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Extract Ethanol of Poguntano as Anti Diabetic in Alloxan induced Diabetic Rats

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Abstract : Background. Diabetes mellitus is a group of metabolic disease with high blood glucose level above 150 mg/dl over a prolonged period, if left untreated can cause both micro and macro complications. The diabetes causes the increased of both morbidity and mortality rate, also the budget of health insurance. Poguntano (Picria fel-terrae Merr) from family Scrophulariaceae found in most part of Indonesia has been used as traditional plant and proved empirically for treatment of fever, malaria, cancer and anti diabetes.
Methods. This is an experimental study using five groups of rats, each group contained three rats. Twelve rats were induced with 150 mg/kg Alloxan given intraperitoneal. Three rats got normal saline injection. This five groups were divided as control normal, control diabetic , group treated with insulin, group treated with extract Poguntano 200 and 300 mg.
Results. Extract ethanol of Poguntano 200 mg and 300 mg showed significant results ($p<0.001$) in lowering blood glucose in Alloxan induced diabetic rats at four week after treatment compared to control diabetic group without treatment, but did not show superior to insulin group ($p=0.566$ and 0.303). Extract Poguntano 200 mg and 300 mg show similar effect in lowering blood glucose in diabetic rats.
Conclusions. In our study we have found that extract ethanol of Poguntano showed significant hypoglycemic activity in diabetic rats.
Keywords : diabetes, hyperglycemia, extract ethanol, Poguntano, anti diabetic.

Introduction

Diabetes Mellitus ia a chronic metabolic disorder with the increase in blood glucose resulting from defect in insulin secretion, or insulin resistance.[1,2,3,4] Diabetes affects systemically with hyperglycemia condition increasing free fatty acids and insulin resistance also.[5] As the disease progresses endothelial dysfunction, hemostasis disturbances and thrombosis may occur which increased the morbidity and mortality rate.[6] Currently 200 million people worldwide were affected with diabetes, and is estimated to reach 300 million by 2030.[7] According to the latest report of WHO, the type 2 diabetes prevalence were increased dramatically within the three decades, with approximately 1,5 million people were die each year or almost 5% of total deaths in the world are related with the complication of diabetes. [8,9]

The life expectancy of the diabetic patients were much lower than the normal people with the micro and macro vascular complications as nephropathy, retinopathy and neuropathy also cerebrovascular and cardiovascular incidences, both of these are major cause of death in diabetic patients.[1]

Hyperglycemia is an important factor in the development and progression of the complications of diabetes mellitus. Thus the mainstay treatments of diabetes are control diets, exercise and medicine.[10,11,12] Due to prolonged exposure to hyperglycemia together with other risk factors such as arterial hypertension, dyslipidemia as well as genetic susceptibility, macro- and microvascular diabetic complications developed. The alterations in vascular homeostasis due to endothelial and smooth muscle cell dysfunction are the main features of diabetic vasculopathy favouring a pro-inflammatory/thrombotic state which ultimately leads to atherothrombosis.[13]

In the present, Indonesia is a country rich of plenty medicinal plants.[14,15,16,17] According to World Health Organization (WHO), plant was the best source for medicine In the present, the world of plants is still become one of the sources of drugs, used in herbs form, extracts and the isolation of chemical components which efficacious in the pure compounds form.[18] Recently, some medicinal plants have been reported in diabetes treatment worldwide,[19,20] Jaya Kumari et al from India have reviewed traditional herbs and its biocompound in diabetes.[21] Poguntano (Picria fel-terrae Merr) from family Scrophulariaceae is one of the medicinal plants in North Sumatera used to treat degenerative and metabolic disease.[z] Antihyperglycemic effects of this plant has been proven empirically for more than 200 years. [19,20,21,22]

The aim of the study is to determine the anti hyperglycemia effect of extract ethanol of Poguntano in diabetic rats.

Methods

This is an experiment study using animal rats.

Preparation of Plants Extract

Identification of Picria fel-terrae Lour. leaves was performed in Bogoriense Herbarium, LIPI, Jakarta, Indonesia. Extraction was done using maceration technique with ethanol 96%.[23]

Animals and Treatment

In our experiment 15 healthy male rats weighing 150-250 g were divided into 5 groups and kept under standard conditions. A water and standard pellet diet were available throughout the experiment period. Four groups of rats were injected intraperitoneally with alloxan monohydrate (Sigma Chemical Company) at 1 dose 150 mg/kg,[24,25] where as the group control received a single intra peritoneal injection of the same volume of saline.

Three days after treatment all the rats with rise blood glucose above 150 mg/dl were define as diabetic rats and were grouped into four groups.

Group I normal control rats
Group 2 diabetic control rats
Group 3 diabetic rats received 1 unit of lantus Insulin
Group 4 diabetic rats received oral extraxt ethanol Poguntano 200 mg/kg
Group 5 diabetic rats received oral extraxt ethanol Poguntano 300 mg/kg

The blood glucose level were measured with the Glucometer before treatment, and 1,2,3,4 weeks (T0w, T1w, T2w, T3w,T4w) after treatment as mentioned above.

Statistical Analysis

The data were analyzed using Analysis of variance (ANOVA),SPSS (Statistical Product and Service Solutions) 17.0.

Results

Table1. Blood Glucose data of experimental rats.

Treatment Group	T0 (mg/dl)	T1w (mg/dl)	T2w (mg/dl)	T3w(mg/dl)	T4w (mg/dl)
Control	102	93	79	110	95
Diabetic Control	374	271	202	284	312
Insulin Group	583	430	481	168	197
Poguntano 200 mg	435	209	164	131	133
Poguntano 300 mg	516	424	239	234	143

Table 2. Analysis one way anova at week four after treatment

		n	Mean ± SD	p
Variabel	Control	3	95,00 ± 3,00	< 0,001
	Diabetic Control	3	312,67 ± 60,01	
	Insulin	3	107,67 ± 49,66	
	Poguntano 200 mg	3	127,33± 15,04	
	Poguntano 300 mg	3	143,67±44,07	

one way anova. *post-hoc* LSD: control vs control diabetes p<0,001; control vs insulin p=0,710; control vs poguntano 200 mg p=0,352; control vs poguntano 300 mg p=0,173; control diabetes vs insulin p<0,001; control diabetes vs poguntano 200 mg p<0,001; control diabetes vs poguntano 300 mg p<0,001; insulin vs poguntano 200 mg p=0,566; insulin vs poguntano 300 mg p=0,303; poguntano 200 mg vs poguntano 300 mg p=0,633

Extract ethanol of Poguntano 200 mg and 300 mg showed significant results (p<0.001) in lowering blood glucose in Alloxan induced diabetic rats at four week after treatment compared to control diabetic group without treatment, but did not show superior to insulin group (p=0.566 and 0.303). Extract Poguntano 200 mg and 300 mg show similar effect in lowering blood glucose in diabetic rats.

Discussion

This study showed the effect of lowering blood glucose in diabetic rats with extract ethanol Poguntano 200 mg and 300 mg, though it seems to be effective after week 2. This study proved the empirical work of Poguntano as anti diabetic and there is no difference in efficacy within 200 and 300 mg. This work has also been done by Urip et al, by using extract hexane of Poguntano in diabetic rats.[18]

Insulin as one of the standard medicine for lowering glucose level did not show superior than the extract Poguntano.

Conclusions

In our study we have found that extract ethanol of Poguntano either 200 or 300 mg showed significant hypoglycemic activity in diabetic rats.

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