

# The Effect of Soybean Power on Blood Sugar and Cholesterol Levels in Type 2 Diabetes Mellitus Patients in the Work Area of the Puskesmas Andalas Padang

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## ABSTRACT

Type II One of chronic disease that we call it diabetes mellitus or DM, that caused when the body cannot produce enough insulin or uses of insulin cannot effectively. Death does not occur as a direct result of DM, but from its complications. Continuous high blood sugar levels will damage body tissues and cause complications. Data from the Padang City Health Office 2016 revealed that the number of people with Type II DM was in the 5th position as many as 846 people. With the largest number of 680 people in the Andalas Health Center Work Area. Soybean (Glycine soja) has benefits as anticarcinogenic, antioxidant, antidiabetic and antilipidemic. As an anticholesterol soy contains isoflavones which have an effect as hypocholesterolemia, increase insulin sensitivity, improve insulin secretion. The objectives of the research were to : Study the effect of giving soybean powder on glucose and cholesterol levels. Method for this research by quasi experimental with post test control group design. Has been carried out for December 2018 in the Andalas Padang Health Center Work Area. The population is patients with type 2 diabetes mellitus. The number of samples needed in this study amounted to 16 people. The sampling technique was purposive sampling. There was no difference in mean glucose levels between the treatment group and the control group after administration of soy powder with p value = 0.676. It's means that was a difference in mean cholesterol between the treatment group and the control group after intervention with p = 0.02. It can be concluded that the administration of soybean powder has an effect on blood cholesterol levels and has no effect on blood glucose levels. It is recommended that soybean powder be given for a longer time.

**Keywords:** soybeans, glucose levels and blood cholesterol levels

## 1. INTRODUCTION

Diabetes mellitus is a blood condition with high and chronic blood sugar conditions, causing its main symptoms through large amounts of sweet urine. (Bilous and Donnelly, 2010). In the Diabetes Atlas 7th Edition in 2015 issued by the International Diabetes Federation (IDF), the number of people with Type II DM worldwide is 415 million people and it is predicted that by 2040 the prevalence of diabetes mellitus will be 642 million people<sup>[1]</sup>.

Death does not occur due to DM directly, but from complications that occur. For blood sugar with high levels continuous will damage body tissues and cause various complications such as diabetic retinopathy, heart disease, diabetic neuropathy, ,

and diabetic nephropathy. Diabetic nephropathy is a major cause of end-stage renal disease and accounts for 30-40% of all diabetes cases<sup>[2]</sup>.

Various strategies were carried out to reduce the occurrence of complications in DM such as giving DM drugs and hypertension drugs<sup>[3]</sup>. In addition to being expensive, these drugs also have side effects on the liver and kidneys so it is necessary to look for alternatives from nature that contain ingredients such as anti-DM and hypertension drugs. The use of medicinal plants and natural ingredients has become an alternative in overcoming diabetes and diabetic nephropathy<sup>[4]</sup>. One of the natural ingredients that can be used as an alternative is soybean. In addition to having antidiabetic activity, soybeans are also a source of

nutrition for humans. Many Asian people use it as a food ingredient<sup>[5]</sup>.

Soybean (*Glycine soja*) is one of the functional foods that have benefits for the body that have benefits as anticarcinogenic, antioxidant, antidiabetic and antilipidemic. As an anticholesterol soy contains isoflavones which have an effect as hypocholesterolemia, increase insulin sensitivity, improve insulin secretion<sup>[6]</sup>. Consumption of soy protein can reduce the risk of cardiovascular disease and kidney disease in DM patients with nephropathy<sup>[7]</sup>. In Asian countries, soybeans have been consumed for a long time as a source of protein. Soybean in powder form is the most widely used form of soybean because it is easy to process, more durable, easy to modify and its nutritional content can still be maintained<sup>[8]</sup>.

In Indonesia, Type II diabetes mellitus is ranked 5th out of total deaths from non-communicable diseases (WHO, 2016). The proportion of the population aged 15 years with impaired glucose tolerance (TGT) reaches 29.9%. This means that more and more people are at high risk of suffering from Type II DM.

In West Sumatra Type II DM is the second leading cause of death after stroke (BPS SUMBAR 2012). In 2015 type II DM became the first cause of death in West Sumatra (BPS SUMBAR 2015). In the city of Padang in 2015, Type II DM was the third most common disease referred from PPK I (Level I Health Service Providers) namely puskesmas to PPK II (Level II Health Service Providers), namely Regional General Hospitals (RSUD) with a total of 4,084 people. In 2015, Type II DM was in the second most common cause of death in the city of Padang with 79 cases (17.4%)

Data from the Padang City Health Office 2016 shows that the number of people with Type II DM is in the 5th place, namely as many as 846 people with Type II DM with the largest number of 680 people with Type II DM being in the work area of the Andalas Public Health Center. (Data Medical Record of Andalas Padang Health Center, 2017). Based on the above background, the research.

problem is how the effect of giving soybean powder on blood glucose and cholesterol levels in patients with type 2 diabetes mellitus. Andalas Health Center in 2017.

**2. MATERIALS AND METHODS**

This research use experimental type, with post test control group design, has been carried out for 1 month from December 4 to December 26 2018 in the work area of the Andalas Padang Health Center. The population is type 2 diabetes mellitus patients who meet the inclusion criteria: Blood glucose levels when >200 mg/dL, routine monthly treatment at the puskesmas and the exclusion criteria are DM patients who suffer from severe illness. The number of samples needed in this study amounted to 16 people (treatment group 8 people and 8 people more in the control group). The sampling technique was purposive sampling.

The research instrument used glukocheck, gluco test strips, 5cc syringe, soybean powder (*Glycine Max*), and a sheet recording the results of measuring glucose levels and blood cholesterol. Research data collection was carried out by measuring blood glucose levels and blood cholesterol levels after administration of soybean powder (5 mg soybean powder with 200 warm water) for 14 consecutive days given every 07.00 am.

**3. RESULTS**

**Table 1.** Average levels of blood glucose levels

Descriptives				
	Group			Statistic
Glukosa	Treatment	Mean		182,875
		95%	Lower Bound	139,3687652
			Upper Bound	226,3612348
Control	Control	Mean		193,375
		95%	Lower Bound	154,6852341
			Upper Bound	232,0647659

**Table 2:** Test Results of Differences in Average Glucose Levels

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Glukosa	Between Groups	12155,062	1	441.000	0,182	.676
	Within Groups	33948,750	14	2424,911		
	Total	34389,750	15			

**Table 3:** Average levels of cholesterol levels

Descriptives				
	Group			Statistic
Cholesterol	Treatment	Mean		189,375
		95%	Low Bound	168,9605424
			Up Bound	209,7894576
Control	Control	Mean		244,5
		95%	Low Bound	198,9957919
			Up Bound	290,0042081

**Table 4:** Test Results of Differences in Average Cholesterol

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Cholesterol	Between Groups	12155.062	1	12155.062	6.831	.020
	Within Groups	24911.875	14	1779.420		
	Total	37066.938	15			

**4. DISCUSSION**

a. Effect of soy powder on blood glucose levels. From the results of statistical tests with Anova, it was found that there was no effect of giving soybean powder on blood glucose levels with  $p = 0.676$  ( $p > 0.05$ ). This is not consistent with research conducted by regarding. Functions of soy isoflavones genistein of anti-diabetic: mechanisms underlying effects on pancreatic -cell function that administration of soy containing genistein 54 mg/day can lower blood glucose levels. and improve glucose tolerance and insulin sensitivity. Rate of blood slur in Insulin sensitivity and blood lipid parameters will increasing after Daily intake of isoflavones (100 mg aglycone) for one year, reducing the risk of cardiovascular disease. To reduce fasting insulin, insulin resistance, glycated hemoglobin (A1C) and LDL cholesterol we need Supplementation of 12 weeks of soy (30 g isolated soy protein). Because in this study the soybean powder was only given for 14 days, so it could not reduce central insulin, and insulin resistance<sup>[5]</sup>.

Soybeans are low in carbohydrates and low in the glycemic index, which is a measure of how food affects the rise in blood sugar after eating, so it is good for people with diabetes to consume. The total dietary fiber content in 100 g of soybean is 75.0 g of soy fiber, this indicates that soy fiber can improve blood glucose levels in subjects with type 2 diabetes, especially at 180 and 240 minutes after consumption. If a person consumes a lot of foods that contain lots of dietary fiber, then that person will feel full faster. This secretion stimulates the excretion of more saliva and gastric juices, causing a full stomach. Therefore, it is expected that soybean powder can be one of the non-pharmacological drug options for

DM patients. Soybeans contain quite a lot of fiber, both soluble fiber and insoluble fiber. Large amounts of fiber will reduce the rate of carbohydrate absorption and reduce serum lipid levels, so that it can suppress the increase in blood sugar levels after eating. The fiber contained in soybeans has been shown to improve glucose tolerance and insulin response in diabetics<sup>[9]</sup>.

From this description, the researcher assumes that there is no effect of giving soybean powder on blood glucose levels in patients with type II diabetes mellitus because isoflavones, lecithin, fiber, protein, vitamins and minerals contained in soybeans as non-pharmacological treatment of type II diabetes mellitus cannot function. The maximum is probably due to the duration of administration which is only 14 days.

b. Effect of soy powder on blood cholesterol levels. There is an effect of soybean powder on blood cholesterol levels with a value of  $p = 0.02$  ( $p < 0.05$ ). At various ages with varying levels of cholesterol or blood pressure, the risk of cardiovascular disease can occur three to five times higher in diabetic patients compared to non-diabetic patients. Abnormalities of fat in the blood usually often occur in patients with diabetes mellitus, even though the patient has carried out regular glycemic control. The hallmark of dyslipidemia is an increase in total cholesterol levels.

Dyslipidemia in diabetic patients is often accompanied by other biochemical and metabolic abnormalities that are indicative of insulin resistance, chronic low-grade inflammation and prothrombotic status<sup>[10]</sup>. This abnormality will substantially increase the risk of cardiovascular disease. Insulin resistance results in changes in the production and disposal of lipoproteins. In fat tissue there is a decrease in the effect of insulin so that lipogenesis is reduced and lipolysis is increased<sup>[11]</sup>. This triggers the occurrence of glucotoxicity accompanied by lipotoxicity which causes an increase in LDL cholesterol levels.

According to Priastiti's 2013 study entitled Comparison of LDL cholesterol levels in dyslipidemic patients on the administration of yellow soybean tempeh and black soybean tempeh, it was found that consumption of yellow and black soybeans could reduce cholesterol levels in postmenopausal patients at the Ka District Health Center. Cirebon. Isoflavones contained in soybeans are plant sterols which when consumed can inhibit the absorption of cholesterol, either from food or produced by the liver. Isoflavones in soybeans can react if they bind to protein. The role of soy protein in lowering blood cholesterol levels through an increase in sterols in feces and bile acids so that blood cholesterol levels can decrease<sup>[12]</sup>

Soybeans also contain polyunsaturated fatty acids that can cause total cholesterol levels in the blood to be reduced because they are rapidly metabolized by the liver and there is an increase in excretion and

stimulation of cholesterol oxidation in bile salts. Another content that can lower cholesterol levels is fiber. The presence of soluble and insoluble fiber can inhibit the absorption of cholesterol from food in the lumen of the small intestine. This leads to reduced levels of cholesterol in the blood.

## 5. CONCLUSION

### Conclusion

There is no effect of blood glucose levels after administration of soy powder and there is an effect of cholesterol levels after administration of soy powder

### Suggestion

a. It can be used as a reference for puskesmas officers in providing counseling to people with diabetes mellitus to be able to consume soybean powder as a prevention of further complications of diabetes mellitus.

b. It can be used as a reference to conduct further research with different designs, other variables and longer time of administration of soy powder.

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