



THE EFFECT OF THE COMBINATION OF BACK ACCUSED THERAPY AND CINNAMON BARK DECOCTION ON FASTING BLOOD SUGAR LEVELS IN PATIENTS WITH DIABETES MELLITUS TYPE II

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ABSTRACT	Keywords
<p>Diabetes mellitus is a degenerative disease that occurs due to chronic metabolic disorders because the pancreas is not enough to produce insulin or the body cannot use the insulin that is produced optimally and effectively. Alternative treatment for type II diabetes mellitus patients with complementary therapy, a combination of back acupressure and cinnamon bark decoction in improving fasting blood sugar levels. This study was conducted to prove the effect of a combination of back acupressure therapy and cinnamon decoction on fasting blood levels in type II diabetes patients. This research is one of a kind true experimental with a plan pretest-posttest control group design. The total sample of 56 people was divided into 2 groups, each consisting of 28 respondents in the intervention group who were given back acupressure and cinnamon bark decoction, while 28 respondents in the control group were only given 5 pillars of diabetes mellitus treatment for 21 days. Then measurements of fasting blood sugar levels were carried out on the 8th and 21st days. Data tested using independent t-test. There was a decrease in blood pressure before and after treatment, namely 172.25 mg/dl to 137.07 mg/dl with a difference of 63.45 mg/dl in the intervention group, then 167.75 mg/dl to 154.96 mg/dl with a difference 76.33 mg/dl in the control group. Test results independent t-test showed a difference in decreasing fasting blood sugar levels between the intervention group and the control group with a p value of 0.000. Conclusion, giving a combination of acupressure and cinnamon bark decoction for 21 days is effective in reducing fasting blood sugar levels in patients with type II diabetes mellitus.</p>	<p><i>Acupressure, cinnamon bark, fasting blood sugar levels, type II diabetes mellitus</i></p>

INTRODUCTION

Diabetes mellitus is a disease that is well known among the public which is a threat to global public health and one of the main causes of death in adults worldwide.¹ Diabetes mellitus is a degenerative disease that occurs due to chronic metabolic disorders because the pancreas is not enough

to produce insulin or the body cannot use the insulin that is produced optimally and effectively.¹ Diabetes mellitus can cause several complications ranging from head to toe, from heart disease and stroke, kidney failure to infections that result in amputation of limbs, to cause death in sufferers.² The causes of Type II Diabetes Mellitus (DM)

are heredity (50%), age, gender is more common (80.4%) compared to men (25%), obesity, lack of physical activity, unhealthy eating patterns, stress, drugs.^{3,4}

International Diabetes Federation (IDF) in 2019 found that there were at least 463 million people in the world aged 20-79 years, equivalent to a prevalence rate of 9.3% of the total population at the same age and also estimated the prevalence of diabetes mellitus by sex in 2019, namely 9% in women and 9.65% in men. The prevalence of diabetes mellitus is estimated to increase with increasing age of the population to 19.9% or 111.2 million people aged 65-79 years. The number is predicted to continue to increase until it reaches 578 million in 2030 and 700 million in 2045.^{5,6} The data from the 2018 Basic Health Research state that the prevalence rate of diabetes mellitus in Indonesia nationally is (8.5%), when compared to the results of Basic Health Research in 2013 (6.9%) this shows that there is an increase in the prevalence of diabetes mellitus. prevalence of (1.6%). Data from the Central Java Provincial Health Office in 2018 showed that the prevalence of diabetes mellitus in Central Java was 2.1% of sufferers.⁷ Preliminary studies that have been conducted at the Spondol Health Center (PKM) found data that the population of diabetes mellitus in 2021 was 1223 people and in January 2022 as many as 60 people had diabetes mellitus.

There are several classifications of diabetes mellitus, one of which is type 2 diabetes, which occurs due to insulin resistance or cell dysfunction in pancreas.⁸ Type 2 diabetes mellitus is not caused by insulin secretion, but insulin target cells fail or cannot respond to insulin normally or are resistant to insulin.^{9,10} Insulin resistance often occurs due to obesity, lack of physical activity or aging. The classic complaints of Diabetes Mellitus include polyuria, polydipsia, polyphagia, and unexplained

weight loss, while other complaints can be in the form of a feeling of weakness, tingling, itching, blurred vision, and erectile dysfunction in men, and itching of the vulva in women.⁸ Beta cell failure is the newest major cause, broadly speaking the pathophysiology of type 2 DM is caused by eleven things (egregious eleven) which includes: pancreatic beta cell failure, effect incretin decrease that can occur due to a decrease in insulin in the cells, the alpha cells of the pancreas function in the synthesis of glucagon which in the fasting state will increase its level in the plasma which will cause hepatic glucose production (HGP) in the basal state increased significantly compared to normal individuals, fat cells increased lipolysis and increased Free fatty Acid (FFA) in plasma, muscle multiple insulin performance disorders in intracellular as a result of impaired tyrosine phosphorylation resulting in impaired glucose transport in muscle cells, decreased glycogen synthesis, and decreased glucose oxidation, liver, brain, large intestine, immune/inflammation deregulation, small intestine/stomach and kidney.¹¹ Handling diabetes mellitus requires proper treatment so that blood sugar can be controlled. Actions that can be taken in preventing and controlling glucose in the blood and improving insulin absorption by body cells include the 5 pillars of implementing DM, among others; education, diet, physical activity, medication and blood sugar monitoring.¹² In addition to the 5 pillars in the management of DM, another therapy that can be done is using non-pharmacology or complementary therapy.¹²

One of the therapies used to lower blood glucose levels and improve insulin absorption is giving back acupressure therapy and giving cinnamon consumption.^{13,14} Acupressure is an action to provide stimulation at certain points using

the fingers with pressure or mechanical techniques. The acupressure technique with the back acupressure method is a healing therapy which is performed on the back area by pressing and vibrating it, using certain points, the back acupressure itself is useful for stimulating the back nerves.¹⁵ The main point of acupressure which is useful for lowering blood sugar levels is the BL 15 point (without), point BL 20 (pi his), point BL 22 (we isu), point BL 23 (sen su).¹⁶ The basic mechanism of acupressure therapy is to lower blood sugar levels by stimulating the points acupoint which is also related to the pancreas to produce insulin and improve blood circulation in the back so that it can stimulate the performance of the pancreas in order to increase insulin resistance, increase the number of receptors on target cells and accelerate the use of glucose, thereby reducing blood sugar levels.¹⁴

Previous studies have shown that acupressure is effective in lowering blood sugar levels with a significant value ($p < 0.05$). Previous research has shown that this back acupressure therapy has one of the benefits, namely improving blood circulation so that glucose in the blood circulation can be metabolized properly. Research entitled *The Effect of Acupressure Therapy on Blood Sugar Levels in Patients with Type II Diabetes Mellitus at the Internal Medicine Polyclinic at Tk II Hospital, dr. Soedjono Magelang in 2016*¹⁴ using the true experiment method pretest and posttest with control group design with a sample of 52 people, 26 intervention groups and 26 control groups. The intervention group received six times of acupressure for three weeks with blood measurements before and after each acupressure. The results showed that the median blood after acupressure (150.50 mg/dl) was significantly lower than before acupressure (181, mg/dl).value=0,031) effect size 0,5 (modest effect).¹⁴ Research by Zarvasi, et al

in 2018 showed that acupressure was effective in reducing fasting blood sugar levels in diabetes mellitus with an average fasting blood sugar level before treatment was 128.30 mg/dl and after treatment in the intervention group was 122.23 with a p value (p value= 0,001). Effect size 0,40 (Modest effect).¹⁷

Cinnamon is a herbal or spice plant that is often used and consumed by Indonesian people. This plant also contains chemical compounds such as selenium, safrole, essential oils, eugenol, tenin, cinnamaldehyde, resin, potassium oxalate and tanners and flavonoids.¹⁸ Flavonoids are natural organic compounds found in roots, leaves, bark, stamens, flowers, fruit and fruit seeds of plants. Flavonoids contained in cinnamon can improve the performance of glucose metabolism and convert glucose into energy, this process can increase cell sensitivity to insulin so that glucose levels in the blood decrease.^{19,20} Flavonoids can lower blood sugar levels with their ability as antioxidants that are protective against cell damage as a producer of insulin and can increase insulin sensitivity. Antioxidants can suppress beta cell apoptosis without changing the proliferation of pancreatic beta cells.²¹ Especially the ability of flavonoid quercetin in inhibiting glucose transporter 2 (GLUT 2) intestinal mucosa so that it can reduce glucose absorption. This can cause a reduction in the absorption of glucose and fructose from the intestine so that blood glucose levels fall. When quercetin When ingested with glucose, hyperglycemia is significantly reduced.¹³ So that flavonoids can provide beneficial effects in fighting diabetes mellitus, both through the ability to control blood sugar levels and optimize the work of the pancreas organ.²⁰ Apart from other Flavonoids, cinnamon contains selenium, which is a micro-nutrient that functions as an antioxidant. Selenium contains proteins that have antioxidant

effects. Seleno protein plays a role in protecting against stress oxidative through production Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNS). ROS affect B cell function failure and chronic DM complications.²²

Research entitled the effect of cinnamon extract on decreasing blood sugar in type II DM sufferers¹⁸ In this study, 20 respondents were given cinnamon consumption twice a day in the morning and in the evening for 7 days. The results showed that there was a difference in the average blood sugar level before consuming cinnamon of 263.40 mg/dl and after consuming cinnamon extract of 225.65 mg/dl with a value of (p value = 0.001) with effect size 0,1 (weak effect).¹⁸ Research entitled The Effect of Cinnamon Decoction on Fasting Blood Sugar Levels in Type 2 Diabetes Mellitus Patients²³ in his research, 10 grams of cinnamon was boiled with 100cc of water until it boiled for 5 minutes, then the cinnamon boiled water was consumed while warm immediately after breakfast and dinner. Respondents' fasting blood sugar was checked every morning at 06.30-08.30 where respondents were previously asked to fast at night for at least 8 hours. /dl and after treatment in the intervention group of 220.84 mg/dl with a value of (p value=0,034) effect size 0,37 (Modest effect).²³ Research with the title effect of combination therapy acupressure and foot exercise to changes in scores ankle brachial index (ABI) and blood sugar in type II DM patients in 2017²⁴ in his research using the method Quasi experimental control group pre-test post-test design and sampling technique consecutive sampling with 20 respondents stated that there was a significant difference in blood sugar pre and post intervention group (p value = 0.138), where the blood sugar before the intervention was 177.40 mg/dL after the

treatment became 125.10 mg/dL. Effect size 0,5 (Modest effect).²⁴

The above data shows that previous research on acupressure and giving cinnamon decoction was statistically significant on blood sugar levels in type II DM patients, but clinically these studies have not shown achievement of normal values from examination of fasting blood sugar levels. To improve the health status of people with diabetes mellitus, combination interventions are needed, namely giving acupressure with acupressure and cinnamon decoction. This combination can improve insulin function, stimulate insulin production, increase peripheral circulation and regenerate blood vessel cells and insulin absorption in cells. Previous studies have only examined acupressure on blood sugar levels and there has been no research on acupressure on blood sugar levels. Research related to acupressure has been linked to blood sugar levels. However, until now there has been no research in the field of nursing that specializes in examining the administration of full-blooded back acupressure by giving as much as six times of acupressure for 21 days combined with giving 100 grams of cinnamon decoction boiled with 200cc water until boiling for 5 minutes given in the morning and evening day in 21 days which can reduce blood sugar levels in the hospital or in the community, judging from the availability and price considerations, cinnamon is easy to get and also affordable. In this regard, the authors are interested in conducting research on the effectiveness of the Combination of Acupressure Therapy and Cinnamon Stewing on Fasting Blood Sugar Levels in Patients with Diabetes Mellitus Type II in reducing blood sugar levels and controlling levels in type II DM patients.

METHOD

Design

The research design carried out is of a type True Experimental with research design Pretest-Posttest randomized control group design used to determine the effect of a combination of back acupressure and cinnamon bark decoction. Both groups were measured for blood sugar levels prior to conducting the study (pretest). After that, the experimental group was given back acupressure and cinnamon bark decoction for 21 days. Whereas the control group was only given 5 pillars of managing diabetes mellitus for 21 days. Then measurements of fasting blood sugar levels were carried out on the 8th and 21st days.

Samples and sampling techniques

The study population in this study were type II diabetes mellitus patients in the Working Area of the Sron dol Banyumanik Health Center, Central Java. Determination of the minimum number of samples using the technique probability sampling by method proporsional random sampling and based on inclusion and exclusion criteria, 56 respondents were divided into two groups with 28 respondents each in the intervention group and 28 respondents in the control group.

Instrument

The instruments used in this study included: Respondent characteristic questionnaire, photometer and Standard Operating Procedures (SPO) for acupressure therapy and giving cinnamon decoction and checking fasting blood sugar levels. The characteristic questionnaire contains several questions about the respondent's biodata which include: initial name, age, gender, level of education, occupation, length of time suffering from DM, smoking history, exercise history. Respondents who were willing to become research samples were examined for fasting blood sugar levels using venous blood, which was carried out

by the Sron dol Health Center laboratory team using spectrophotometry using a photometer. Monitoring blood sugar levels using an observation sheet for blood sugar levels, this sheet contains data on the results of measuring fasting blood sugar levels (GDP), values for fasting blood sugar levels of 80-109 mg/dl (good), 110-125 mg/dl (moderate) and >125 mg/dl (bad). Researchers conducted validity and reliability tests on standard operating procedures for checking fasting blood sugar levels, then researchers conducted consultations with competent experts/experts in the treatment and control of diabetes mellitus.

Intervention

The research process begins with conduct sample selection proporsional random sampling based on gender – male and female. Selected respondents were asked to fill out a sheet informed consent for their willingness to be respondents. Researchers assisted enumerators conducting a pretest on type II DM patients. Researchers and enumerators do a fasting blood sugar test pre-test in the intervention group and the control group. The enumerator's educational background is a nurse who understands how to acupressure the back acupressure which has previously been done apperception in this study. Then, the intervention group in give a combination of acupressure treatment for back acupressure on day 1 to day 21 with cinnamon decoction on day 3, day 5, day 7, day 10, day 12, day 14 , the 17th day, the 19th day, and the 21st day. Meanwhile, the control group only received 5 pillars of managing diabetes mellitus by taking 500 mg of metformin, an anti-diabetic drug obtained from the Community Health centers. Examination of fasting blood sugar levels at the end of the observation (post-test) in the intervention group and the control group after being given the

combination treatment of full-blooded back and cinnamon stew. The measurement results are then entered into the observation sheet of fasting blood sugar levels.

Analysis Data

This research was carried out by researchers in collecting data with the method of identification, observation, interviews and filling out questionnaires. The data that has been obtained is then carried out statistical analysis using the program Statistical Package For The Social Science (SPSS) 24.0 for Window. However, before the analysis test is carried out, the data normality test is first carried out. Where the normality test is used is the test Shapiro-Wilk because the sample is <50 respondents. The average fasting blood sugar level is pretest and posttest normal distribution results ($p > 0.05$) so that the bivariate analysis uses a parametric test. In the bivariate analysis, the parametric test was carried out using the test Independent T-test. Data processing is used for the basis of discussion of the problem statement which is then presented in tabular form so that conclusions can be drawn.

Ethical considerations

The researcher must first ask for permission to do research from the Head of the Health Applied Masters Study Program at the Semarang Ministry of Health Polytechnic, then the Semarang City Health Office, submit a permit to the research location at the Spondol Banyumanik Semarang Health Center to conduct data collection and the research process. When conducting research, researchers need to pay attention to several considerations or ethical aspects, including: anonymity, confidentiality, autonomy, justice and beneficency. The researcher asked for consent to the participation of the respondents (informed consent) before the research is done.

RESULT

Table 1. Correlation of confounding variables and fasting blood sugar in type II DM patients

Characteristics	Diabetic Client		R
	n	%	
Age			
41-60 years	20	35.7%	0.582
>60 years	36	64.3%	
Gender			
Male	29	51.8	0.389
Female	27	48.2	
Long Suffering DM			
<5 years	11	19.6	0.105
6-10 years	44	78.6	
>10 years	1	1.8	

**Homogeneity test*

Based on table 1 above, it shows that the age of most respondents is >60 years old. The addition of age can affect blood sugar. And the most gender in this study was male and the average duration of diabetes mellitus was 6-10 years. The results of calculating the confounding correlation of the variable fasting blood sugar in the intervention group and the control group from the results of age with $r = 0.582$, gender with results of $r = 0.389$ and duration of suffering from DM with results of $r = 0.105$.

Table 2. Differences in average fasting blood sugar levels before (pre -test) and after (post-test) treatment in the intervention group and the control group

Group	Variab le	Mea n	Average differen ce	p
Interventi on (GDP)	Pretest	172.25	35.179	0.04
	Posttest	137.07	33.373	
Control (GDP)	Pretest	167.75	12.786	0.00
	Posttest	154.96	31.295	

**Independent t test*

Based on table 2 above, it shows that the value of the intervention group is $p = 0.040$, meaning that acupressure therapy

with cinnamon bark decoction is effective in reducing GDP levels. Meanwhile, the value of $p = 0.000$ means that the administration of metformin 500 mg in the control group significantly reduced the level of GDP.

Table 3. Differences in the average delta of fasting blood sugar levels before and after treatment between the intervention group and the control group

Variable	Intervention Group	Control Group	Width	p
GDP Pre-test	26.16±7 32.50	30.84±8 63.50	- 1.0	0.2 83
			74	
GDP Post-test	22.79±6 38.00	34.21±9 58.00	- 3.7	0.0 38
			57	
(D) Delta GDP	37.43±1 048.0	19.57±5 48.00	- 4.1	0.0 00
			08	

**Independent t test*

Table 3 above shows that the administration of metformin therapy and the intervention of acupressure and a supplement of cinnamon decoction 100 mg 2 x 200 ml for 21 days was effective in reducing fasting blood sugar levels greater than the control group and approaching normal with results ($p = 0.000$) between groups the combination and control groups after receiving the intervention of giving cinnamon decoction and full-back acupressure for 21 days, in which cinnamon decoction was given as much as 100 grams 2 x 1 per day, acupressure 2 times a week for 21 days showed a significant difference with the mean delta value for Fasting blood sugar levels in the intervention group were higher than the control group, namely -43.267 mg/dl in the intervention group and -25.700

mg/dl in the control group with a value $p=0,000$.

Table 4. Combination therapy with the consumption of cinnamon decoction and back acupressure is effective against fasting blood sugar levels (GDP) in type II DM patients

Variable	Group	Average Difference	Difference IK 95% Lower-Upper	P
GDP	Intervention	137.07	(-35.440)	0.038
	Control	154.96	- (-345)	

**Independent t test*

Based on table 4 above, it shows that the GDP variable has a significant effect on the statistical test with $p = 0.038$ and the difference in the mean of the intervention group appears to be better when compared to the control group, the clinical conditions indicated by the 95% CI also present a different situation, namely an increase of more than one from lower to upper (35,440).

DISCUSSION

The results showed the average change in fasting blood sugar levels before and after being given acupressure and cinnamon decoction therapy in the intervention group using a different test with the previous result of 172.25 to 137.07. Statistical test results with independent t-test in the intervention group $p = 0.000$, in the control group with previous results 167.75 to 154.96 values $p=0.040$. There was a delta value in the intervention group of 63.45 and the control group of 76.33. The two groups from the delta test got $p = 0.000$. From the two groups, both the control and intervention groups, the average p-value was less than 0.05, which meant that there were significant changes in both groups. Based on normal values (cut point) on fasting blood

sugar levels of <126 mg/dl. In the treatment group, 11 respondents (39.3%) received normal values for back acupressure therapy and administration of cinnamon bark decoction. And in the control group given the drug metformin 500 mg reached normal values by 7 respondents (25%). Relative Risk Reduction (RRR) for the value of the fasting blood sugar level the intervention received the intervention of buttock therapy intervention and the administration of cinnamon bark decoction can reduce therapy failure by 20% and patients who receive metformin 500 mg drug therapy, with value absolute risk reduction (ARR) or the difference in failure to increase administration in the administration and control groups by 15%, value number of needed (NNT) amounting to 6.7%.

In previous research by Djafar in 2022 Cinnamon decoction therapy was carried out. The results of this study showed statistical significance, $p = 0.000$ ($p \leq 0.05$). The average sugar level before the study in the intervention group was 240.90 mg/dL with a standard deviation of 21.891 mg/dL. Meanwhile, the average blood sugar level in the intervention group after the study was 240 mg/dL with a standard deviation of 15.741 mg/Dl.

Noviana and Dewi Yuliana in 2021 with the results of a study using a sample of 32 people, the average blood sugar level of the patients before treatment was 269.75 and after the acupressure intervention the results were 259.06 with ($p = 0.001$) effect size 0.04 (weak effect).²⁵ The difference with previous studies when compared to the calculation of the effect size in the study conducted by Noviana had a weak effect on reducing fasting blood sugar levels, an effect size of 0.04, while the calculation of the effect size in the therapy of back acupressure therapy and administration of cinnamon bark decoction resulted in a value of 0.88 moderate which means it has a stronger

effect on fasting blood sugar levels. From these results it is known that therapy with back acupressure therapy and administration of cinnamon bark seems to have a better effect on reducing GDP levels.

The results of this study are in line with research conducted by Nurayati, 2017 which proved that there is a significant relationship between physical activity and fasting blood sugar levels. Physical exercise is one of the pillars in the management of DM which functions to improve insulin sensitivity and also to maintain body fitness. Physical exercise can help enter glucose into cells without the need for insulin, besides that physical exercise can also reduce the weight of obese diabetes and prevent the rate of progression of impaired glucose tolerance to DM. When the body moves, there will be an increase in the body's need for fuel by active muscles. The results of this study are also supported by research conducted by Komariah et al (2020) that there is a significant relationship between age and fasting blood sugar levels. This is because at this age a person becomes less active. gain weight. muscle mass decreases, and the result of the aging process causes progressive shrinkage of β cells. In addition, the incidence of diabetes increases with age. especially at the age of > 45 years because at that age there is an increase in glucose intolerance.

Cinnamon contains active substances, namely polyphenols with Cinnamaldehyde components which work by increasing insulin receptor proteins in cells so that they can increase insulin sensitivity and reduce blood glucose levels to near normal. metabolism to produce coumarin metabolites, namely 7-hydroxycoumarin. Agree with research conducted by Azmaina entitled the effect of cinnamon decoction on reducing fasting blood sugar levels in type II DM patients. like insulin.

Back acupressure therapy is a therapy non pharmacology by applying pressure and vibration on 2 meridian points acupoint which are around the spine, namely the meridians of which has 12 acupoints along the spine and urinary content meridian which has 25 acupoints along the spine 2 fingers to the right of the meridian. Acupressure can release endorphins in the brain to relax muscles, reduce pain, and increase comfort.⁵³ Acupressure on points SP6, ST36, and SP10 can also activate glucose-6-phosphate and can act on the pancreas to increase insulin resistance. Acupressure can activate glucose-6-phosphate (a carbohydrate metabolism enzyme) and can have an effect on the hypothalamus. Acupressure works on the pancreas to increase insulin synthesis, increase one of the receptors on target cells, and accelerate the use of glucose in cells, so that the result is lowering blood sugar levels. The acupressure points that are often used are on Pishu (BL 20), Feishu (BL 23), Shenshu (BL 23), Zusanli (ST 36), Sanyinjiao (SP 6), Hegu (LI 4) (Ingle et al, 2011).

CONCLUSION

The results showed that the combination of back acupressure and cinnamon decoction was effective in reducing fasting blood sugar levels in type II diabetes mellitus patients. It is expected that nursing services for nursing service agencies both in hospitals and health centers, especially the working area of the Sronдол Banyumanik Health Center Semarang where the research was carried out can provide cinnamon to be boiled by patients and provide acupressure therapy for diabetes mellitus patients.

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