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The Effect Of The Combination Of Cinnamon Powder Infusion And Honey On Reducing Blood Sugar Levels In Type II Diabetes Mellitus Patients In RT 007 And 008 / RW 05, Balekambang Subdistrict, East Jakarta

Muhamad Tridhal Dadi Utomo[1], Dewi Susanti[2], Ratna Sari Dinaryanti[3]
[1,2,3]Sekolah Tinggi Ilmu Kesehatan Pertamedika, Jakarta, Indonesia

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ABSTRACT
Diabetes Mellitus is a metabolic disorder caused by impaired insulin function, leading to hyperglycemia (blood sugar <200 mg/dL). Its management includes pharmacological therapy (insulin) and non-pharmacological approaches, such as the use of cinnamon powder and honey. This study aims to determine the effect of the combination of cinnamon powder and honey on reducing blood sugar levels in Type II Diabetes Mellitus patients in RT 007 and 008/RW 05, Balekambang Subdistrict, East Jakarta. The research design used was a quasi-experimental design with a one-group pre-test post-test without control. The population consisted of Type II Diabetes Mellitus patients, with a sample of 32 respondents selected through consecutive sampling. The research instruments included a glucometer, observation sheets, cinnamon powder, and honey. Statistical analysis was performed using the Paired T-test. The results showed the average blood sugar level before the intervention (247.0 mg/dL) and after the intervention (222.7 mg/dL) using the combination of cinnamon powder and honey. The test results indicated a significant relationship between the combination of cinnamon powder infusion and honey with a reduction in blood sugar levels in Type II Diabetes Mellitus patients in RT 007 and 008/RW 05, Balekambang Subdistrict, East Jakarta, with a p-value = 0.000 < 0.05. This study provides recommendations for nursing services to implement non-pharmacological therapy to reduce blood sugar levels.

Corresponding Author:
Muhamad Tridhal Dadi Utomo
Sekolah Tinggi Ilmu Kesehatan Pertamedika, Jakarta, Indonesia
tridhalutomo@gmail.com

INTRODUCTION

Diabetes Mellitus is a disorder of carbohydrate, protein, and fat metabolism characterized by increased blood glucose levels due to abnormalities in insulin secretion or decreased sensitivity to insulin. This condition can cause hyperglycemia, which, if not properly managed, can lead to serious chronic complications[1]. Diabetes Mellitus is classified into four categories: Type 1 Diabetes Mellitus, Type 2 Diabetes Mellitus, Gestational Diabetes, and Other Diabetes.

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Type 1 Diabetes Mellitus occurs when the pancreas cannot produce insulin, resulting in high blood sugar levels because the body is unable to transport sugar into the cells. This condition often emerges during childhood or adolescence with sudden and severe symptoms that can lead to coma if not treated promptly with insulin. Type 2 Diabetes Mellitus is a metabolic disorder marked by elevated blood sugar levels due to varying levels of beta-cell damage, ranging from dominant insulin resistance with relative insulin deficiency to predominantly insulin deficiency. Gestational Diabetes occurs during pregnancy, while Other Diabetes refers to secondary diabetes caused by conditions outside the common categories, such as insulin production disorders or interference with insulin function due to other diseases[2].

According to the International Diabetes Federation (IDF, 2019), the prevalence of Diabetes Mellitus (DM) cases has been increasing significantly. In 2019, global cases of DM reached 463 million. Projections suggest that by 2030, the number of cases will rise to 578 million, and by 2045, it is estimated to reach 700 million, indicating an urgent need for global action to prevent and manage this growing epidemic.

Indonesia, as a developing country, also has a high number of diabetes cases. According to Wadja (2018), Indonesia ranks seventh among countries with the highest number of diabetes cases. The 2018 Riskesdas survey reported that the prevalence of diabetes increased to 8.5%. Additionally, doctor-diagnosed cases rose from 1.5% to 2% in the same year, according to the Ministry of Health, highlighting the growing health burden both nationally and globally[3][4].

The increasing number of diabetes cases is partly due to the lack of awareness of symptoms among individuals. Symptoms such as fatigue and weakness are often dismissed as the result of poor sleep, stress, or aging. However, people are often surprised and alarmed when diagnosed with diabetes, as the symptoms can develop gradually and vary depending on the affected organ. Two key symptoms of high blood sugar include increased urination frequency and volume, and excessive thirst due to fluid loss through urine[5]. The causes of Type 2 Diabetes Mellitus are often linked to unhealthy lifestyle factors, including obesity, hypertension, family history, age, childbirth history, genetics, alcohol, and smoking[6]. If left untreated, Diabetes Mellitus can lead to macrovascular complications such as kidney failure, stroke, heart disease, liver damage, and gangrene in the lower extremities. It can also cause microvascular complications, including diabetic retinopathy, neuropathy (nerve damage), and nephropathy [5]. Although diabetes is incurable, continuous management is essential to control blood glucose levels and improve the quality of life for those affected.

The management of Diabetes Mellitus relies on four main pillars: medical nutrition therapy, physical exercise, medication, and education. Consistency in these areas is key to effective diabetes management[7]. Treatment can involve pharmacological and non-pharmacological therapies. Pharmacological treatments include medications and insulin, but these can have adverse side effects[1]. As a result, people are increasingly seeking safer, natural alternatives. One popular non-pharmacological treatment is cinnamon.

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Cinnamon is a dried bark from trees of the genus Cinnamomum. It is commonly found in Indonesia's mountainous regions. The most frequently used type is Cinnamomum cassia, which originates from Southeast Asia, particularly Sri Lanka, and thrives in regions with temperatures between 10°C to 23°C at altitudes of 100 to 1200 meters above sea level. Other varieties include Cinnamomum aromaticum, Cinnamomum verum, Cinnamomum zeylanicum, and Cinnamomum burmannii, the latter being widely found in Indonesia[8]. Cinnamon contains essential oils such as eugenol and polyphenols, which enhance insulin receptor proteins in cells, thereby improving insulin sensitivity and lowering blood glucose levels (Farry [9]).

For those who find the scent of cinnamon overwhelming, it can be combined with honey. Honey is a sweet liquid produced by bees from plant nectar. Its composition depends on geographic origin, plant type, environmental conditions, climate, and processing methods. Honey mainly consists of fructose and glucose and contains carbohydrates that form a protective layer against bacterial growth[10]. It also contains small amounts of proteins, enzymes, amino acids, minerals, vitamins, aromatic compounds, and phenolics, providing numerous health benefits, including antioxidant, antibacterial, and hypoglycemic properties (Hermawan[11]).

Previous research by Azmaina, Juwita, L., & Amelia, S [1] on Type II Diabetes Mellitus patients in the Kumun Health Center found that after consuming cinnamon infusion, the average blood glucose level was 148.95 mg/dL, with a statistically significant p-value of 0.000, indicating the positive effect of cinnamon infusion on blood sugar reduction. A study by Novrian, F., & Hajar, S[12] found that blood glucose levels increased 15 minutes after consuming wild honey, with a mean of 115.91 and a standard deviation of 5.546, showing a significant difference with a p-value of 0.000 between pre- and post-consumption levels.

Based on preliminary research and interviews conducted on March 22, 2024, with health cadres in RW 05, Balekambang Subdistrict, Kramat Jati District, East Jakarta, it was found that RT 007 and 008/RW 05 have a population of 659 residents, comprising 205 households in RT 008 and 285 households in RT 007. The interviews revealed low awareness about healthy living, including poor diet and lack of physical activity. According to the head of RW 05, 90 residents have diabetes, with 49 of them not taking medication. Their blood sugar levels range between 230-321 mg/dL.

Interviews with 12 diabetes patients in RT 007 and 008 found that 7 (58.3%) reported symptoms such as numbness, fatigue, and drowsiness. They consume 2 tablespoons of honey daily but are unaware of cinnamon infusion as a treatment option due to its strong scent. Meanwhile, 5 (41.6%) who do not manage their condition reported frequent urination at night, blurred vision, hunger, tooth loss, and weight loss. Observations indicated that only 3 residents regularly consume cinnamon infusion for blood sugar management. Given these findings, the researcher is interested in conducting a study titled "The Effect of the Combination of Cinnamon Powder Infusion and Honey on Blood Sugar Levels in Type II Diabetes Mellitus Patients in RW 05, Balekambang Subdistrict, East Jakarta."

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METHOD

This study used a quantitative research method with a quasi-experimental design employing a pre-post test without control group design. The population in this study consisted of 49 Type 2 Diabetes Mellitus patients in RT 007 and 008/RW 05, Balekambang Subdistrict, East Jakarta. The sample size was 32 respondents, selected using consecutive sampling, where participants who met the inclusion criteria were enrolled in the study until a specific period was reached. The instruments used in this study were as follows:

a. Questionnaire on respondent characteristics covering age, gender, education, and occupation.
b. Glucometer to measure blood sugar levels before and after the intervention.
c. Cinnamon and honey:
    1. 3 grams of ground dried cinnamon (1 teaspoon) was added to 200 ml of hot water.
    2. After the mixture cooled slightly, 2 teaspoons of pure honey were added and stirred evenly.
    3. Once the infusion cooled, the cinnamon and honey drink was ready for consumption.
d. Observation sheets containing the results of blood sugar measurements before and after the intervention.
e. The study was conducted according to Standard Operating Procedures (SOPs).

RESULTS AND DISCUSSION

Univariate Results

Respondent Characteristics

a. Age

Table . Distribution of Respondent Characteristics Based on Age of Respondents with Type II Diabetes Mellitus

Age	Frequency	Percentage (%)
30-40 years old	11	34.4
41-50 years old	12	71.9
51-60 years old	9	28.1
Amount	32	100.0

Based on table 1, it shows that the characteristics of respondents based on age from 32 respondents, 12 respondents (71.9%) were aged 41-50 years, 11 respondents (34.4%) were aged 30-40 years, and 9 respondents (28.1%) were aged 51-60 years. The majority of respondents are aged 41-50 years (71.9%), aligning with the study by Azmaina et al [1], which found 70% of respondents in the same age group related to type II diabetes. This age is considered vulnerable as the aging process reduces the pancreas's ability to produce insulin, and most respondents have lived in the research location for a long time[13]

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b. Gender

Table 2. Distribution of Respondent Characteristics Based on Gender of Respondents with Type II Diabetes Mellitus

Gender	Frequency	Percentage (%)
Man	16	50
Woman	16	50
Amount	32	100.0

This study shows an equal distribution of respondents by gender, with 50% male and 50% female. These results differ from the study by Purnamawati & Kep[14], which found a majority of female respondents (67%) in research on the effect of cinnamon decoction on lowering blood sugar levels. Sex refers to the biological differences between males and females, which are fixed from birth, while gender reflects differences in roles and responsibilities shaped by social constructs[15]. The researchers concluded that respondents in RT 007 and 008 / RW 05, Balekambang Village, have a balanced gender distribution, supported by population data from the neighborhood head showing nearly equal numbers of males and females.

c. Education

Table 3. Distribution of Respondent Characteristics Based on Education of Respondents with Type II Diabetes Mellitus

Education	Frequency (people)	Percentage (%)
Elementary Education (SD)	7	21.9
Secondary Education (Junior High School,	17	53.1
Senior High School)	8	25
Higher Education (D3, S1, S2)		
Amount	32	100.0

Based on table 3, this study shows that the majority of respondents have a secondary education (SMP, SMA) at 53.1%, consistent with the study by Isnaniah & Nirwana[16], which recorded 63.3% of respondents with secondary education related to the effect of cinnamon infusion on blood sugar levels. Education aims to create a learning environment that fosters the development of students' potential, including intelligence, morals, and skills (Pristawanti et al., 2022). The researchers concluded that most respondents in RT 007 and 008 / RW 05, Balekambang Village, East Jakarta, have a secondary education due to low interest in further studies and the perception that SMP or SMA education is sufficient for employment.

d. Work

Table 4. Distribution of Respondent Characteristics Based on Occupation of Respondents with Type II Diabetes Mellitus

Work	Frequency	Percentage (%)
Work	28	87.5
Doesn't work	4	12.5
Amount	32	100.0

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Based on table 4, this study shows that the majority of respondents are employed (87.5%), in line with the study by Purnamawati & Kep[14], which found 63% of respondents working in relation to the effect of cinnamon decoction on blood sugar levels. Work is an activity performed to meet personal and societal needs while developing skills and responsibilities[17]. The researchers concluded that most respondents in RT 007 and 008 / RW 05, Balekambang Village, East Jakarta, are employed, primarily because their area is close to shopping centers, such as traditional markets, where many work as traders.

1. Average Blood Sugar Levels Before Given Combination Intervention of Cinnamon Powder and Honey Brew

Table 5. Average Blood Sugar Levels of Respondents Before Being Given a Combination Intervention of Cinnamon Powder and Honey Brewing Water to Reduce Blood Sugar Levels in Type II Diabetes Mellitus Patients

Blood sugar levels	Mean	Std. Deviation
Pre	247.0	49.01

Based on table 5, this study shows that the average blood sugar level of respondents before receiving the cinnamon and honey infusion intervention was 247.0 mg/dl. These findings align with the study by Syafriani & Verawati [18], which examined the effect of cinnamon extract on blood sugar levels in type II diabetes mellitus (DM) patients in Kumantan Village using a quasi-experiment with a non-equivalent pretest-posttest design. The intervention involved administering cinnamon extract twice daily for seven days, resulting in an average blood sugar reduction of 37.75 mg/dl, from 263.4 mg/dl to a lower level. Blood sugar refers to the level of glucose in the bloodstream, which comes from carbohydrates in food and is stored as glycogen in the liver and skeletal muscles[2]. Glucose is essential as an energy source for various biological processes in the body. The analysis revealed that respondents were in the high blood sugar category, with habits of insufficient physical activity and irregular eating patterns. Interviews indicated that type II DM patients often rest after morning activities and follow unhealthy diets. Managing DM requires a diet low in carbohydrates and fat, high in protein, regular exercise, sufficient sleep, and avoiding smoking and alcohol.

2. Average Blood Sugar Levels After Given a Combination Intervention of Cinnamon Powder and Honey

Table 6. Average Blood Sugar Levels of Respondents After Being Given a Combination Intervention of Cinnamon Powder and Honey Brewed Water to Reduce Blood Sugar Levels in Type II Diabetes Mellitus Patients

Blood sugar levels	Mean	Std. Deviation
Post	222.7	40.42

Based on table 6, this study shows that the average blood sugar level of respondents before the intervention with cinnamon and honey infusion was 247.0 mg/dl. These findings are consistent with the study by Azmaina et al[1], which recorded an initial average blood sugar level of 222.5 mg/dl. Cinnamon, derived from the dried bark of trees in the

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Cinnamomum genus, contains key components such as essential oils, eugenol, flavonoids, and polyphenols, which enhance insulin receptor proteins in body cells[8]. Honey, produced by Apis and Meliponinae bees, aids glycemic control, stimulates glucose uptake in peripheral tissues, and regulates enzymes involved in carbohydrate metabolism[19]. The researchers' analysis indicates that respondents' blood sugar levels slightly decreased after the intervention. Interviews revealed that diabetes symptoms experienced by respondents diminished after consuming the infusion regularly for seven days. Additionally, respondents began adopting a healthier lifestyle as recommended by the researchers, including maintaining a proper diet and engaging in physical activity.

3. Difference in Average Blood Sugar Levels Before and After Given a Combination Intervention of Cinnamon Powder and Honey

Table 7. Difference in Average Blood Sugar Levels of Respondents Before and After Given a Combination Intervention of Cinnamon Powder and Honey Brewed Water on Reducing Blood Sugar Levels in Type II Diabetes Mellitus Patients

Blood sugar levels	Mean	Std.deviation
Pre	247.0	49.1
Post	222.7	40.42

Based on table 7, it shows that giving a combination of cinnamon powder and honey infusion can reduce the average blood sugar level before the intervention was (247.0 mg/dl), while the average blood sugar level after the intervention of the combination of cinnamon powder and honey infusion was (222.7 mg/dl).

Bivariate Results

Table 8. The Effect of a Combination of Cinnamon Powder and Honey Brewed Water on Reducing Blood Sugar Levels in Type II Diabetes Mellitus Patients

Variables	Mean	SD	*P Value*	N
Blood Sugar Levels				
Blood Sugar Levels (Pre-post)	24.28	25.81	0,000	32

Based on the results of table 8, the study on the effect of cinnamon powder and honey infusion on reducing blood sugar levels in type II diabetes mellitus patients in RT 007 and 008 / RW 05, Balekambang Village, East Jakarta, a decrease of 24.28 mg/dl in respondents' blood sugar levels was observed. The statistical test using the Paired T-test yielded a p-value of 0.001 ($P < 0.05$). These results indicate that H0 is rejected, meaning the cinnamon and honey infusion had a significant impact. These findings align with Syafriani & Verawati's [18] study, which demonstrated a 37.75 mg/dl reduction in blood sugar levels after cinnamon extract intervention in type II diabetes mellitus patients, with a non-equivalent pretest-posttest statistical result of p-value 0.001 ($P < 0.05$). The study by Safitri et al[11] also supports these results, showing a 105 mg/dl reduction in blood sugar levels after the consumption of cinnamon and honey infusion in type II diabetes mellitus patients at Ketapang Health Center, with a p-value of 0.000 ($P < 0.05$), indicating a significant effect.

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Cinnamon reduces blood glucose levels due to flavonoid compounds that enhance the sensitivity of pancreatic beta cells to release insulin[1]. Honey, derived from *Apis* and *Meliponinae* bees, improves glycemic control, stimulates glucose uptake in peripheral tissues, and regulates the activity and expression of enzymes involved in carbohydrate metabolism[19].The researchers concluded that non-pharmacological management of type II diabetes through cinnamon and honey infusion positively impacts blood sugar reduction. While cinnamon lowers blood glucose by enhancing insulin release, honey improves glycemic control and glucose uptake. However, some respondents were still unaware of the benefits of this combination due to limited information.

CONCLUSION

Based on the research results and the discussion presented in the previous chapter regarding the effects of cinnamon powder and honey infusion on reducing blood sugar levels in type II diabetes mellitus patients in RT 007 and 008 / RW 05, Balekambang Village, East Jakarta, the researcher concludes: The majority of respondents are aged 41-50 years (71.9%), with an equal gender distribution of 50% male and 50% female. Most respondents have a secondary education (SMP/SMA) at 53.1%, and 87.5% are employed. The average blood sugar level before the intervention with cinnamon powder and honey infusion was 247.0 mg/dl. The average blood sugar level after the intervention decreased to 222.7 mg/dl. There is a significant effect of the cinnamon powder and honey infusion on reducing blood sugar levels in type II diabetes mellitus patients in RT 007 and 008 / RW 05, Balekambang Village, East Jakarta, as indicated by the statistical test result with a p-value of 0.000 < 0.005.

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