 ± 34.72| 108.22 ± 30.36| 116.39 ± 35.87| 110.44 ± 25.47|
|               | 10.56        | 0.049   | -5.94  | 0.586   |
| Triglyceride  | 151.83 ± 52.71| 143.06 ± 39.18| 153.78 ± 48.54| 150.28 ± 41.96|
|               | -8.78        | 0.726   | -3.50  | 0.572   |
Water-soluble fiber reduces blood cholesterol levels. In this case, fiber reduces blood cholesterol levels. It stimulates bowel movements, fat metabolism (cholesterol and triglycerides), and regulates blood sugar levels.

Fiber is needed to maintain the normal functioning of the digestive tract. Fiber is also needed to facilitate bowel movements, fat metabolism (cholesterol and triglycerides), and regulate blood sugar levels. In this case, fiber reduces blood cholesterol levels. Water-soluble fiber reduces blood cholesterol levels by 5% or more. Fiber can be found in fruits, vegetables, seeds (whole grains), and nuts. Pectin (water-soluble fiber from fruit) can reduce LDL cholesterol levels (Narayan et al., 2014).

Foods with high crude fiber content can reduce weight. Dietary fiber will stay in the digestive tract in a relatively short time so that the absorption of food substances is reduced. Foods with relatively high crude fiber content usually contain low calories, low sugar levels and low fat which can reduce weight, reduce the occurrence of obesity and heart disease (McRae, 2017). Aloe vera gel extract resulted in a significant decrease in serum glucose, total cholesterol, and triglycerides (p <0.05) in the treatment group of diabetes compared to the control group of diabetes (Alinejad-Mofrad et al., 2015; Elnasri and Ahmed, 2008). In addition, treatment with Aloe vera gel extract can improve oxidative stress as evidenced by a significant decrease in serum MDA levels and a significant increase in serum nitric oxide and total antioxidant capacity in the treatment group of diabetes as compared to the control group of diabetes (Sumi et al., 2019).

Changes of HDL levels occurred after Aloe vera juice administration for 14 days in both groups. In the treatment group, there was a higher increase of 4.35 mg/dl (9.56%) than the control group of 2.15 mg/dl (4.39%) although there was a significant increase between initial HDL and HDL after Aloe vera juice administration in the treatment group while in the control group, there was a significant increase (Rianita et al., 2008). An increase in HDL levels is caused by Aloe vera which contains active ingredients that can affect HDL levels namely niacin (vitamin B3), magnesium, and vitamin C. The magnesium content in Aloe vera can increase the production of Apolipoprotein A-IV and Apolipoprotein E so that it can increase HDL level.

Aloe vera can reduce LDL levels because they contain various active ingredients such as niacin (Vitamin B3) which can reduce VLDL cholesterol production so that LDL levels also decrease. A decrease in HDL, LDL and triglyceride levels were caused by all respondents in the treatment group consumed Aloe vera juice for 15 consecutive days. Aloe vera which contains glucomannan active substances can improve the lipid profile because glucomannan is able to combine (assimilate) with cholesterol in the bile so that bile salts and glucomannan will be excreted with feces.

This study showed that the mean intake before and after the intervention was 108.22 (p-value = 0.049) while in the control group, the mean of HDL levels before the intervention was 116.39 and the mean of HDL level after the intervention was 110.44 (p-value = 0.586). The results of statistical tests showed that there was a significant difference in the intervention group where there was a decrease in the mean of LDL levels after the intervention. In the intervention group, the mean of triglyceride levels before the intervention was 151.83 and after the intervention was 143.06 (p-value = 0.726) and in the control group, the mean of triglyceride levels before the intervention was 153.78 and after the intervention was 150.28 (p-value = 0.572). The results of statistical tests showed that there was no significant difference between before and after the intervention in both groups due to p-value <0.05 (Table 2).

The results of the study showed that the mean respondent had a BMI in the overweight category (41.7%) and obese (27.8%) with adequate and excessive intake. Risk factors for prediabetes sufferers are a family history of diabetes mellitus, a history of cardiovascular disease, overweight or obesity (Smith and Lall, 2008). Waist size, lack of physical activity, smoking, high blood pressure, increased triglycerides, HDL, and LDL levels. A mother who has a history of obesity has a risk of 3.56 times to suffer from diabetes mellitus compared to a mother who has no history of obesity (Hosler et al., 2011).

This study showed that after the intervention with 250 ml of Aloe vera juice, the mean changes of HDL levels in the intervention group showed insignificant increase from 59.72 to 74.61 (p > 0.05). The mean changes of LDL levels in the intervention group showed a significant decrease from 118.78 to 108.22 (p <0.05) which means there was a difference between before and after the intervention. The mean changes of triglyceride levels in the intervention group showed insignificant decrease from 151.83 to 143.06 (p > 0.05) which means there was no difference between before and after the intervention.

Another study showed that Aloe vera juice administration in mothers without diabetes mellitus caused a decrease in LDL levels and significantly increased HDL levels (P <0.05) (Hermawan, 2006). The body needs fiber to maintain the normal functioning of the digestive tract. Fiber is also needed to facilitate bowel movements, fat metabolism (cholesterol and triglycerides), and regulate blood sugar levels. In this case, fiber reduces blood cholesterol levels. Water-soluble fiber reduces blood cholesterol levels.
shows that the intake before and after the intervention had no differences, so it can be concluded that Aloe vera juice can decrease HDL, LDL and triglyceride levels.

CONCLUSIONS

The mean HDL level had an increase while the LDL level and triglyceride level had a decrease. Aloe vera juice can be developed to prevent increased cholesterol levels in prediabetes.

ACKNOWLEDGEMENTS

The authors thank East Pontianak Primary Health Center for allowing this study to be carried out. In addition, the authors thank the supervisor and colleagues who helped the authors to collect respondents, for all respondents who participated in this study and all those who helped until the study was completed.

Conflict of Interest

None.

Funding Support

None.

REFERENCES

Alinejad-Mofrad, S., Foadoddini, M., Saadatjoo, S. A., Shayesteh, M. 2015. Improvement of glucose and lipid profile status with Aloe vera in pre-diabetic subjects: a randomized controlled-trial. Journal of Diabetes & Metabolic Disorders, 14(1).

Alwan, A., MacLean, D. R., Riley, L. M., d’Espaignet, E. T., Mathers, C. D., Stevens, G. A., Betcher, D. 2010. Monitoring and surveillance of chronic non-communicable diseases: progress and capacity in high-burden countries. The Lancet, 376(9755):1861–1868.

Bhowmik, B., Siddiquee, T., Mujumder, A., Afsana, F., Ahmed, T., Mdala, I., Omsland, T. 2018. Serum Lipid Profile and Its Association with Diabetes and Prediabetes in a Rural Bangladeshi Population. International Journal of Environmental Research and Public Health, 15(9).

Choudhary, M., Kochhar, A., Sangha, J. 2014. Hypoglycemic and hypolipidemic effect of Aloe vera L. in non-insulin dependent diabetics. Journal of Food Science and Technology, 51(1):90–96.

Elnasri, H. A., Ahmed, A. M. 2008. Patterns of lipid changes among type 2 diabetes patients in Sudan. Eastern Mediterranean Health Journal, 14:314–324.

Hermawan, E. 2006. The Effect of Orally Administered Aloe vera Linn. Juice on HDL Cholesterol and LDL Cholesterol Serum Level in Hiperlipidemic Wistar Rats. Universitas Diponegoro.

Hosler, A. S., Nayak, S. G., Radigan, A. M. 2011. Stressful events, smoking exposure and other maternal risk factors associated with gestational diabetes mellitus.

Mahan, L. K., Stump, S. E. 2000. Krause’s food, nutrition, and diet therapy.

McRae, M. P. 2017. Dietary Fiber Is Beneficial for the Prevention of Cardiovascular Disease: An Umbrella Review of Meta-analyses. Journal of Chiropractic Medicine, 16(4):289–299.

Narayan, S., Lakshmipriya, N., Vaidya, R., Bai, M. R., Sudha, V., Krishnaswamy, K., Mohan, V. 2014. Association of dietary fiber intake with serum total cholesterol and low density lipoprotein cholesterol levels in Urban Asian-Indian adults with type 2 diabetes. Indian Journal of Endocrinology and Metabolism, 18(5):624–630.

Rianita, R., Bardosono, S., Victor, A. A. 2008. Relationship between plasma lipid profile and the severity of diabetic retinopathy in type 2 diabetes patients. Medical Journal of Indonesia, 17:221–221.

Smith, S., Lall, A. 2008. A Study on Lipid Profile Levels of Diabetics and Non-Diabetics Among Naini Region of Allahabad. India. TürkBiyokimyaDergisi / Turkish Journal of Biochemistry, 33:138–141.

Sumi, F. A., Sikder, B., Rahman, M. M., Lubna, S. R., Ulla, A., Hossain, M. H., Jahan, I. A., Alam, M. A., Subhan, N. 2019. Phenolic Content Analysis of Aloe vera Gel and Evaluation of the Effect of Aloe Gel Supplementation on Oxidative Stress and Fibrosis in Isoprenaline-Administered Cardiac Damage in Rats. Preventive Nutrition and Food Science, 24(3):254–264.

Tabák, A. G., Herder, C., Rathmann, W., Brunner, E. J., Kivimäki, M. 2012. Prediabetes: a high-risk state for diabetes development. The Lancet, 379(9833):2279–2290.