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Original Research Article

THE INFLUENCE BOILING OF FRAGRANT PANDAN AND CINNAMON TO REDUCING BLOOD GLUCOSE LEVELS IN DIABETES MELLITUS

Roihatul Zahroh[1)*], Istiroha[2)], Suwanto[3)], Dewi Zulfiatu Rohmah[4)]
[1,3,4)]Nursing Science Study Program, Faculty of Health Sciences, Universitas Gresik
[2)]Nursing Profession Study Program, Faculty of Health Sciences, Universitas Gresik

*Corresponding Author, E-mail: roihatulzr@gmail.com

ABSTRACT

Introduction. Diabetes mellitus is a metabolic disease characterized by high levels of glucose in the blood, if not treated many body systems can be damaged, especially nerves and blood vessels. The purpose of this study was to explain the effect of pandan leaves and cinnamon decoction on random blood glucose reduction in patients with diabetes mellitus. **Method.**This research design uses Quasy-Experimental with a pre post test control group design approach. The study population was 35 respondents in Gurangwetan Hamlet. In the selection of samples using purposive sampling method which amounted to 32 respondents. The independent variable in this study is a decoction of fragrant pandanus and cinnamon, while the dependent variable is random blood glucose levels in patients with diabetes mellitus. Instruments used SOP fragrant pandanus and cinnamon decoction, observation sheet, Glucose meter (Esay touch). Data analysis using the Wilcoxon Signed Rank Test and Mann Whitney U-test. **Result & Analysis.** The results of the Wilcoxon Signed Rank Test statistical test of random blood glucose in the intervention group (p=0.001) means that there is an effect of fragrant pandanus and cinnamon decoction on reducing random blood glucose levels, in the control group (p=0.008) means that there is a difference in random blood glucose levels before and after intervention. **Discussion.** The results of the Mann Whitney U-test showed no difference in the intervention and control groups after being given the intervention to reduce random blood glucose levels (p=0.382). **Discussion.** The intervention of fragrant pandanus and cinnamon decoction has the same effectiveness as pharmacological drugs that can reduce random blood glucose levels, so this complementary therapy of fragrant pandanus and cinnamon decoction can be used as a companion therapy for people with diabetes mellitus.

Keywords: Cinnamon, Diabetes mellitus, Fragrant pandan, Random blood glucose

INTRODUCTION

Diabetes Mellitus (DM) has become a health problem in the world. The incidence and prevalence of this disease continues to increase, especially in developing countries and countries that have entered a culture of industrialization (Arisman, 2013). The most common DM disease is type-2 DM, which covers about 85% of diabetes mellitus patients (Greenstein and Wood, 2010). Type 2 DM is a long-term disease that if ignored will cause complications that can affect all parts of the body, this is caused by uncontrolled blood sugar levels in people with diabetes mellitus (Soegondo, 2010).

The results of the preliminary study on November 22 2020 showed that 10 of 35 DM patients at the Ponkesdes, Gurananyar Village, Cerme Gresik District, showed they were unable to control their blood sugar levels, because the patients did not regularly take medication because the patients did not want to depend on drugs

and were afraid of experiencing interference. on the kidneys. Apart from that, another reason is that after taking anti-diabetic medication, the patient feels discomfort in the stomach, so that in the end the patient stops taking the drug. The results of several studies state that there is a significant effect on reducing blood sugar levels due to the intervention of giving fragrant pandan leaf water (Pasaribu, 2018). The results of several studies also show that the intervention of giving cinnamon bark extract has an effect on reducing blood sugar levels (Arrafi, 2018; Nafisah 2020; Hardiyani, 2013). However, the effect of giving fragrant pandan decoction (Pandanus amaryllifolius Roxb) and cinnamon (Cinnammomum zeylanicum) on reducing blood sugar levels in people with diabetes mellitus cannot be explained.

According to the International of Diabetes (IDF), (2019), the global prevalence rate of DM sufferers in 2019 was 463 million people aged 20-79 years in the world, or equivalent to a prevalence rate of 9.3%. Based on gender, IDF (2019) estimates the prevalence in 2019 is 9.70% for women and 9.65% for men. The prevalence of diabetes is expected to increase to 578 million in 2030 and 700 million in 2045. Indonesia is the 7th country with 10.7 million DM sufferers after China, India, the United States, Pakistan, Brazil and Mexico (IDF , 2019). Based on Basic Health Research data (2018) in Indonesia, in general the incidence of Diabetes Mellitus has increased quite significantly over the last 5 years. In 2013, the incidence of DM in adults reaches 6.9% or 4,765,000 people of the total population of Indonesia aged 20-60 years of 69,061,000 people. In 2018 the number continued to soar to 8.5% or 6,284,000 people of the total population of Indonesia aged 20-60 years of 73,937,000 people. Based on the Litbankes Agency, Ministry of Health of the Republic of Indonesia (2019) East Java ranks 5th with DM sufferers of 2.6% or 1,027,000 people of the total population of East Java of 39,500,000 people. Based on data from the East Java Province Health Profile (2020) it shows that the population of Gresik Regency in 2016 suffered from DM as many as 18,521 million people, while in 2019 the number of DM sufferers increased to 134,700 million people. 000 people out of the total population of Indonesia aged 20-60 years of 69,061,000 people. In 2018 the number continued to soar to 8.5% or 6,284,000 people of the total population of Indonesia aged 20-60 years of 73,937,000 people.

Based on the Litbankes Agency, Ministry of Health of the Republic of Indonesia (2019) East Java ranks fifth with DM of 2.6% or 1,027,000 people of the total population of East Java of 39,500,000 people. Based on data from the East Java Province Health Profile (2020) it shows that the population of Gresik Regency in 2016 suffered from DM as many as 18,521 million people, while in 2019 the number of DM sufferers increased to 134,700 million people. Meanwhile, data from the

Ponkesdes of Gurananyar Village shows that there were 25 patients suffering from DM in 2019, while in 2020 it increased to 35 people and the average random blood sugar level of DM patients was > 200 mg/dl.

Type 2 DM is generally caused by insulin resistance and insulin deficiency (Holt, 2004 in Ozougwu, 2013; Zahroh dkk, 2022). Generally, type 2 DM is influenced by several conditions of insulin resistance due to obesity, lack of physical activity and aging (Fatimah, 2015). Dysfunction of pancreatic β cells that can cause insulin deficiency through 3 pathways, namely, external influences that cause damage to pancreatic β cells such as viruses and chemicals, decrease in glucose receptors in the pancreas gland, damage to insulin receptors in peripheral tissues (Fatimah 2015). Insulin resistance and insulin deficiency are the main causes of type 2 DM. The occurrence of lipolysis and increased hepatic glucose are characteristics of insulin resistance (Dipiro, 2015).

One of the plants that can lower blood glucose levels is fragrant pandan leaves. Fragrant pandan leaves contain alkaloids, saponins, flavonoids, tannins, polyphenols, steroids/terpenoids and glycosides (Hariana, 2009). Each of these chemical compounds can help lower blood glucose levels in the body. Apart from fragrant pandan, a complementary therapy that can be used to lower blood glucose levels is cinnamon bark. Cinnamon bark contains active substances, namely polyphenols. One of these polyphenolic components is Cinnamaldehyde with a mechanism of action by inhibiting the α-glucosidase enzyme, this enzyme plays a role in the hydrolysis of food carbohydrates into glucose and other monosaccharides (Suwanto et al, 2020). In patients with diabetes mellitus, inhibition of this enzyme causes inhibition of glucose absorption thereby reducing the state of hyperglycemia after eating (Guo et al, 2017) The content of this active substance is cinnamon can be processed into an ingredient that can help reduce blood glucose levels in DM patients and can be used in the long term (Arini and Ardaria, 2017).

Based on the above problems, researchers are interested in conducting research on the effect of a combination of fragrant pandanus water and cinnamon on lowering blood sugar levels in patients with DM.

METHOD

The research This study uses the Quasy-Experimental method (pre-post test control group design). This design seeks to reveal a causal relationship by involving a group of subjects and a control group.

Data collection used observation sheets & SOP which showed changes in blood pressure levels in Beton Village, Kec. Replacing Kab. Gresik on February 20-28 2019. The population in this study were DM sufferers who routinely checked at the Gurang Wetan Dusun Ponkesdes, Cerme District, Gresik Regency, totaling

35 people. Determining the size of the sample using purposive sampling and samples that met the inclusion criteria were 32 people. The independent variables are fragrant pandan and cinnamon stew. The dependent variable is changes in blood glucose levels in DM patients. Research data was taken using observation sheets and SOPs. Instruments were measured with a glucose meter (Easy Touch).

Provision of fragrant pandan and cinnamon decoction was given to the treatment group as much as 225 ml per day for 7 days consumed in the morning at 09.00 without giving OAD.

RESULT

1. **Random blood glucose levels of respondents in the treatment group before and after the intervention of fragrant pandanus and cinnamon decoction**

Table 1 can show that in the treatment group before the intervention was given, most were in the category of Hiperglycemia levels, namely 11 people (68.8%) and a small number were included in the euglycemia category, namely 5 people (31.3%). After being given intervention, most of them were in the euglycemia category, namely 10 people (62.5%) and a small number of hypoglycemia and hyperglycemia categories were both 3 people (18.8%).

Table 1. Randomized blood glucose levels of respondents in the treatment group before and after the intervention

Random blood glucose category	Pre-test		Post-test	
	N	%	N	%
Hipoglikemia	0	0	3	18,8
Euglikemia	5	31,3	10	62,5
Hiperglikemia	11	68,8	3	18,8
Total	16	100	16	100
Mean	2,69		2,00	
Std. Deviation	0,479		0,632	
Uji Wilcoxon	$\alpha = 0{,}001$			

The results of the Wilcoxon Rank Test in the treatment group found that the p value = 0.001 ($\alpha < 0.05$), so H1 is accepted, meaning that there is an effect of giving a decoction of pandanus leaves and cinnamon on reducing blood glucose levels in patients with diabetes mellitus.

2. **Random blood glucose levels of respondents in the control group before and after antidiabetic drug intervention**

Table 2 explains that the GDA levels of the control group before the intervention were mostly included in the hyperglycemia category, namely 10 people (62.5%) and a small portion included in the euglycemia category, namely 6 people (37.5%). Whereas after the intervention, the GDA levels of most respondents were included in the euglycemia category, namely 11 people (68.8%) and a small proportion were included in the hypoglycemia category, namely 1 person (6.3%).

Table 2. Random blood glucose levels of respondents in the control group before and after the intervention

Random blood glucose category	Pre-test N	Pre-test %	Post-test N	Post-test %
Hipoglikemia	0	0	1	6,3
Euglikemia	6	37,5	11	68,8
Hiperglikemia	10	62,5	4	25,0
Total	16	100	16	100
Mean	2,63		2,19	
Std. Deviation	0,500		0,544	
Uji Wilcoxon	$\alpha = 0{,}008$			

The results of the Wilcoxon Rank Test in the control group found that the p value = 0.008 ($\alpha < 0.05$) means that there is a significant difference in blood glucose levels before and after the intervention in the control group.

3. Differences in randomized blood glucose levels after intervention between treatment and control groups

Table 3. Shows that the mean rank in the treatment group after the intervention is 15.28, while in the control group after the intervention the mean rank is 17.72. The results of the Mann whitney statistical test z-875 value with ρ value 0.382 (ρ sign> 0.05) means that there is no difference in the level of decline in blood glucose levels between the treatment group and the control group after the intervention. Both can reduce blood glucose levels.

Table 3. Differences in randomi blood glucose levels after intervention in treatment and control groups

Category Random blood glucose levels Post-test	Treatment Group N	Treatment Group %	Control Group N	Control Group %
Hipoglikemia	3	18,8	1	6,3
Euglikemia	10	62,5	11	68,8
Hiperglikemia	3	18,8	4	25,0
Total	16	100	16	100
Mean Rank	15,28		17,72	
Sum of Ranks	244,50		283,50	
Hasil Uji Mann-Whitney test $\rho = 0{,}382$				

DISCUSSION

1. Random blood glucose levels of respondents in the treatment group before and after the intervention of fragrant pandanus and cinnamon decoction

The results showed that the random blood glucose levels of respondents in the treatment group before the intervention were mostly included in the category of hyperglycemia (201-250 mg/dl) and a small part was included in the category of euglycemia (101-200 mg/dl). The results showed that respondents in the treatment group were mostly female. RISKESDAS (2013) states that diabetes mellitus is experienced more by women than men, these factors include women who have higher levels of cholesterol, HDL, LDL and triglycerides in women than men which can cause a decrease in insulin sensitivity. The results of this study are in line with Trisnawati (2013) that the incidence of type 2 DM is more common in women because women have higher LDL levels than men. In addition, the factors of monthly cycle syndrome (premenstrual syndrome) and post-monopouse in women can cause the distribution of fat in the body to accumulate due to the hormonal process so that women are at risk of type 2 DM.

Random blood glucose levels of treatment group respondents after the intervention were mostly euglycemia (101-200 mg/dl) as many as 10 people (62.5%) and some hypoglycemia (70-100 mg/dl) as many as 3 people (18.8%) and some hyperglycemia 3 (18.8%). During the study, all respondents in the treatment group were given a decoction of pandan leaves and cinnamon per day as much as 225 ml for 7 days and consumed in the morning at 09.00 which was drunk after the respondents had breakfast without giving antidiabetic mellitus drugs.

Pandan leaves contain flavonoids, which can inhibit phosphodiretase, thus increasing cAMP in pancreatic β cells. This increase in cAMP will stimulate PKA (protein kinase A) which stimulates insulin secretion to increase (Ajie, 2015). Insulin encourages the absorption of glucose by most cells through GLUT-4 as a recutment transporter this can reduce blood sugar levels. Meanwhile, cinnamon contains an antioxidant component, Sinamaldehida, which functions as an inhibitor of α-glucosidase. In the digestive process, complex carbohydrates will be digested by various digestive enzymes contained in the small intestine, including the α-glucosidase enzyme which is a carbohydrate enzyme that works to catalyze the release of α-glucose, with the inhibition of the work of the α-glucosidase enzyme, it can delay the decomposition of oligosaccharides and disaccharides into monosaccharides so that they cannot release glucose into the blood vessels and there is a decrease in blood glucose levels.

2. **Random blood glucose levels of respondents in the control group before and after antidiabetic drug intervention**

The results showed that the GDA levels of respondents in the control group before the intervention were mostly included in the category of hyperglycemia (201-250 mg/dl) as many as 10 people (62.5%) and a small portion included in the category of euglycemia (101-200 mg/dl) as many as 6 people (37.5%). Based on the age factor, respondents in the control group were mostly aged> 45 years. According to Damayanti (2015) explains that the risk factor for type 2 DM is age over 30 years, this is due to anatomical, physiological, and biochemical decline. Changes start at the cellular level, then continue at the tissue level and finally at the organ level, which can affect homeostasis. Body functions begin to decline in a person over 30 years of age who can experience an increased risk of developing diabetes mellitus and cause changes in pancreatic β cells that will reduce the ability to produce insulin. In addition, it is also supported by the research of Nurhayati and Novianti (2016) that age is one of the factors that can cause glucose levels in the blood to increase due to a person's physioligical decline which will reduce the endocrine function of the pancreas to produce insulin.

Random blood glucose levels of respondents after the intervention were

mostly euglycemia (101-200 mg/dl) as many as 11 people (68.8%) hyperglycemia (201-250 mg/dl) as many as 4 people (25.0%) and a small portion of hypoglycemia as many as 1 person (6.3%). Respondents in the control group received therapy according to ponkesdes, namely the administration of OADs of the Glibenclamide and Metformin types. Glibenclamide belongs to the sulfonylurea group. The mechanism of action of this group is to stimulate insulin secretion in beta cells in the pancreas by closing the K ATP canal in the membrane of beta cells, thus providing a stimulating effect to increase insulin secretion. While metformin belongs to the biguanid group biguanid, the mechanism of action of this group is to reduce glucose production in the liver and increase the sensitivity of muscle and adipose tissue to insulin due to the activation of kinse in cells (AMP-acyivated protein kinase).

3. Differences in randomized blood glucose levels after intervention between treatment and control groups

The results of statistical analysis using the Mann-Whitney U Test statistical test obtained a significance value of $\rho = 0.382$ which > 0.05, which means, there is no difference in the level of reduction in blood glucose levels in the treatment group and control group after the intervention. Both can reduce blood glucose levels. The intervention of pandan wangi and cinnamon is the same as pharmacological drugs that can reduce the GDA levels of type 2 DM patients. The effectiveness is the same as pharmacological drugs so that this complementary therapy of fragrant pandanus and cinnamon decoction can be used as a treatment companion for DM patients.

This may be due to the value of blood glucose levels of respondents who fall into the category of hyperglycemia, besides that it is caused by a dose of cinnamon that is too small, namely 0.408 grams with a less long administration of 7 days with measurement time on the first day and day seven, so that the result is that the decoction of pandan wangi and cinnamon has no difference in the group given OAD (anti-diabetic drugs). The results of this study are in line with Hasanzade et.al. (2013) where no significant results were obtained (ρ value> 0.05) for the decrease in blood glucose levels with the administration of cinnamon both in the intervention group and the control group given placebo. This is because the amount of cinnamon dose is too small 1 gram.

CONCLUSIONS AND SUGGESTIONS

Conclusions

Random blood glucose levels in the treatment group before the intervention were mostly categorized as hyperglycemia and after the intervention, random blood glucose levels mostly decreased to euglycemia. Random blood glucose levels in the control group before being given the

intervention, mostly included in the category of hyperglycemia and after being given the intervention random blood glucose levels, mostly decreased to euglycemia. There is an effect of giving a decoction of fragrant pandanus and cinnamon on reducing blood glucose levels in patients with diabetes mellitus.

Suggestions

Further research needs to be carried out regarding evidence of the long-term effectiveness of therapy from the decoction of pandan leaves and cinnamon, especially in samples with type 2 diabetes mellitus with a larger sample and research on the possibility of other compounds in pandan wangi and cinnamon that have the potential as hypoglycemic agents, as well as increasing the time of administration of the intervention of pandan wangi and cinnamon decoction, which was previously 7 days, can be added to the provision of interventions for up to 14 days or even more.

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