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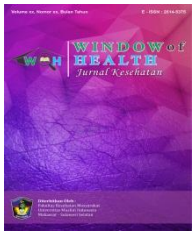

ARTICLE RESEARCH

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The Effect of Giving Ginger, Lemongrass, and Clove Capsules (JaSeKeh) in Helping Reduce Blood Glucose Levels in Women

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ABSTRACT

Diabetes mellitus is a disease characterized by elevated blood glucose levels (hyperglycemia), which occurs due to the body's inability to produce or effectively use the hormone insulin. According to data from *the International Diabetes Federation* (IDF), it is projected that by 2021, worldwide, 10.5% (537 million) of adults aged 20-79 years will be suffering from diabetes mellitus, and this number is expected to continue increasing annually. This study aims to determine the effect of taking ginger, lemongrass, and clove capsules (JaSeKeh) on helping to reduce blood glucose levels. The type of research is *true experiment* research, a *Pretest-Posttest Group design*. The population of this study comprised the entire community in the working area of Kassi Kassi Health Center, and the research sample consisted of 100 respondents selected using the *purposive sampling method.* The results showed that the average fasting blood glucose level in the intervention group decreased from 115 mg/dL to 94 mg/dL, with an average decrease of 21 mg/dL. The results of this study indicate a significant effect of ginger, lemongrass, and clove capsules (JaSeKeh) in helping to lower blood glucose levels (p<0.000).. The conclusion of this study is that taking ginger, lemongrass, and clove capsules (JaSeKeh) helps reduce blood glucose levels in the work area of the Kassi Kassi Health Center, Makassar City, South Sulawesi.

Keywords: JaSeKeh; Blood Glucose Level; Diabetes Mellitus

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INTRODUCTION

Non-communicable diseases have become a significant health problem worldwide. Non-communicable diseases such as diabetes mellitus are a leading cause of death and disability worldwide. Diabetes mellitus is a disease that develops slowly over a long period of time and is a leading cause of death worldwide. [(1)] Diabetes mellitus is a chronic disease because it can persist for years. It can kill a person slowly and silently, hence the name "silent killer." An unhealthy lifestyle is a major factor in the increasing prevalence of diabetes mellitus, particularly type II diabetes mellitus.. [(2)]

WHO data from 2020 shows that the number of people with diabetes mellitus reached 415 million and is expected to continue to rise. The death toll from diabetes reached 1.5 million. The WHO estimates that developing countries will be severely impacted by the diabetes epidemic in the 21st century. This is because more than 70% of people with diabetes live in developing countries. [(3)]

Data from the International Diabetes Federation (IDF) in 2021 explains that there are 10.5% (537 million) adults aged 20-79 years worldwide who suffer from diabetes mellitus and will continue to increase every year, it is predicted that cases of diabetes mellitus will increase to 11.3% (643 million) cases in 2030 and 12.2% (783 million) cases in 2040. Diabetes mellitus has caused 6.7 million deaths in 2021. [(4,,5,6,7)]

The prevalence of diabetes mellitus sufferers in Southeast Asia has reached 46.5 million people and is estimated to increase to 80.3 million people in 2025. The number of diabetes mellitus sufferers will continue to increase every year and is estimated to increase annually to around 21.3 million sufferers by 2030. [(8)]

South Sulawesi Province is one of the provinces in Indonesia with the third-highest prevalence of diabetes mellitus. The prevalence of diabetes mellitus ranked second among non-communicable diseases at 15.79% and the leading cause of death at 41.56% in South Sulawesi Province in 2020. This increase is double the previous Riskesdas data. The prevalence of diabetes mellitus increased from approximately 1,697 cases the previous year and is expected to continue to increase annually. [(9)]

If the prevalence of type II diabetes mellitus continues to rise, the mortality rate will also increase. Addressing this problem requires comprehensive treatment and prevention efforts. One approach that has been implemented is lifestyle changes, dietary adjustments, and careful use of medications, including those derived from herbal plants. [(10)]

The results of research conducted by Dewi N, Supriyadi S, Cita EE (2022) showed that the average blood glucose level before ginger therapy was 270.5. The average blood glucose level after ginger therapy was 222.75. There is a difference in blood glucose levels before and after ginger therapy in Diabetes Mellitus patients[(8)]. Similarly, research on lemongrass in type II diabetes sufferers conducted by Widaryanti & Tripramatasari in 2021 showed that administering a mixed extract of Ginger (Zingiber officinale Rosc.), Lemongrass (Cymbopogon nardus (L.) Randle), Cinnamon (Cinnamomum burmanii B.) has an effect on reducing blood glucose levels and improving pancreatic histology. The dose of

mixed extract of Ginger (Zingiber officinale Rosc.), Lemongrass (Cymbopogon nardus (L.) Randle), Cinnamon (Cinnamomum burmanii B.) 400 mg/kg bb is most effective in reducing blood glucose levels.[11]

The results of trials on mice (Mus musculus) showed that administration of JaSeKeh extract was proven to be effective in reducing blood glucose levels. In the positive control group, there was a significant decrease of 16.7 mg/dL on day 1, 56.98 mg/dL on day 7, and 98.31 mg/dL on day 14 (p = 0.000). Meanwhile, in the negative control group, blood glucose levels did not show a significant decrease, even only a slight increase. In the treatment group, a dose of 200 mg/kgBW reduced blood glucose levels by 13.88 mg/dL on day 1, 42.92 mg/dL on day 7, and 73.19 mg/dL on day 14.

METHOD

This type of research uses a true experiment with a *Pretest-Posttest Group design*. Researchers provide treatment to the study group by examining fasting blood glucose levels first, (*pre-test*) then an intervention is carried out by administering ginger, lemongrass, clove capsules (JaSeKeh) with a dose of 500 mg/capsule consumed twice a day (morning, evening) for 14 days after 14 days, then blood glucose levels are measured again (*post-test*) to determine the effect of administering ginger, lemongrass, clove capsules (JaSeKeh) in helping to reduce blood glucose levels. Adapun izin etik diperoleh dari lembaga etik Universitas Muslim Indonesia dengan No. 222/A.1/KEP0UMI/IV/2025.

The population of the study was the entire community in the working area of the Kassi Kassi Health Center, Rappocini District, Makassar City, South Sulawesi. The sample used was 100 respondents, with a *purposive sampling method* . The Inclusion Criteria: have undergone random blood sugar level screening, fasting blood glucose level of around 125 mg/dl or more, Middle adult productive age 30-59 years, Female gender, Not currently receiving medical treatment or additional therapy, No history of heart and ulcers, No complications of other diseases, PMO (Medication Supervisor), Willing to consume JaSeKeh capsules, willing to follow the education that has been designed, Able to communicate and understand instructions in providing education, No history of allergies to ginger, lemongrass, and cloves and Signed informed consent as a sign of agreement to participate in the study. Exclusion Criteria: Aged <18 years and >59 years, Patients are pregnant, have a history of heart, ulcers and other disease complications, have a history of allergies to ginger, lemongrass, cloves, Not able to communicate well and Currently undergoing additional treatment or therapy.The data analysis used in this study was a 2-group paired t-test, namely the paired t-test if normally distributed if not continued with the Wilcoxon test. Furthermore, the data is displayed in the form of tables and narratives. Before the data is analyzed, it is necessary to test the data using the data normality test (test of normality) to determine whether the data obtained is normally distributed or not. The presentation of this data is carried out from the results of data processing and data analysis presented in the form of tables and explained in narrative form.

RESULTS

Respondent Characteristics

Table 1. Distribution of Respondents Based on Age

Age	n	%
15-45 Years	53	53
46-59 Years	47	47
Total	100	100

Table 1 shows that the majority of respondents are in the 15–45 year age group, namely (53%), while the 46-59 year age group is (47%).

Table 2. Distribution of Decrease in Blood Glucose Levels After Administration of JaSeKeh Capsules

Average Decrease	n	%
0-20 mg/dl	59	59
21-40 mg/dl	19	19
41-60 mg/dl	18	18
61-80 mg/dl	4	4
Total	100	100

Table 2 shows that most respondents experienced a decrease in random blood glucose levels, namely the highest decrease in the range of 0-20 mg/dl of 59%. While the lowest average decrease was 41-60 mg/dl, or 4%.

Table 3. Distribution of Fasting Blood Glucose Level Decrease in Diabetes Cases After JaSeKeh Intervention

NO	Fasting Blood Glucose Levels (Pre-Test)	Fasting Blood Glucose Levels (Post-Test)	Decreased Fasting Blood Glucose Levels
1	123	107	16
2	117	86	31
3	110	82	28
4	125	97	28
5	115	101	14
6	102	79	23
7	107	104	3
8	109	89	20
9	125	101	24
10	120	107	13
11	112	86	26
12	110	92	18
13	117	84	33
14	108	87	21
15	125	107	18
Average	115	94	21

Table 3, It was observed that fasting blood glucose levels decreased in the majority of respondents. Before the intervention, the average fasting blood glucose level was 115 mg/dL, while after the intervention, the average decreased to 94 mg/dL. Thus, the average decrease in fasting blood glucose levels was 21 mg/dL.

Table 4. Distribution of Fasting Blood Glucose Level Decrease in Diabetes Cases After Educational Intervention

NO	Fasting Blood Glucose Levels (Pre-Test)	Fasting Blood Glucose Levels (Post-Test)	Decreased Fasting Blood Glucose Levels
1	121	119	2
2	110	107	3
3	102	80	22
4	110	108	2
5	107	101	6
6	101	95	6
7	123	120	3
8	101	87	14
9	117	110	7
10	122	117	5
11	100	86	14
12	120	110	10
13	100	104	-4
14	112	94	18
15	109	100	9
Avergae	110	103	7

Table 4, It was observed that fasting blood glucose levels decreased in most respondents. Before the intervention, the average fasting blood glucose level was 110 mg/dL, while after the intervention, the average decreased to 103 mg/dL. Thus, the average decrease in fasting blood glucose levels was 7 mg/dL.

Table 5. Normality Test of Random Blood Sugar Level Data

Variables	Kolmogorov-Smirnov		
	Statistics	df	Sig
JaSeKeh Pre-Test	0.140	100	0.000
JaSeKeh Post-Test	0.113	100	0.003

Table 5 shows the normality test using the Kolmogorov-Smirnov test; the random blood glucose levels were not normally distributed ($p < 0.05$).

Table 6 shows that in the measurements before and after treatment (consumption of JaSeKeh capsules), there were 97 respondents who experienced a decrease in blood glucose levels, as indicated by a negative rank value of 97 with a mean rank of 49.00. This shows that most respondents experienced a decrease in blood glucose levels after the intervention. Meanwhile, there were no respondents who experienced an increase in blood glucose levels (positive ranks = 0), and as many as 3 respondents had the same blood glucose levels before and after the intervention (ties = 3). The significance value

(p0.000<0.05 indicates that there is a significant effect on the administration of JaSeKeh capsules in helping to reduce blood glucose levels.

Table 6. Wilcoxon Test of the Effect of JaSeKeh Capsule Administration

Variables	Negative Ranks		Positive Ranks		Ties	*p value*
	Mean	f	Mean	f		
JaSeKeh Post Test - JaSeKeh Pre Test	49.00	97	0.00	0	3	0.000

DISCUSSION

Respondent Characteristics

The results of this study indicate that the majority of respondents are in the 45–59 age group, namely 24 respondents (80%), while the remaining 6 respondents are in the 35–45 age group, namely 20%. This indicates that the majority of respondents are in the productive age group, both young adults and middle adults.

According to the Indonesian Ministry of Health (2020), productive age is the age group of 15–59 years, who are generally still physically and economically active, but remain at risk of experiencing metabolic disorders such as diabetes. This risk is mainly influenced by an unhealthy lifestyle, such as an unbalanced diet, lack of physical activity, stress, and other bad habits that are common in the productive age group. In addition, with increasing age, especially entering the age of over 40 years, there is a decrease in pancreatic function and insulin sensitivity which can increase the risk of impaired glucose tolerance. (12)

Diabetes mellitus often occurs in women, due to unhealthy lifestyles such as rarely exercising due to daily activities, consuming foods containing sugar which triggers increased blood sugar levels in women who are at greater risk than men. Research in South Brazil on 2,295 women showed a prevalence of diabetes of 15.51% . The main risk factors are waist circumference and high body mass index, confirming the increased prevalence of DM in women, because women have unhealthy diets and often consume fatty and sugary foods. (13)

The decrease in blood glucose levels that occurred varied in each respondent. This shows that the body's response to the JaSeKeh intervention can vary depending on the metabolic condition of each individual. This fact is in line with the theory that the combination of ginger and lemongrass herbs has the potential as an additional therapy in managing blood glucose levels through anti-inflammatory, antioxidant effects, and increased insulin sensitivity. (14)

The Effect of Giving Ginger, Lemongrass, Clove Capsules (JaSeKeh) in Helping Reduce Blood Glucose Levels During Pregnancy

The results of this study indicate that the case group comprised residents within the Kassi-Kassi Community Health Center (Puskesmas) working area who met the criteria and were given treatment in

the form of JaSeKeh capsule consumption without education. This case group consisted of 15 respondents who received the intervention of JaSeKeh capsule consumption twice daily, in the morning and evening, for 14 consecutive days. Statistical analysis using the Shapiro-Wilk test showed a p-value of >0.05. This indicates that all data were normally distributed, thus meeting the requirements for parametric testing. Therefore, the data analysis in this study used the Paired Sample T-Test.

This study showed a significant difference between fasting blood glucose levels before and after the intervention. The decrease in blood glucose levels is strongly suspected to be related to the active ingredients in JaSeKeh capsules, which consist of ginger, lemongrass, and cloves. Ginger contains gingerol which acts as an antioxidant and antidiabetic by increasing insulin sensitivity. Lemongrass is known to have citral compounds that can help control blood sugar levels through anti-inflammatory effects and increased metabolism. While cloves contain eugenol which has hypoglycemic activity, namely lowering blood sugar levels by increasing insulin action.

Based on the phytochemical and pharmacological theories of medicinal plants , bioactive compounds such as gingerol in ginger, citral in lemongrass, and eugenol in cloves have the ability to modulate glucose metabolism pathways through various mechanisms. Gingerol, for example, has been scientifically proven to increase glucose uptake by muscle cells by activating the AMPK *(AMP-activated protein kinase) pathway ,* a pathway that is also activated by exercise and metformin, thereby improving insulin sensitivity. Citral in lemongrass functions as a natural anti-inflammatory. In type 2 diabetes, chronic inflammation can make it difficult for the body to respond to insulin. Citral helps reduce inflammation by suppressing inflammatory substances such as TNF-α and IL-6, thereby improving the way insulin works. Meanwhile, eugenol in cloves is known to activate PPARγ (*Peroxisome Proliferator-Activated Receptor gamma*) receptor , which is a nuclear receptor that plays a role in regulating the expression of genes that regulate glucose and lipid metabolism. PPARγ activation has long been known as the target of antidiabetic drugs in the thiazolidinedione group, which work by increasing insulin sensitivity and reducing fasting blood glucose (Wright et al., 2000). Therefore, the combination of the three active ingredients in JaSeKeh capsules shows a synergistic effect in regulating blood glucose levels, both through increasing glucose use by cells, suppressing inflammation, and modulating genetic expression. [15]

These findings are supported by several previous studies showing that this herbal ingredient has the potential to lower blood glucose levels, both individually and in combination with ginger, lemongrass, and cloves. Furthermore, regular capsule administration and patient compliance also contributed to the results.

Previous research that is in line with this research on the effect of ginger on diabetes mellitus patients showed that there was a decrease in blood glucose in the ginger group, a decrease of 9.1 mg/dL from the initial measurement of 131.0 mg/dL to 121.9 mg/dL in the 12th week, so it can be said that there is an effect of ginger (Zingiber officinale) in reducing glucose levels in type 2 diabetes mellitus patients. [16]

This study is in line with research conducted by Shidfar et al. (2024), which showed that giving ginger as much as 3 grams per day for 12 weeks significantly reduced fasting blood glucose and HbA1c levels in patients with type 2 diabetes. In that study, the group consuming ginger experienced a decrease in fasting glucose by 19.4 mg/dL and a decrease in HbA1c by 0.77%, compared to the control group, which showed no significant changes. These findings support the results of our study, where the intervention of capsules containing ginger, lemongrass, and cloves showed potential in reducing the blood glucose levels of respondents. The antihyperglycemic effect of ginger in the journal is thought to originate from its ability to increase insulin sensitivity and suppress oxidative stress, which can provide a synergistic effect when combined with lemongrass and cloves, which have similar mechanisms. This strengthens the scientific basis for the use of herbal combinations as adjunctive therapy in the management of type 2 diabetes.

Previous research, consistent with this study, on the effect of clove powder on fasting blood glucose levels showed that doses of 1, 2, and 3 grams/day reduced blood glucose levels by 0.52 + 24.4; 2.46 + 18.7; and 13.3 + 16.3 mg/dl for FBG, and by 31.7 + 14.7; 38.32 + 27.2; and 31.11 + 32.5 mg/dl for GD2JPP. Furthermore, there was a significant difference (p=0.001) between groups in FBG levels. Adequate fiber intake is a variable that influences FBG levels, so clove powder can lower FBG levels and can be used as an alternative to prevent type 2 diabetes mellitus. [17]

Another similar study in 2024 stated that healthy and pre-diabetic volunteers who consumed 250 mg/day of clove polyphenol extract capsules for 30 days showed a significant reduction in post-prandial blood glucose levels in just the first 12 days, with pre-prandial glucose levels decreasing in the group with high baseline levels after 24–30 days of the intervention. This immediate effect is likely due to the inhibition of the enzymes α-glucosidase and α-amylase, which slow carbohydrate digestion and absorption. While long-term effects may involve increased insulin sensitivity and decreased hepatic glucose production, as supported by in vitro studies showing increased glucose uptake by muscle cells and inhibition of glucose production in hepatocytes. These results are highly relevant to this study, as they support that the clove component in the ginger-lemongrass-clove combination capsules not only has the potential to improve post-meal glycemic control but also helps stabilize fasting glucose levels. [18]

Research that supports the results of this study, where the combination of ginger (*Zingiber officinale*) and lemongrass (*Cymbopogon citratus*) has been shown to have the potential to help lower blood glucose levels in humans. The study explains that ginger has the effect of increasing insulin sensitivity and is an antioxidant and anti-inflammatory, while lemongrass functions to inhibit carbohydrate-digesting enzymes such as α-glucosidase, which plays an important role in slowing down the absorption of glucose from the intestine. When used together, ginger and lemongrass have a synergistic effect, namely complementing each other in the way they work, so that they can provide more effective results than when used separately. Based on the content of active compounds that act as antibacterial extracts from each, namely ginger, lemongrass and cloves. With the support of Christy et

al.'s research, the use of this herbal combination is increasingly scientifically proven as a promising natural approach to blood glucose management. (19,20)

Thus, the JaSeKeh capsule intervention can be considered an alternative complementary therapy that supports blood glucose management, particularly in individuals with prediabetes. The combination of ginger, lemongrass, and cloves contained in these capsules has hypoglycemic, anti-inflammatory, and antioxidant properties that play a role in increasing insulin sensitivity, improving glucose metabolism, and helping reduce post-meal blood glucose spikes. Therefore, this intervention has the potential to be a safe and natural alternative in efforts to prevent progression to type 2 diabetes. (21,22,23)

In addition to consistent research, there are also studies that show conflicting results. A study conducted by (Diakos et al., 2023) concluded that administering ginger at a dose of 1.2–2 grams per day for 4 to 12 weeks did not significantly reduce fasting blood glucose or HbA1c levels. Although some studies have shown positive results, the overall effect is considered inconsistent and not statistically robust. The authors stated that these inconsistent results could be due to various factors, such as differences in ginger dosage and dosage form (powder, capsules, or extract), too short a duration of administration, a small number of respondents, and the presence of lifestyle factors and patient diets that were not strictly controlled in this study. (24,25,26)

According to the researchers in the journal, the results of clinical trials indicate that consuming ginger alone does not significantly reduce fasting blood sugar levels. This finding differs from the results of this study, which showed a decrease in blood glucose levels after administering JaSeKeh capsules, a combination of ginger, lemongrass, and cloves.

This difference in results likely occurred because the journal only used ginger as the intervention, whereas in this study, three complementary herbal ingredients were used. Ginger alone may not be strong enough to significantly lower blood sugar levels in all individuals. However, when combined with lemongrass, which slows sugar absorption in the intestine, and cloves, which can help increase the body's sensitivity to insulin, the blood sugar-lowering effect becomes stronger and more effective. Thus, the journal shows that using ginger alone is not necessarily effective enough, while herbal combinations such as those used in this study can provide more optimal results.

CONCLUSION AND RECOMMENDATIONS

There was a significant effect of administering JaSeKeh capsules in helping lower blood glucose levels. The average fasting blood glucose level in the intervention group decreased from 115 mg/dL to 94 mg/dL, with an average decrease of 21 mg/dL. Increase the duration of JaSeKeh capsule administration and monitor blood glucose levels weekly, for example on days 7, 14, 21, and so on, until blood glucose levels return to normal.

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