

# The effect of the use of bitter melon (*Momordica charantia*) on reducing blood sugar levels in patients with diabetes mellitus

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## Abstract

*Diabetes Mellitus comes from the Greek diabainein which means "translucent" or "water fountain" this disease became known as diabetes. Diabetes mellitus is a metabolic disease characterized by symptoms of hyperglycemia due to impaired insulin secretion. Diabetes Mellitus is a serious chronic disease that occurs when the pancreas does not produce enough insulin (a hormone that regulates blood glucose). Bitter gourd (momordica charantia) in general is often used by people as a vegetable. In fact, bitter melon can be used as a herbal medicine, one of which is to lower blood glucose levels and can also be an alternative ingredient as a wound healer for diabetes mellitus. The aim of this research is to determine the effect of using bitter melon (momordica charantia) on reducing blood sugar levels in diabetes mellitus sufferers. Design: In this research, there is a study of literature and Google Scholar data sources (2017-2019) to take journals that are relevant to the suitability of the writing topic to be published in Indonesian. This research is a type of literature study research by examining journals related or related to bitter melon and blood sugar levels. A total of five selected journals were used in the literature study research. One journal boils bitter melon to reduce blood sugar levels. Three journals on making bitter melon extract to reduce blood sugar levels, and another journal about topical bitter melon for healing Diabetes Mellitus wounds. Giving bitter melon extract has an effect on reducing blood sugar levels. So it can be concluded that giving bitter melon extract can reduce blood sugar levels in Diabetes Mellitus sufferers. Suggestion: Can be used as a source of information and knowledge for nurses during the process of preventing diabetes mellitus by using bitter melon as an option.*

**Keywords:** Blood sugar levels; bitter melon (*momordica charantia*); Diabetes mellitus

## BACKGROUND

Diabetes Mellitus comes from the Greek diabainein which means "translucent" or "shower", Mellitus which means "sweet taste" This disease came to be known as diabetes. Characterized by a continuous and varied increase in blood sugar levels or hyperglycemia, especially after eating. Other sources say that diabetes mellitus is a state of chronic hyperglycemia accompanied by various metabolic disorders due to hormonal disorders. This can cause various chronic complications in the eyes, kidneys, and blood vessels (Sunaryati, 2014).

Diabetes mellitus (DM) is a metabolic disease characterized by symptoms of hyperglycemia as a result of impaired insulin secretion. Lack of the hormone insulin that functions to utilize glucose as a source of energy

and synthesize fat is caused by the pancreas is no longer able to secrete insulin, while the lack of the hormone insulin is relatively caused by insufficient insulin production with the body's needs.(Kadek et al., 2021)

In 2017, the World Health Organization (WHO) found that the number of Diabetes Mellitus patients had attacked 415 million people in the world in 2017, this number is estimated to increase to 642 million (55%). Diabetes Mellitus is the third largest death case in Indonesia at 6.7%, if not addressed, it will reduce productivity in stability, premature death.(Hayati et al., 2020)

According to the International Diabetes Federation (IDF), there are 425 million people suffering from diabetes in the world and this will increase by 629 million people by 2045. Indonesia

had more than 10,276,100 cases of diabetes in 2017 out of a total adult population of 166,531,000 which means there is a prevalence of diabetics of 6.7% and is ranked 6 of the top 10 countries for the number of diabetics.(Azizah et al., 2019)

Indonesia is currently ranked 7th country with the highest number of people suffering from DM in the world. Diabetes prevalence in Indonesia from 5.7% in 2013 to 6.9% or around 9.1 million for 2017. According to the provinces obtained data for DKI Jakarta 2.5%, Central Java 1.7%, North Sumatra 2.0%, Central Sulawesi 1.6%. While the mortality rate of gangrene ulcers in people with diabetes mellitus in Indonesia is as much as (17-32%). (Rahmasari & Wahyuni, 2019)

According to data from the North Sumatra Provincial Health Office, the number of people with diabetes mellitus in North Sumatra each year has increased from January 2017 to April 2017 the incidence of category 1 diabetes is 18,358 patients and category 2 is 54,843 people. Diabetes mellitus sufferers in Deli Serdang reached an incidence of 2,275 cases in 2018 (Hayati et al., 2020)

According to basic health research (Riskesdas) 2013, the proportion of patients with each DM, impaired glucose tolerance (TGT) and impaired fasting blood sugar (GDP) was 6.9%, 29.9%, and 36.6%.(Fitriani & Erlin, 2019) Based on data from Riskesdas, 90% of diabetics are diagnosed with type 2 DM and of these most do not realize if they have DM so that it can cause complications. Government efforts in dealing with DM prioritize preventive and promotive efforts, by not neglecting curative efforts, and are implemented in an integrated and comprehensive manner between the government, the community and the private sector. Regulation of the Minister of Health of the Republic of Indonesia Number 1575 of 2005, established the Directorate of Infectious Disease Control which has the main task of independent people to live healthy lives through controlling risk factors for non-communicable diseases.(Rahmasari & Wahyuni, 2019)

People with diabetes have an increased risk of a number of serious health problems. Consistently high blood glucose levels can lead to serious illnesses that affect the heart and blood vessels, eyes, kidneys, nerves and teeth. In addition, diabetics also have a higher risk of

infection. In almost all high-income countries, diabetes is a leading cause of cardiovascular disease, blindness, kidney failure, and lower extremity amputations.(Azizah et al., 2019)

Bitter melon in general is often used by the community only as vegetables, and the leaves are just thrown away. Actually bitter melon can be used as herbal medicine, one of which is to lower blood sugar levels and as an alternative to treat diabetes mellitus wounds because the results of phytochemical content tests show that the content of flavonoids, tannins, saponins, steroids, alkaloids, and terpenoids contained in bitter melon. These compounds have antibacterial properties that are able to heal diabetes mellitus wounds.(Fauziah et al., 2019)

Research results (Rahmasari, 2019) with the title effectiveness *Momordica charantia* (bitter melon) against a decrease in blood glucose levels. And from the results (Hasibuan & Manurung, 2020) entitled the effectiveness of bitter melon juice on reducing blood sugar levels in patients with diabetes mellitus with hasil there is a significant influence on blood sugar levels of people with diabetes mellitus after giving bitter melon juice.(Rahmasari & Wahyuni, 2019)(Hasibuan & Manurung, 2020) And from another study conducted by (Widananta et al., 2018) with the title The effectiveness of bitter melon water partitions on reducing blood sugar levels of diabetic mice. The results showed that bitter melon water partitioning at a dose of 50 mg / kg body weight can reduce blood glucose levels. And from the results (Adnyana et al., 2017) with the title anti-diabetic effect of bitter melon on blood glucose levels. Results show that bitter melon extract has antidiabetic effects that can lower blood sugar levels.(Kadek et al., 2021) And from the results (Pazry et al., 2017) entitled the potential of bitter melon leaf ethanol extract as an Alternative Healing Drug for Diabetes Mellitus Wounds on the backs of mice. The results of phytochemical content tests show that the presence of flavonoids, tannins, saponins, steroids, alkaloids, and terpenoids is able to heal wounds. Based on the explanation above, researchers are interested in conducting a literature study on the effect of bitter melon use on reducing blood sugar levels in people with diabetes mellitus using bitter melon in 2021.(Widananta et al., 2018)(Pazry et al., 2017)

## METHOD

The type of data used is secondary data. The method used is a *literature study* or systematic literature review. A method that identifies, assesses, and interprets findings on a research topic to answer predetermined questions. The keywords used are Diabetes Mellitus, Decrease in blood sugar levels, Pare. The research was carried out using literature studies in May-October 2021. The population in this study was the entire journal that deals with the effectiveness of bitter melon and the reduction of blood sugar levels. The sample in this study was a subset of the population that met the inclusion criteria and had no conditions on the exclusion criteria.

This research began searching research journals using an accredited electronic database, *Google Scholar*, by typing the keywords Laka Bakar and Daun Binahong. Grouping research journals based on the Effect of Binahong Leaf Extract on the Healing Process of Burns, then selecting research journals, journals based on inclusion and exclusion criteria year, publikasi, indexes based on the Effect of Binahong Leaf Extract on the Healing Process of Burns, then reading isi research journals carefully and presenting in chapters the results and discussion of research journal reviews, conclusions and suggestions.

## RESULT

According to research from the 5 journals above, it can be known that bitter melon extract or the benefits of bitter melon can have a good effect on reducing blood sugar levels. This is because bitter melon contains charantin. The content of saponins, flavonoids, polyphenols, and vitamin C bitter melon serves as an antioxidant that aims to ward off free radicals that can interfere with the survival of Leydig cells due to diabetes mellitus. This is in accordance with the five journals that have been reviewed above.

Research results of Rahmasari (2019) The effectiveness of *memordoca charantia* (bitter melon) against reducing blood glucose levels.

This study used a sample of 23 female and male respondents. Most of the female respondents were 15 respondents (62.5%), and a decrease in glucose levels was seen in the treatment group, the majority of glucose levels in the blood of respondents were 140-200 mg / dl.

Most respondents were aged 51-60 years in both the treatment and control groups, the highest proportion in the age group of 55-64 years. The majority of respondents were high school education. Based on the decrease in blood glucose levels in the treatment group before and after the intervention, namely the GDS of patients before the intervention > 200 mg / dL both in the treatment group and in the control group. While the majority of GDS respondents after intervention was 140-200 mg / dl. The effectiveness of *memordoca charantia* (bitter melon) against reducing blood glucose levels was given 3 times in 1 week for 1 month. This study used quasi-experimental methods, quasi-experimental including the type of research that tested with one group or respondents after the control group and before the treatment group. In this study, the GDS of patients before the intervention was >200 and after the intervention was 140-200 mg / dL.

According to (Ikrima Rahmasari, 2019) In bitter melon there is also phytonutrient content, which is one type of insulin plant that is very known to reduce blood sugar levels, besides that there are also hypoglycemic agents or charatin which will help increase the absorption of glucose and glycogen synthesis in liver cells, so that with these compounds bitter melon is considered to reduce blood sugar levels in people with diabetes mellitus. (Rahmasari & Wahyuni, 2019)

In line with research conducted by Benny (Pratama, 2011) the content of bitter melon that is useful in reducing blood sugar levels is charatin, the mechanism of action of charantin is to stimulate pancreatic gland beta cells to produce more insulin, and increase glycogen reserves in the liver

Research Results (Hasibuan & Manurung, 2020) the effectiveness of bitter melon juice on reducing blood sugar levels in patients with diabetes mellitus.

This study used a sample of 42 male and female respondents. Most of the female respondents were 23 respondents (54.8%) and men as many as 19 respondents (45.2%) In terms of diet, the most respondents with a good diet were 25 respondents (59.5%), and the least with a bad diet, which was 17 respondents (40.5%), while in terms of heredity, the most respondents had diabetes in the family, namely 24 respondents (57.1%). And the least who do not have diabetes

in the family is as many as 18 respondents (42.9%) frequency and percentage of respondents based on age, gender, diet and heredity. The most respondents were in the age interval of 56-65 years, which was 24 respondents (57.1%), and the least respondents were in the age interval, from the results of statistical tests obtained the average mean blood sugar levels of respondents before the intervention 252.81 and after the intervention 259.48. The p-value is 0.490 at alpha 5%. Differences in the average blood sugar levels of respondents in the experimental group before and after the intervention (N = 21) This study used quasi-experimental methods, quasi-experimental including the type of research that tested with one group or respondents after the control group and before the treatment group.

From the results of statistical tests, the average mean blood sugar levels of respondents before the intervention were 247.67 and after the intervention 172.14. The p-value is 0.000 at alpha 5%. It can then be concluded that there is a significant influence on the blood sugar levels of diabetics before and after the intervention.

According to (Hasibuan & Manurung) The content contained in bitter melon is charatin which is suspended to reduce blood glucose levels by increasing gastric emptying so that glucose entering the intestine becomes inhibited and glucose levels in the blood do not increase. In addition, kharantin can stimulate pancreatic beta cells to produce more insulin, increase glycogen synthesis in the liver and increase glucose uptake in liver and muscle cells In line with research conducted by (Wulandari 2016), about the antihyperglycemia effectiveness test of bitter melon juice, that based on data analysis conducted in the treatment group the reduction in blood sugar levels occurred due to the elimination of glucose in the treatment group due to the influence of administration of test preparations.(Hasibuan & Manurung, 2020)

The results of the study (Widananta et al., 2018) the effectiveness of bitter melon water partition on reducing blood sugar levels of diabetic mice.

This study used a sample of 20 mice aged 3 months. Rats are first kept for 2 weeks in cages for adaptation to environmental conditions. All rats weighed and injected with S7Z at a dose of 40 mg/kg body weight intraperitoneally except control

rats (-). Rats were divided into four treatments, namely po: negative control (without extract), pl: positive control (STZ), P2: STZ + bitter melon extract 2% and P3: STZ bitter melon water partition 50 mg / kg body weight, each given to rats placed in separate cages. The treatment of 2% bitter melon extract and water partition was given on the 3rd day after S7Z injection until day 20. The amount of blood needed to measure blood glucose levels is 2.5-4  $\mu$ l. measurement of blood glucose levels using enzymatic methods, using the Glucose-Dr® device (brand GESGD-013) which reacts specifically with glucose contained in the blood.(Widananta et al., 2018)

From the results of the study, the results were obtained on day 4 to day 18 glucose levels of p3 group rats decreased, the decrease in glucose levels was clearly visible from day 11 with an average of  $189.2 \pm 113.84$  compared to day 4 with an average of  $538.8 \pm 136.847$  on day 18 there was a decrease in glucose levels in p3 group rats with an average of  $134.8 \pm 98.799$  From the results above, it can be concluded that bitter melon water partitions with a dose of 50 mg / kg body weight can reduce Blood glucose levels were markedly compared to positive controls and were indeed effective in lowering blood glucose levels of male white rats.

The results of the study (Adnyana et al., 2017) the anti-diabetic effect of bitter melon on blood glucose levels. This study used samples of 25 mice as experimental animals, aged 2-3 months. Rats were randomly divided into 5 groups, namely positive control (K +), treatment 0 (PO), treatment 1 (P1), treatment 2 (P2), and treatment 3 (P3). Each group consists of 5 repetitions. Mice were adapted for 7 days before treatment. Each group was placed in a separate cage and each group was given different treatment. During the study, rats were fed and drank ad libitum. The effectiveness of bitter melon extract (*Momordica charantia*) given once a day orally using gastric sonde for 21 days. From the results of this study we can know the increase in blood glucose levels of diabetic rats, the results of alloxane induction at the 0th hour in the positive control group (K +), P0, P1, P2 and P3 were  $>200$  mg / dl, while the average blood glucose levels of rats before treatment  $< 100$  mg / dl. Hyperglycemia in a group of alloxan-induced diabetic rats is thought to occur due to the toxic

effects of alloxane that damage insulin receptors accompanied by damage from cells  $\beta$  pancreas. The effect of bitter melon extract (*Momordica charantia*) to Langerhans cell count, blood glucose levels and white rat Leydig cell count. Treatment K (+) is treated with a standard diabetes drug, Glibenclamide which works by stimulating the release of stored insulin and increasing insulin secretion due to glucose stimulation. (Kadek et al., 2021)

For 21 days the K+ group, namely hyperglycemic white rats given 0.126 mg Glibenclamide showed higher average count of Leydig cell counts than those in the K- group, but the average number of Leydig cells in the K+ group was lower than in the Effects group For 21 days, the K+ group, namely hyperglycemic white rats given 0.126 mg Glibenclamide, showed higher average count results of the number of Leydig cells than in the K- group, however, the average number of Leydig cells in the K+ group was lower than in the P1, P2, and P3 groups. Through the results achieved by the K+ group, it illustrates that Glibenclamide's ability to increase the number of Leydig cells is lower than that of the P1, P2, and P3 groups. Glibenclamide is an oral antidiabetic drug class sulfonylurea that works to improve the ability of pancreatic  $\beta$  cells to secrete insulin.

For 21 days, the P1 group, namely hyperglycemic white rats given bitter melon extract 29 mg / kg bb / 1ml / day showed the average count of the number of Leydig cells was higher than in the K + group, but the average number of Leydig cells in the P1 group was lower than in the P2 and P3 groups. Treatment of bitter melon extract at a dose of 29 mg / kg has not been effective enough in its use for the purpose of increasing the number of Leydig cells in hyperglycemic white rats.

For 21 days, the P2 group, namely hyperglycemic white rats given bitter melon extract 50 mg / kg bb / 1ml / day (for 21 days) showed the results of counting the average number of Leydig cells higher ( $p < 0.05$ ) compared to the K + group, and P1. The therapeutic dose of bitter melon extract in the P2 group is the best dose in this study that can be used to increase the number of hyperglycemic white rat Leydig cells, considering that the dose of bitter melon extract 59 mg / kg bb / 1ml / day (P3) showed the results of

increasing the number of Leydig cells that were not significantly different ( $p > 0.05$ ) with the P2 group.

From the results of this study it can be concluded that bitter melon extract (*Momordica charantia*) at a dose of 50 mg / kg / 1ml / day can reduce blood glucose levels, increase the number of Langerhans island cell constituents and the number of hyperglycemic rat Leydig cells.

The results showed that the highest size of wound closure was found in P2 with an average wound closure length of 1.47 cm from the initial wound length of 1.5 cm, then P3 with an average wound closure length of 1.41 cm, P1 and K (+) treatment with an average closure length of 1.38 cm, and K (-) treatment with the lowest average wound closure length of 1.14 cm. The treatment group that had the highest average rate of reduction in wound length was shown in the P2 group, where on the 9th day left the wound length of 0.03 cm, then followed by the P3 group with a wound length of 0.09 cm on the 9th day. The P1 and K (+) groups had the same mean value on day 9 with the remaining wound length of 0.11 cm. The K (-) treatment group had the lowest average rate of wound length reduction with 0.35 cm remaining wound length on day 9.

From the data on the average development of wound length above, it can be seen that mouse wounds smeared with bitter melon leaf extract have the fastest healing rate compared to positive control K (+) smeared with povidone iodine and negative control K (-) smeared with 95% ethanol as placebo. The results showed that bitter melon leaf extract has the potential for wound healing by accelerating the healing process of mouse back skin wounds and has the best histopathological picture compared to control.

Based on 5 journals that have been studied, all journals show the effect of bitter melon (*Momordica charantia*) on reducing blood sugar levels in patients with diabetes mellitus before the intervention and after the intervention. These results showed that the administration of bitter melon extract (*Momordica charantia*) was effective against reducing blood sugar levels.

The results of 3 journals from 5 journals stated that reducing blood sugar levels using bitter melon extract (*Momordica charantia*) was more effective against reducing blood sugar levels in

people with diabetes mellitus. Then 1 more journal shows bitter melon boiled water can also lower blood sugar levels, and then 1 more journal shows topical use of bitter melon extract (*Momordica charantia*) can heal wounds.

According to the assumption of researchers that bitter melon (*Momordica charantia*) is effective against reducing blood sugar levels in people with diabetes mellitus, because bitter melon contains charatin, and saponins that will help increase the absorption of glucose and glycogen synthesis in liver cells, so that with these compounds bitter melon can reduce blood sugar levels in people with diabetes mellitus.

## CONCLUSION

After conducting research on "Study literature on the Effect of the Use of Bitter Melons (*Momordica Charantia*) on Reducing Blood Sugar Levels in Diabetes Mellitus Patients in 2021", it can be concluded as follows. Based on 5 journals that have been studied show that the effect of the use of bitter melon (*Momordica charantia*) on reducing blood sugar levels in patients with diabetes mellitus because bitter melon contains charatin which will help increase the absorption of glucose and glycogen synthesis in liver cells, so that with these compounds bitter melon can reduce blood sugar levels in people with diabetes mellitus.

For the next researcher who wants to do research about Study literature Effects of Bitter Melon's Use (*Momordica Charantia*) Against the reduction of blood sugar levels in patients with diabetes mellitus is expected to further expand the aspects studied, multiply in finding references, information and insights in using Study literature as a reference for compiling the final project.

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