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

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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

2011. In West Kalimantan, specifically, Pontianak City occupied the highest number of diabetes sufferers nationwide as many as 11,226 people in 2012. The high number of diabetes sufferers 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 caused 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, eduaction, job, and BMI category). The highest number of respondents was in 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 Respodents based on Characteristics di East Pontianak Primary Health Care Center West Kalimantan**

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

**Table 2: Changes of MeanLipid Profile Level before and intervention of Aloe vera juice**

| Lipid Profile | | Intervention | Control |
|---|---|---|---|
| HDL | Pre | $59.72 \pm 11.82$ | $58.94 \pm 15.61$ |
| | Pos | $74.61 \pm 41.11$ | $60.17 \pm 7.43$ |
| | $\Delta$ mean | 14.89 | 1.22 |
| | P Value | 0.170 | 0.769 |
| LDL | Pre | $118.78 \pm 34.72$ | $116.39 \pm 35.87$ |
| | Pos | $108.22 \pm 30.36$ | $110.44 \pm 25.47$ |
| | $\Delta$ mean | 10.56 | -5.94 |
| | P Value | 0.049 | 0.586 |
| Triglyceride | Pre | $151.83 \pm 52.71$ | $153.78 \pm 48.54$ |
| | Pos | $143.06 \pm 39.18$ | $150.28 \pm 41.96$ |
| | $\Delta$ mean | -8.78 | -3.50 |
| | P Value | 0.726 | 0.572 |

vera juice administration was 118.78 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 I (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 obese (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 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 statistically insignificant or in other words, there was no significant difference between before and after the intervention. This

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

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