Effect of *Cinnamomum burmannii* Stew on Glucose Fasting Blood Levels in Adult Prediabetes in Makassar

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Abstract

BACKGROUND: Prediabetes is a condition that precedes the onset of diabetes mellitus (DM), DM disagreement, and penalties are needed through the management of prediabetes.

AIM: This study aimed to study the effect of giving cinnamon stems (*Cinnamomum burmannii*) for 14 days on the levels of fasting adult blood sugar (glukosa darah puasa [GDP]) in prediabete adults in Makassar City.

METHODS: This research method uses a quasi-experimental randomized pre-test design with a control group. There are 28 samples from a total of 167 communities in the working area of Pampang and Antara Community Health Center who have diabetes risk factors. Levels of GDP, Anthropometry, knowledge level, and 24-h recall were taken from samples that were divided into two groups of cinnamon stew studio with a dose of 10 g + education for the intervention group and education for the control group. Data were analyzed using the will-coxon test and the Mann–Whitney test.

RESULTS : The results showed that significant changes in GDP after giving cinnamon stew and education in the intervention group (p = 0.032), there was a change in GDP levels but not significant after providing education in the control group (p = 0.197), for the average difference change in GDP in the group intervention (−4.14) is greater than the control group (−2.50) but the magnitude of change in GDP is not significant, whereas there is no significant difference in GDP levels between the intervention group and the control group after the intervention (p = 0.270). Consumption of 10 g of cinnamon stew for 14 days can reduce fasting blood sugar levels.

CONCLUSION: Based on the results of the study, there were significant changes in GDP after giving cinnamon stew and education in the intervention group, there was a change in GDP levels but not significant after providing education in the control group, the average change in the intervention group was greater than the control group but the change in GDP not significant, there was no significant difference in GDP levels between the intervention group and the control group after the intervention.

Introduction

Metabolic syndrome is a set of symptoms caused by a group of interconnected factors that can increase the risk of cardiovascular disease and type 2 diabetes mellitus (DM) [1]. Prediabetes is a condition where blood glucose levels are above normal, but have not yet reached the DM criteria. This condition is indicated by the occurrence of Impaired glucose tolerance (IGT) and impaired fasting glucose (IFG) and/or fasting blood glucose (glukosa darah puasa [GDP]) is disturbed [2].

Indonesia ranks third in the world after China and the US with the most prediabetes, which is 27.7 million [3]. Based on the Basic Health Research report in 2018, there were 26.3% of the Indonesian population experienced impaired fasting glucose (100-125 mg / dL).

To help change the behavior of patients with prediabetes, it can be done by changing lifestyles such as food intake and physical activity and providing education. Health education regarding DM influences community behavior opportunities as indicated by a decrease in blood glucose levels after 3 months of education [5]. In addition to education, reducing blood sugar levels can be done by consuming cinnamon stew decoction.

Besides being safe, plants are cheaper and free of side effects [6]. One of the traditional medicinal plants that are believed to reduce blood glucose and lipid profile levels is *Cinnamomum burmannii* or cinnamon because it has a bioactive component of the polyphenol group which has an activity similar to insulin (mimetic insulin) [7].

Research conducted by Meida and Hellena [8] on the effect of cinnamon stew on fasting blood sugar levels showed results between differences before and after fasting blood sugar levels in patients with type 2 DM after being given interventions in the form of cinnamon stew at a dose of 10 mg. Cinnamon has a bioactive component of the polyphenol group that has activities similar to insulin (mimetic insulin) [9].

This cinnamon bark contains active substances, namely, polyphenols which work by

increasing the insulin receptor protein in cells so that it can increase insulin sensitivity and decrease blood glucose levels to near normal. In addition, there are essential oils obtained only from the bark, namely, trans-cinnamaldehyde, eugenol, and linalool which have a percentage of 82.5% of the total composition [10].

This study aims to determine the effect of cinnamon stew on prediabetes adult fasting blood sugar levels in Makassar City.

Materials and Methods

This research was conducted in two working areas of the health center, Pampang health center, and Antara health center for 14 days of educational intervention and cinnamon stew. This research is a quasi-experimental design with randomized pre-test post-test with control group.

The population in this study is adult prediabetes in the working area of Pampang Health Center and Antara Makassar Health Center. The study sample was prediabetes adults in the Makassar City area who met the inclusion and exclusion criteria totaling 28 people. The sample was divided into two study groups: The intervention group (10 g cinnamon stew and education) and the control group (education without cinnamon stew) with a total sample of 14 people per group. The inclusion criteria of this study were those aged 40–60 years, had a GDP level of 100–125 mg/dl, and were willing to consume cinnamon stew every day for 14 days. While the exclusion criteria of this study are body mass index (BMI) <17 kg/m^2, taking herbal medicines or from doctors who can control blood glucose levels, pregnant/breastfeeding women, and in sickness or in doctor's care.

Primary data obtained directly from interviews, questionnaires and laboratory results in the form of respondent characteristics data, data on fasting blood sugar levels, food intake of respondents, and knowledge level questionnaire. Secondary data were obtained from families and from other reference sources that support the research.

Data processing is performed using a SPSS computer program. A univariate test is performed on each variable to see an overview of its distribution and frequency. While the bivariate test was carried out by comparing the results of fasting blood glucose examination before and after the intervention was given using the Wilcoxon test and the Mann–Whitney test to test intergroup treatment. Furthermore, the data that have been obtained will be presented in the form of tables and graphs accompanied by narration.

Results

Table 1 shows that of the two groups, the majority of respondents were female, namely, 13 people (92.9%) in the intervention group and 12 people (85.7%) for the control group. For the age group can be seen for each intervention and control group most of the respondents in the early elderly group (46–55 years), as many as 11 people (78.6%), for the control group as many as nine people (64.3). For the level of education, it can be seen that the educational characteristics for the intervention group are the highest, namely, four junior high school students and four academic students (28.6%), and the most academic/control group is eight people (35.7%).

Table 1: Characteristics of the prediabetes Society in the work area of the Pampang Health Center, and Antara Health Center Makassar City, 2019

Karakteristik	Kelompok				Total	
	Intervensi		Kontrol			
	n	%	n	%	n	%
Jenis Kelamin						
Laki-laki	1	7.1	2	14.3	3	10.7
Perempuan	13	92.9	12	85.7	25	89.3
Kelompok Umur						
Dewasa Akhir (36-45 tahun)	1	7.1	3	21.4	4	14.3
Lansia Awal (46-55 tahun)	11	78.6	9	64.3	20	71.4
Lansia Akhir (56-65 tahun)	2	14.3	2	14.3	4	14.3
Pendidikan						
SD	3	21.4	3	21.4	6	21.4
SMP	4	28.6	2	14.6	6	21.4
SMA	3	21.4	1	7.1	4	14.3
Academy/College	4	28.5	8	57.1	12	32.2
Pekerjaan						
PNS	2	14.3	4	28.6	6	21.4
Wiraswasta	1	7.1	6	42.9	7	25.0
Buruh	1	7.1	0	3.6	1	3.6
IRT	10	71.4	4	28.6	14	50.0
Status Perkawinan						
Menikah	14	100	12	85.7	26	92.9
Cerai mati	0	0	2	14.3	2	7.1
Riwayat Keluarga DM						
Ada	9	64.3	11	78.6	20	71.4
Tidak Ada	5	35.3	3	21.4	8	28.6
Obes Sentral						
Normal	1	7.1	1	7.1	2	7.1
Tidak normal	13	92.9	13	92.9	26	92.9
Obes (IMT)						
Normal	0	0.0	1	7.1	1	3.6
Overweigh	2	14.3	5	35.7	7	25.0
Obesitas	12	85.7	8	57.1	20	71.4

DM: Diabetes mellitus.

In Table 1, for occupation, the intervention group most of the respondents work as IRTs as many as ten people (71.4%) for the control group the majority of respondents work as entrepreneurs, namely, six people (42.9%). For marital status, most respondents have married status where the intervention group is 14 people (100%) and in the control group is 12 (85.7%). Family history, most respondents have a family history of DM, in the intervention group as many as nine people (64.3%) and 11 people (78.6%) for the control group.

In Table 1, for the characteristics of central obesity in the abdominal circumference of each group of respondents, both the intervention group and the control group were mostly of the central obesity status of 13 people each (92.9%). For BMI, the intervention group was mostly obese, 12 people (85.7%), and right people (57.1%) for the control group.

In Table 2, it can be seen that the Wilcoxon test results show that there is a significant difference between the levels of GDP before and after the intervention is given to the intervention group where p value is 0.032 < 0.05 while for the control group shows no significant difference between the levels of GDP before and after it is given intervention where p value is 0.197 < 0.05.

Table 2: Fasting Blood Glucose Analysis of Prediabetes Society in the work area Pampang's Health Center and Antara Health Center Makassar City, 2019

FBG (mg/dL)	Group		p-value
	Intervention Mean ± SD	Control Mean ± SD	
Pre-intervention	108.50 ± 6.88	110.93 ± 7.79	0.489**
Post-intervention	104.36 ± 8.68	108.43 ± 9.18	0.270**
Nilai p	0.032*	0.197*	
Δ FBG concentration	−4.14 ± 6.20	−2.50 ± 6.67	0.506

*Uji Wilcoxon, **Uji Mann–Whitney.

Table 2 also shows that based on the results of the average Mann–Whitney test for GDP levels in the two groups before the intervention, there is no significant difference where p value is 0.489 > 0.05, indicating that the average GDP level of the respondents before the intervention is homogeneous between groups. The mean GDP levels in the two groups after the intervention also showed no significant difference where p value was 0.270 > 0.05.

Table 2 also shows that based on the results of the average Mann–Whitney test for GDP levels in the two groups before the intervention, there is no significant difference where p value is 0.489 > 0.05, indicating that the average GDP level of the respondents before the intervention is homogeneous between groups.

Table 2 also show the mean GDP levels in the two groups after the intervention also showed no significant difference where p value was 0.270> 0.05. Based on the magnitude of the difference in levels of GDP, before the intervention and after the intervention in the intervention group was −4.14 ± 6.20, in the control group was −2.50 ± 6.67, the same results for the difference in the average levels of GDP before and after the intervention showed no there was a significant difference between the two groups where p value was 0.506> 0.05.

In Table 2, the differences in GDP levels between the two intervention and control groups after the intervention also showed no significant difference where p value was 0.270> 0.05.

Discussion

This study shows the effect of giving cinnamon stew on the GDP of prediabetes patients. There was a significant change in the GDP of the intervention group after the intervention, for the control group there was a decrease in the level of GDP but not significant after

the provision of educational intervention, whereas for between groups there was no significant difference in GDP levels between the intervention group and the control group.

Judging by the results for the level of knowledge of the intervention group has increased after being given education, this is because respondents were able to find out about prediabetes, how to arrange food to reduce blood sugar levels and the benefits of cinnamon for reducing blood sugar levels. This study is in line with Tim _et al_. [11] in Lakeland Florida about the Effects of Soluble Cinnamon Extract on Body Composition and Metabolic Syndrome in Pre-Diabetes Men and Women showing the results of a decrease in fasting blood sugar levels.

This study is also in line with the study of Meida and Hellena [8] on the Effect of Cinnamon Stew (_C. burmannii_ on Fasting Blood Sugar Levels of Type 2 DM Patients showing results after drinking cinnamon stew for 3 days in a dose of 10 mg showed significant results with p = 0.006 < α [0.05]). Similar study by Arini and Ardiaria [12] with the results that there were significant changes (p < 0.05) in all three test groups, with the most significant changes being in the 10 g group with a correlation level of 0.000 and the group 8 g with a correlation of 0.001.

Cinnamon is a plant that has flavonoid content [13] The workings of flavonoid compounds have been shown to have beneficial effects in fighting diabetes, both through the ability to control blood sugar levels and optimize the work of the pancreatic organs by increasing the sensitivity of pancreatic beta cells to produce the insulin hormone needed to regulate blood glucose levels in the body [14].

In addition, the main polyphenol components in cinnamon include cinnamic acid and ferulic acid, both of which have m-hydroxy and p-methoxy residues in the phenol ring structure having significant activity on pancreatic function at a concentration of 1 μM [15]. Increased glucose uptake and slows hepatic gluconeogenesis with no effect from pancreatic insulin output [16]. Asan cinnamat has the same effect as cinnamaldehyde, which can be insulin secretion, increase glucokinase activity and glycogen levels, thereby suppressing the occurrence of gluconeogenesis and glycogenolysis that occurs in the liver [17].

Table 2 also shows the results for the control group given education shows that the mean change in fasting blood sugar levels decreased from 110.93 to 108.43 but statistically not significant (p = 0.197)> 0.05 which means there is no difference between before and after providing education. This is because the control group did not consume cinnamon stew to help reduce blood sugar levels.

These results are in line with the results of the study of Norris _et al_. [18] who said that education is important in the treatment of DM patients where

the provision of education can control blood gamma hydroxybutyrate (GHb) in respondents (0.76%), whereas without the provision of controlled GHb education only (0.26%). This knowledge can be enhanced by forming confidence in oneself so that someone can behave in accordance with daily life [19], [20].

For changes in GDP between the intervention group and the control group, then seen from the large difference in changes between the intervention groups and the control group is statistically insignificant where the value (p = 0.506) which means there is no difference in change between the intervention group and the control group but in each group decreased but a greater change occurred in the intervention group where the value of the difference was 4.14 compared to the control which was 2.50.

For between groups the mean difference in GDP levels in the two groups after the cinnamon stew intervention and education, there was no significant difference where p = 0.270> 0.05 indicating there was no change in fasting blood sugar levels between the intervention group and the control group after the intervention. This is because the time of intervention of cinnamon stew in the intervention group is still lacking so the difference is still less visible.

Recommendation

The level of involvement is one of the impacts in the implementation of a healthy city consisting of two indicators. An evaluation of the two indicators gave satisfactory results. The involvement of stakeholders in this matter is that women have been quite active and participatory. Besides that, the political commitment of the Makassar city government itself has succeeded in bringing satisfactory results to the development of the city. However, it is recommended for each Regional work units at the city government level to further improve coordination with each other, because there are still overlapping tasks between each SKPD.

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