

# Consumption of Purple Sweet Potato Snack Bar and Self Help Group for Blood Glucose Levels in Patients Diabetes Mellitus Type 2

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**Abstract:- Background:** Diabetes Mellitus is one of the most common chronic diseases in the world, occurs when insulin production in the pancreas is insufficient or when insulin cannot be used effectively by the body, so that blood sugar levels exceed the normal range. The increase in the prevalence of diabetes mellitus from year to year has increased significantly. Currently, diet management, exercise and the use of pharmacological therapy are options in the management of diabetes mellitus. In addition to this therapy, there is therapy by giving purple sweet potato snack bars and self help groups. **Purpose:** to prove the effectiveness of the intervention of a combination of purple sweet potato snack bar and self help group on fasting blood glucose levels of respondents with diabetes mellitus. **Methods:** This research is a true experimental study with a pretest-posttest design. This study had 60 respondents who were divided into 2 groups and were taken using non-probability sampling techniques with the stratified random sampling method. The study was conducted on March 12, 2022 – June 3, 2022. In this study, statistical analysis was carried out computerized. The pre-test post-test difference test uses the Wilcoxon test. Difference test between groups using Mann-Whitney. **Results:** This study showed that a significant difference before being given treatment with purple sweet potato snack bars 2x32 grams/3 days a week for 21 days and self-help group therapy for 3 meetings in 21 days showed a significant decrease from 173.30 mg/dl. to 130.03 mg/dl with a delta difference of -43.267 mg/dl in the intervention group, while the control group also decreased after giving self help group therapy for 3 meetings in 21 days showing a decrease from 189.53 mg/dl to 163.83 mg/dl with a delta difference of -25,700 mg/dl ( $p = 0.033$ ). **Conclusion:** Treatment in the form of purple sweet potato snack bar intervention and self help group had an effect on reducing fasting blood sugar levels of respondents with type II diabetes mellitus. type II diabetes mellitus patient.

**Keywords:-** Diabetes Mellitus Type 2; Purple Sweet Potato Snack Bar; Self Help Group.

## I. INTRODUCTION

According to the *International Diabetes Federation* (IDF) in 2019, diabetes mellitus is one of the most common chronic diseases in the world, occurring when insulin production in the pancreas is insufficient or at a time when insulin cannot be used effectively by the body. Diabetes Mellitus is one of the degenerative diseases that is an important concern because it is part of the four priorities of non-communicable diseases that always increase every year and become a threat to world health in the current era. (Saeedi et al., 2019).

The WHO also says about 422 million people worldwide have diabetes, the majority live in low- and middle-income countries, and 1.5 million deaths are directly attributed to diabetes each year. Both the number of cases and the prevalence of diabetes have steadily increased over the past few decades. (WHO, 2021). The prevalence of diabetes mellitus based on measurement results in the population aged  $\geq 15$  years according to the Basic Health Research (Riskesdas) in 2013 diabetes in Indonesia reached 6.9% while basic health research (Riskesdas) in 2018, showed that in Indonesia there was an increase in the prevalence of diabetes mellitus increasing to 10.9%, for the national level where the highest prevalence occurred in North Sulawesi around 3.0% and the lowest in the Papua region is around 1.1%. The prevalence of diabetes mellitus in Central Java based on Riskesdas 2018 in the population aged  $\geq 15$  years, according to the survey results showed results that reached 2.1% while in the city of Semarang alone it reached 1.8% who had diabetes mellitus. (Balitbangkes, 2018).

Untreated diabetes will result in complications and can attack all limbs caused by uncontrolled blood glucose levels in people with diabetes, diabetes control measures to prevent complications are very necessary, especially keeping blood sugar levels as close to normal as possible, but blood sugar levels that are completely normal are difficult to maintain, this is because patients lack discipline in carrying out a diet or unable to reduce the number of calories of his food. (Worang et al., 2013). (Armalia et al., 2020). The high incidence of diabetes mellitus is inseparable from lifestyle changes due to intense social and urban influences, some unhealthy lifestyles such as the habit of consuming fast food, lack of physical activity, smoking habits, and not

paying attention to diet management (Sasmiyanto, 2020). Diet management that is less related to blood glucose levels of people with diabetes mellitus where the better the patient's dietary behavior, the more controlled blood glucose levels in people with diabetes mellitus. (Dalle et al., 2021).

Treatment in the management of diabetes mellitus, which includes pharmacological treatment basically to keep blood glucose levels controlled, in addition to nonpharmacological therapy to maintain controlled blood glucose levels can be through effective dietary arrangements in controlling blood glucose levels, one of which is through the consumption of foods that do not cause a rapid increase in blood glucose. (Carella, 2016). Food consumption with high amylose content (>25%) and low glycemic acid (<55) is able to improve insulin sensitivity in people with diabetes mellitus, reduce the rate of glucose absorption, and is useful in blood glucose control so as to reduce the risk of complications in diabetics. (Carella, 2016). The use of processed foods with high amylose content and low IG has been widely found and developed to treat chronic diseases such as uncontrolled blood glucose levels (diabetes mellitus), including purple sweet potatoes, brown rice, wheat, and black rice. (Y. D. Putri, 2021). Functional food is a natural food or processed food that contains one or more components of bioactive compounds that can have a beneficial effect on health. (Kusuma et al., 2020). In food technology that are practically consumed such as snack bars. The production of snack bars as interlude food is increasingly varied, but the snacks made are usually high in calories, fat, and carbohydrates that are as delicious as possible. Making snack bars with purple sweet potato staples is expected to produce products that are not only liked but also have more benefits for health, namely rich in fiber, and low in glucose so that this purple sweet potato snack bar is good for consumption by the public, especially for DM sufferers. (Sabuluntika, 2013).

In Rhea's research, which makes processed food made from purple sweet potatoes, namely purple sweet potato pudding, which aims to determine the effect of giving d'bingu pudding made from purple sweet potatoes on reducing blood glucose levels in DM sufferers. the results of this study stated the average blood glucose levels before in the treatment group 275.17 mg / dl and the control group 263.7 mg / dl while the average blood glucose level after the treatment group was 221.87 mg / dl and the control group was 250.03 mg / dl. (Gipyapuri et al., 2020).

Another intervention strategy that can be implemented by involving the process of a diabetic group together with the community as a source of support through the formation of a *self-help group*. (Dinyati et al., 2019) *Self help group* is a collection of several people who provide support between them, in that group they share the problems they face, especially about the disease they are experiencing. (Sari et al., 2021). Previous research has been conducted by Mutianingsih in 2019 who wanted to know the effect of *self-help group* on *self-care* in DM patients with  $p = 0.001$  which means that there is an influence of intervention, with respondents 10 and 4 meetings for 14 days, where in this

study the indicator of *self-care* studied related to eating regulation, physical activity, control of blood sugar consumption of drugs and foot care. The blood sugar control indicator shows that *the self-help group* is effective in blood sugar control even though the score change is not too large in the pre-test, the average mean value of  $0.2 \pm 0.421$  while the post test score is  $1.2 \pm 2.097$ . (Dinyati et al., 2019).

According to Tesaviani in 2019 in his research emphasized that *self-help groups* can produce social relationships so that the expected goals are achieved, holistic treatment both physically and mentally is expected to be carried out by diabetes mellitus patients, namely *self-help groups*, namely groups consisting of diabetic mellitus sufferers who share problems with each other and provide support to each other, *self-jelp group* activities contains about the sharing of each sufferer. Some of the problems experienced by sufferers are lifestyle adjustments such as medication adherence, diet, stress management and physical activity. (Kusumastiwi et al., 2019).

The data above shows that, previous studies on foodstuffs about purple sweet potatoes and *self-help groups* were statistically significant to blood sugar levels, but clinically the researchers have not shown the achievement of normal values from checking blood sugar levels. To improve the health degree of diabetics mellitus, a combination intervention is needed, namely the provision of a purple sweet potato *snack bar* and a *self-help group*. This combination can improve insulin function and improve the knowledge and care independently of people with Diabetes Mellitus.

Previous studies have not been conducted on purple sweet potato *snack bars* against blood sugar levels while studies related to *self-help groups* have been linked to blood sugar levels. However, until now there has been no nursing field that investigates the provision of purple sweet potato *snack bars* combined with *self-help groups* in diabetics mellitus who are able to control blood sugar levels in hospitals, health centers and communities. In this regard, the author is interested in conducting research on purple sweet potato *snack bars* and *self-help groups* on the blood sugar levels of diabetics mellitus.

## II. METHOD

### A. Research Design

This type of research is a quantitative research with a *true experimental* research design with a *pretest-posttest randomized control trial* design. This study became two groups, namely the intervention group and the control group where the intervention group was given the consumption of purple sweet potato snack bars and a *self-help group* while the control group was given a self-help group and drug therapy.

**B. Setting and Samples**

The population in this study was all people with type II diabetes mellitus who carried out treatment in the work area of puskesmas Puduk Payung and Padang Sari for one year. Puskesmas Puduk Payung in 2021 as many as 115 people while in pudak umbrella as many as 110. Based on monitoring, respondents who suffered from type II DM at puskesmas Puduk Payung averaged 50 people per month for the past year and 60 people from Padang Sari health center.

The population used in this study was people with type II diabetes mellitus who experienced hyperglycemia in the work area of puskesmas Puduk Payung and Padang Sari and intervened for 21 days setiap responden. In this study, the number of respondents reached by researchers to be used as respondents was 60 respondents which were divided into 2 groups, namely the intervention group of 30 and the control group of 30 respondents with a *non-probability sampling* technique with a *proportional random sampling* method (male and female) for the male sex divided into 2 blocks L1= 15 (intervention and control), L2:15 (intervention and control), the female sex is divided into 2 blocks P1=15 (intervention and control), P2=15 (intervention and control), after obtaining the number of respondents will be divided into a combination group consisting of men and women. Likewise, the control group was divided into groups consisting of men and women.

**C. Intervention (Applies To Experimental Studies)**

The intervention group was given a combination treatment of konsumsi snack bar purple sweet potatoes as much as 2 x 32 grams (2 pieces) , and the administration of *self-help group* therapy for 21 days for 3 meetings, namely day 7, 14, for 21 days while still consuming anti-diabetic drugs, while in the control group only the group therapy was given *self help group* for 21 days for 3 meetings, namely day 7, 14, for 21 days while still consuming anti-diabetic drugs. The study was conducted in March-May 2022.

**D. Measurement and Data Collection;**

The instruments used in this study included respondents' characteristics sheets, lifestyle questionnaires, foodrecall logbooks, standard operating procedures for purple sweet potato snack bars and self-help groups, blood sugar levels taken from veins and examined using a spectrophotometer, observation sheets.

The data is collected by printing data (editing), complete data is then processed and then analyzed using SPSS for windows software version 26, interpreting the results, making reports on research results, revisions, and duplication of research results, and finally improving research results.

**E. Ethical Considerations.**

In conducting this research, the researcher pays attention to research ethics which include, explanation and consent, confidentiality, fairness, Ethical permission, benefits for respondents. Before collecting research data, obtain a research permit from the Head of the Master of Applied Health Nursing Study Program and ethical

clearance from the Ethics Committee of Health Research, Poltekkes, Ministry of Health, Semarang Researchers also obtained a research permit from the Semarang City Health Office through the General Sub-Section, Staffing of the Semarang City Health Office to collect data and research at the Puskesmas Puduk Umbrella and Padang Sari.

**III. RESULTS**

**Table 1. Proximate Analysis Results of Purple Sweet Potato Snack Bar Preparations.**

Parameter	Rate Results (%)
Water content	4,21
Ash Content	1,73
Protein Content	7,823
Fat levels	4,38
Carbohydrate Levels	81,857

Based on the results of table 1, the water content in the purple sweet potato snack bar product was found to be 4.21%, the ash content was 1.73%, the protein content was 7.823%, the fat content was 4.38% and the carbohydrate content was 81.857%.

**Table 2. Anthocyanin Levels in Purple Sweet Potato Snack Bars**

Sample	Aquades Solution, Vortex (mL)	Anthocyanin Levels mg/kg
Purple sweet potato snack bar(32g)	25	12,45

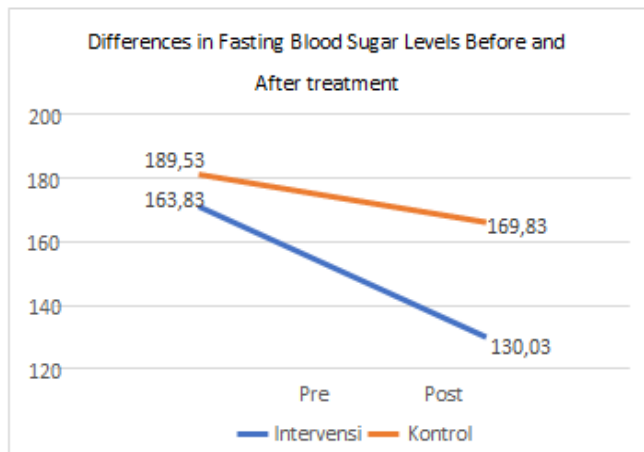
Based on Table 2, it shows the results of anthocyanin content analysis using distilled water, vortex on purple sweet potato snack bars showing a value of 12.45 mg/kg.

**Table 3. Descriptive Analysis of Fasting Blood Glucose Levels Before and After Intervention in the Intervention Group and Control Group**

Variabel		Intervensi	Kontrol
		Mean±SD	Mean±SD
GDP	Pre	173.30±52.013	189.53±46.137
	Post	130.03±34.392	163.83±44.415

Table 3 shows that the average fasting blood sugar level before treatment in the intervention group was 173.30 mg/dl (n=60) and 189.53 mg/dl in the control group and the average fasting blood sugar level decreased after being given the intervention in both the intervention group. as well as in the control group.

**Graph 1. Difference in Mean Fasting Blood Sugar Levels Before (pre test) and After (post test) Treatment in the Intervention Group and Control Group**



Graph 1 shows that there was a decrease in the average fasting blood sugar level after treatment in both the intervention and control groups. However, the decrease in the intervention group was greater than the control group, namely 173.30 mg/dl after before treatment to 130.03mg/dl (fasting blood sugar levels in the good category) after treatment. Meanwhile, in the control group the average fasting blood sugar level before treatment was 189.53mg/dl (fasting blood sugar level in the bad category) to 163.83mg/dl after treatment. fasting blood sugar before treatment was 189.53mg/dl (fasting blood sugar level in the bad category) to 163.83mg/dl after treatment.

**Table 4. Difference in Mean Fasting Blood Sugar Levels Before (pre test) and After (post test) Treatment in the Intervention Group and Control Group**

Group	Pre test MR±SR	Post test MR±SR	z	p
<b>Intervention</b> Sweet potato snack bar and self help group	15.50±465.00	.00±.00	-4.786	0.000
<b>Control</b> Self helpgroup	16.24±406.00	11.80±59.00	-3.569	0.000

Table 4 shows that fasting blood sugar levels in both groups before and after treatment experienced changes. The fasting blood sugar level value in the intervention group decreased after being given treatment and was included in the moderate fasting blood sugar level category of 130.03mg/dl (p=0.000), while the mean fasting blood sugar level value in the control group was included in the poor fasting blood sugar level category. 163.83 (p=0.000).

**Table 5. Difference in mean Delta Fasting Blood Sugar Levels Before and After Treatment Between the Intervention Group and the Control Group**

Variabel		Kelom Intervensi MR±SR	Kelompok Kontrol MR±SR	z	p
Sugar level fasting blood	Pre-test	26.02±34.392	34.98±1049.50	-1.989	0.047
	Post-test	22.03±661.00	38.97±1169.00	-3.757	0.000
( )Delta Sugar level fasting blood		-34.33±1030.0	-26.67± 800.0	-1.702	0.033

Table 5. shows that the mean value of fasting blood sugar levels between the combination group and the control group after receiving intervention was giving purple sweet potato snack bars 2 x 1 piece per day with a dose of 32 grams per piece, carrying out self-help group treatment for 3 meetings over 21 days. showed a significant reduction with the mean delta value for fasting blood sugar levels in the intervention group being greater than in the control group, namely -43,267mg/dl in the intervention group and -25,700 mg/dl in the control group (p=0.033).

**IV. DISCUSSION**

From the results of the Relative Risk Reduction (RRR) calculation for values on fasting blood sugar levels, the intervention got purple sweet potato snack bars and *self-help groups* , it can reduce therapeutic failure by 0.6 (60%) and patients get Metformin drug therapy of 500 mg, with *absolute risk reduction* (ARR) values or differences in failure to improve the therapy of giving purple sweet potato snack bars and *self-help groups* in the intervention group and control group by 0.4 (40%). And *the number of needed* (NNT) value is 2.5 which means that it takes 2-3 people to be given an intervention to give a purple sweet potato snack bar and *self-help group* to prevent 1 person from being hyperglycemic. Based on the analysis of RRR, ARR, and NNT data, it was concluded that the administration of purple sweet potato snack bar therapy and *self-help groups* and the administration of metformin 500 mg drugs can reduce fasting blood sugar levels for people with type 2 diabetes mellitus.

This purple sweet potato snack bar has physical and chemical qualities that are suitable for containing high protein, low fat, and high fiber which is good for people with diabetes mellitus. This purple sweet potato snack bar also has a very strong antioxidant activity because of its high anthocyanin content and contains low reduction sugar so that this purple sweet potato snack bar is feasible and good for consumption by people with diabetes mellitus. (Carella, 2016).

The purple sweet potato snack bar has a purplish color caused by the presence of anthocyanin pigments contained in it. Anthocyanins as phytochemical compounds have a water-soluble characteristic and can provide a natural purple color so that they are safe for consumption. (Dan et al., 2013). Anthocyanins have antioxidant abilities that are able to inhibit the work of free radicals that can repair pancreas  $\beta$  cells so that they can increase insulin secretion so that they are useful in controlling blood glucose levels. (Anjani et al., 2018) Snack bars from purple sweet potatoes have the lowest IG value of 21.54 compared to yellow sweet potatoes and red sweet potatoes, so that purple sweet potato snack bars are a good food for consumption by dm sufferers.

The *self-help group* formed through the group of respondents with type 2 diabetes mellitus through Puskesmas and Puskesmas cadres is able to become an effective means in empowering the community to improve health and control fasting blood sugar levels because activities are carried out regularly, namely 3 meetings for 21 days so as to reduce fasting blood sugar levels for people with type 2 diabetes mellitus. (Kusumastiwati et al., 2019).

The stimulation provided from this *self-help group* intervention is to increase respondents' knowledge in undergoing type 2 diabetes mellitus therapy by exchanging experiences and discussing and supporting each other fellow type II diabetes mellitus sufferers, respondents can increase experience and knowledge about how to control and reduce fasting blood sugar levels of people with type II diabetes mellitus. (Sudirman, 2018).

The control group in this study was only given pharmacological therapy and *self-help group* for 21 days. This is because respondents have the opportunity to share knowledge and experience through group discussions. That sharing knowledge or experience can only be done when each member has a wide opportunity to express his opinions, ideas, criticisms and comments to other members. The formation of self-help groups allows group members to expand social networks, receive information, and get emotional support from group friends so that they can provide many benefits in various ways. (C. R. Putri, 2020). Likewise, the mechanism of action of drugs in lowering blood sugar levels is to stimulate the pancreas glands to increase insulin production, reduce glucose production in liver, inhibit carbohydrate digestion so that it can reduce glucose absorption and stimulate receptors. (Theralisa, 2011)

In the treatment of diabetes mellitus, the therapy chosen should be one that has minimal side effects. In this era of globalization, purple sweet potato snack bars and *self-help groups* can be applied and chosen as alternative treatments for people with diabetes mellitus, because side effects are minimal. Treatment of diabetes mellitus with medication will cause several side effects such as diarrhea, vomiting nausea, decreased appetite, back pain and muscle pain. (Riwu et al., 2015). Therefore the addition of diabetes mellitus therapy with the consumption of purple sweet potato snack bar and *self help group*, in this case the purple

sweet potato snack bar is given continuously for 21 days while the *self help group* is given as much as 3 meetings in 21 days with a duration of 40 minutes in each meeting.

Research on interventions for giving purple sweet potato snack bars and *self-help groups* are more effective in lowering fasting blood sugar levels compared to research on foodstuffs made from purple sweet potatoes conducted by Rhea (2020) and research on *Self help groups* to reduce fasting blood sugar levels, namely Aghnia (2018). (Gipyapuri et al., 2020)(Dinyati et al., 2019).

In Rhea's research (2020), namely the Effect of Pemberian Pudding D'Bingu on Reducing Blood Sugar Levels in Patients with Type 2 DM with a quantitative type of research with a quasi-experimental design. This data analysis used a paired t-test and t-independent with a value of  $p = 0.000$  with *effect Size* = 0.5 (*modest*) with the treatment of getting 4 cups of d'bingu pudding for 3 consecutive days and taking the drug with an average value of blood sugar levels before treatment, namely blood sugar at 275.17 mg / dl which is converted into fasting blood sugar levels of 205 mg/dl, and after the intervention of 221.87 mg/dl which is converted into fasting blood sugar levels of 165 mg /dl which means that purple sweet potato pudding is effective in lowering blood sugar levels of people with type 2 diabetes mellitus. (Gipyapuri et al., 2020).

This is in line with the nonce (2022) research, namely the Administration of Purple Sweet Potato Spring Rolls against Controlling Blood Sugar Levels of Diabetes Mellitus Patients with a quantitative type of research design with a pseudo-experimental design, pre-test and post test in the treatment and control group. Dwas carried out in 60 samples consisting of 2 groups, namely 30 people in the treatment group and 30 people in the control group. Pthere were dm Type 2 respondents with a weight per fruit of 50 grams for 1 week (1 day given 2 spring rolls). With the average fasting blood sugar level, namely before treatment 278.53 mg / dl and after treatment 231 mg / dl with delta -46.80 ( $p < 0.001$ ) with *effect size* = 0.7 (Moderate). (Legi & Pascoal, n.d.).

Meanwhile, the *self-help group* research to reduce fasting blood sugar levels conducted by Aghnia (2018) showed that the *self-help group* administration with the study sample was 10 respondents and its implementation for four meetings in four weeks where in blood sugar control the score change was not large. In the pre-test, the average score was  $0.2 \pm 0.421$  while the post test score was  $1.2 \pm 2.097$ . Although in the implementation of self-help groups, education or understanding of the importance of glycemic control as management of the four pillars of DM management and self-care has been given. It does not appear to show a significant effect on blood sugar control scores. independently. (C. R. Putri, 2020).

As for the intervention study of the consumption of purple sweet potato *snack bars* and *self-help groups*, which was carried out for 21 days, purple sweet potato snack bars were consumed regularly every day as much as 2 pieces (62 grams), namely 1 piece (32 grams) in the mid morning and 1

piece (32 grams) in the afternoon. As for the self-help group, it is carried out for 3 meetings with a meeting duration of 40 minutes. Can reduce the average value of fasting blood sugar levels in people with type II diabetes mellitus with a value of  $p = 0.000$ . The average value of fasting blood sugar levels in the intervention group before treatment was 173.30 mg / dl (bad category) and the average fasting blood sugar level after treatment was 130.03 mg / dl (moderate category) or almost reached the good category number with a delta value of -43,267mg / dl While the control group of the average value of fasting blood sugar levels before treatment was 189.53 (bad category) mg / dl with the average fasting blood sugar level after administration treatment was 163.83(bad category) with an average delta value of -25,700 mg/dl.

To compare the results of the research of the researcher with other researchers, the calculation of *the effect size of the cohens'd* was used. The results of *Cohen's effect size* in the study conducted by Rhea were  $E_s = 0.5$  (Moddest) which means the administration of purple yam pudding and has a weak influence on blood sugar levels, and Nonce of  $E_s = 0.7$  (Mooderate) which means the administration of purple yam pudding and has a weak influence on blood sugar levels. Meanwhile, the results of calculating *Cohen's effect size* in the intervention study of purple sweet potato snack bar and *self-help group* to reduce fasting blood sugar levels were  $E_s = 0.85$ , which means that the intervention group in this study had a moderate effect on fasting blood sugar levels.

The results of statistical tests conducted by Rhea and Monce compared to researchers both had significant differences ( $= < 0.05$ ). However, when viewed from the results of calculating *the effect size cohen's* that the research conducted by Rhea has a lower *effect size* value compared to the intervention study of providing consumption of purple sweet potato snack bars and *self-help groups*, which means giving purple sweet potato snack bars and *self-help groups* its greater effect on fasting blood sugar levels is compared with the addition of purple yam pudding without a combination.

So that this purple sweet potato snack bar can also be used as an interlude food that has high antioxidant activity is very good for consumption by people with type 2 diabetes mellitus, this is because antioxidants can help minimize oxidative stress which can increase auto oxidation of glucose, amino acids and lipids that can provoke complications in DM type 2.

## V. CONCLUSIONS

### A. Conclusions

Based on the results of this study, it can be concluded that the intervention of purple sweet potato snack bars and *self-help groups* on fasting blood glucose levels of respondents with type 2 diabetes mellitus. This is evidenced that the treatment in the form of interventions in purple sweet potato snack bars and *self-help groups* had an effect on reducing fasting blood sugar levels of respondents diabetes mellitus type 2 which was carried out for 21 days

purple sweet potato snack bars consumed regularly every day as much as 2 pieces (62 grams) namely 1 piece (32 grams) in the mid morning and 1 piece (32 grams) in the afternoon with a decrease in the average value of fasting blood sugar levels in the group the intervention before treatment was 173.30 mg/dl (bad category) and the average fasting blood sugar level after treatment was 130.03 mg/dl (moderate category) or almost reached the good category with a delta value of -43,267mg/dl.

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