# Similirity_Efficacy of Therapeutic-DM Functional Drink

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# The Efficacy of Therapeutic-Diabetes Mellitus Functional Drinkon Blood Glucose and Plasma *Malondialdehyde (Mda)* Levels in Type 2 Diabetes Mellitus Patients

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**Abstract.**The long-time condition of hyperglycemia in type 2 diabetes mellitus (DM) will cause *glucose auto-oxidation,* which can increase *Reactive Oxygen Stress*. The improvement of the balance between the composition of the gut microbiota and host cells in DM patients with the concept of prebiotics and probiotics is one of the therapies that can be used to reduce the risk of ongoing *inflammation*. The purpose of this study was to examine the efficacy of the Therapeutic Diabetes Mellitus functional beverage product from local functional food on blood glucose levels and plasma *Malondialdehyde (MDA)* levels of patients with Type 2 DM.Thisstudy used a "pre-post test control design" research design. The research subjects were patients with type 2 DM as many as 46 people who were divided into two groups, namely the intervention group and the control group. Sampling by purposive sampling. The intervention was given in the form of a drink yoghurt*bengkuang tape ketanhitam* as much as 200 ml for 2 weeks. The statistical test used independent t-test. The results showed that there was no difference in the mean blood glucose levels of the samples before and after treatment of yobetam in the control group (4.9±39.3) and in the intervention group (-14.1±52,1). There was a difference in the mean levels of *MDA* in the samples before and after treatment of yobetamin the control group (0.16±0.39) and in the intervention group (0.46±0.37). It is hoped that the functional drink produced can be used as an alternative to oral therapy.
***Keywords***: *Blood Glucose;Malondialdehyde;diabetes mellitus*

## 1. Introduction

The increasing incidence of Type 2 Diabetes Mellitus (DM Type 2) worldwide is considered alarming, especially in the elderly population [1]. The prevalence of type 2 DM sufferers in Indonesia is estimated to increase from 6.9 million people in 2010 to 12 million people in 2030 [2], [3].Data from the American Diabetes Association, stated that 90-95% of the incidence of diabetes is type 2 diabetes, characterized by insulin resistance which resulted in hyperglycemia [4]. Hyperglycemia conditions for a long time will cause glucose autoxidation or non-enzymatic protein glycosylation reactions that can increase reactive oxygen compounds (ROS) [5], [6].

One of the specific environmental factors that play an important role in the development of metabolic disorders is the composition of the gut microbiota. Patients with diabetes and obesity are characterized by changes in the gut barrier that lead to disruption of the symbiotic relationship between the gut microbiota and host cells. [7], [8]. The concept of prebiotics and

probiotics is applied to health by improving the balance of intestinal microbiota by inhibiting the growth of harmful bacteria and stimulating beneficial bacteria to the host [9], [10].

The development of functional food ingredients as oral therapy for diabetes mellitus is one of the factors that has an important role in suppressing the occurrence of complications and reducing the mortality rate from diabetes mellitus [11]–[13]. Animal studies and several human studies have shown that functional foods and their bioactive compounds can control carbohydrate metabolism and hyperglycemia, and prevent micro and macrovascular complications [13]–[15].

The use of functional food ingredients and their bioactive compounds is an effective strategy for a complementary treatment for type 2 diabetes mellitus [1], [11], [14]. *Bengkuang* is a local food ingredient that has very good functional value, which contains the bioactive component inulin with a naturally sweet taste [16], [17]. This property of inulin is very useful for product applications for people with diabetes mellitus and those on a low-calorie diet[18]. Another known functional food ingredient is *tape ketanhitam*, which contains anthocyanins including the plavonoid group, which is a group of polyphenols that play a role in food because of their beneficial biological effects on the body [16], [19].

The functional food product that is currently being developed is yoghurt which is produced from fermented milk with added bacterial culture consisting of a mixture of Streptococcus themophilus and Lactobacillus bulgarius[20]. A study that analyzed the effect of probiotics on glucose metabolism using rats, revealed a decrease in fasting blood glucose and postprandial blood glucose and a decrease in HbA1C after consuming probiotics.[21]·[22].

The effect of fermentation causes a sour taste and smells, so that yoghurt is not liked by some groups of people [23]. *Tape ketanhitam* liquid contains lactic acid bacteria and proteolytic enzyme activity that is able to coagulate milk so that it can be combined with yoghurt to produce yoghurt with a sweet taste and not too sour so it is preferred [18].The results of the initial laboratory experimental research obtained a functional drink product in the form of *yoghurtbengkuangtape ketanhitam* which was named *Yobetam*. This *Yobetam* beverage product has been tested sensory (taste, aroma, color and texture). Viscosity tests have also been carried out to see the thickness of the drink, where *Yobetam* has a value of 150 poise or 150 d.Pa.S which is within normal limits [24], [25]and it is known that the nutritional content of protein is 1.9432%, fat is 1.3803%, Vitamin C 0.0361% and glucosecontent 0.9611%. This study continued to test the efficacy of therapeutic-diabetes mellitus functional drinkon *blood glucose*and plasma *malondialdehyde (mda)* levels in type 2 diabetes mellitus patients.

## 2. Methodology

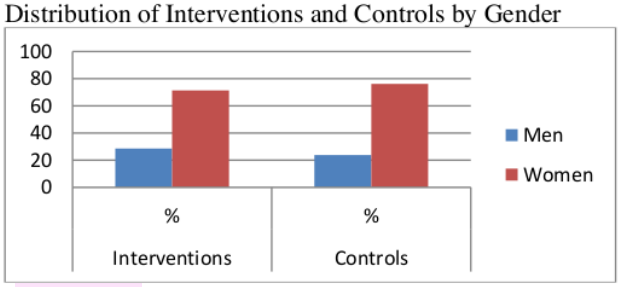
This study was an experimental study with a pre-post test control design. The sample in this study were patients who had been diagnosed with DM by doctors, aged 40 years and over, totalling 46 people, then divided into 2 groups, namely 23 intervention people and 23 controls. Purposive sampling technique. The dependent variable is fasting *blood glucose* level and *malondialdehyde* level (MDA). The independent variable was the intervention of 200 cc of *yoghurt bengkuang tape ketanhitam (Yobetam)* functional drink every day during 2 weeks.

The data was collected by means of interviews using questionnaires, forms and checklists, home observations by trained enumerators, direct measurements by professionals who were invited to work together, namely nutritionists, doctors, and health analysts. The implementation of the intervention was carried out by field workers who had been trained and invited to work together, namely 2 nutritionists as the daily person in charge. The data collected was data on the characteristics of research subjects, collected by means of interviews using questionnaires and direct observation. Anthropometric data were measured using standard procedures, fasting blood glucose levels were measured under fasting conditions for 8-12 hours and were examined using the enzymatic method using the enzyme glucose oxidase or hexokinase, and MDA measurements were carried out with using a spectrophotometer at an excitation wavelength of 515 nm and emission of 553 nm [10]. Data analysis using paired t-test if the data was normally distributed and the Wilcoxon test if the data is not normally distributed. This research is guided by 3 basic principles of research on humans by paying attention to the principles of respect for person, benefit and justice with the ethical review that has been carried out.

## 3. Result and Discussion

Based on the research that has been done, the characteristics of the sample can be seen in figure 1 below:

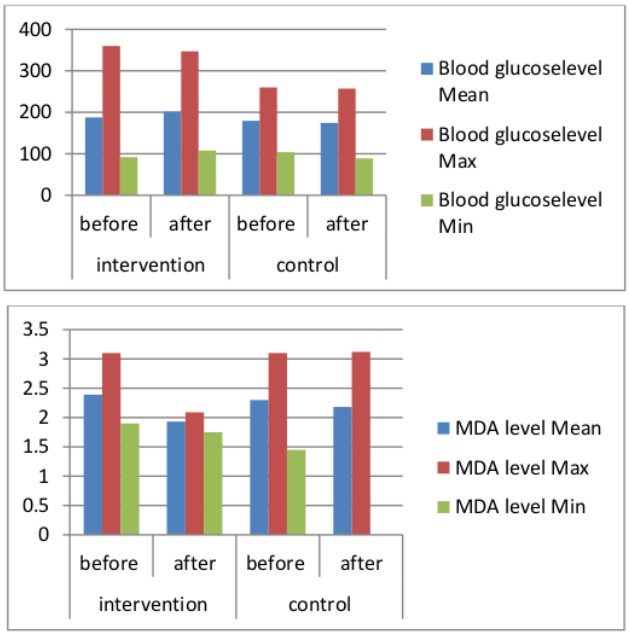
**Figure1.** Distribution of Interventions and Controls by Gender




Based on figure 1, it can be seen that there are more women than men with a percentage of 71.4% for the intervention while the control is 76.2%.

Based on the results of the study, the average *blood glucose* and *malondialdehyde (MDA)* levels before and after treatment of Yobetam can be seen in figure 2 below:

**Figure 2.** Average *Blood glucose* and *MDA* Levelsbefore and after giving Yobetam




In figure 2, it can be seen that the average intervention blood glucose level after being given treatment, namely 187.8 ± 65.9 (before) and 201.6 ± 66.6 (after). In the control, blood glucose levels decreased after being given treatment, namely 179.5±48.5 (before) and 174.6±44.0 (after). While the levels of *Malondialdehyde (MDA)* in the intervention and control decreased after being given treatment, namely intervention 2.39±0.37 (before) and 1.93±0.10 (after), control 2.30±0.44 (before) and 2.18±0.34 (after).

The intervention of functional drink of *yoghurtbengkuang tape ketan hitam (Yobetam)* as much as 200 ml per day for 15 days was given to 21 samples (intervention). The results of giving yoghurt to blood glucose levels and MDA intervention and control can be seen in tables 3 and 4 below:

**Table 1**.The Results of Mean Differences in Blood glucose levels before and after Giving Yobetam

| **Group** | **before (mean±SD)** | **after (mean±SD)** | **Differences (mean±SD)** | **p-value** |
|---|---|---|---|---|
| intervention | 187.8±65.9 | 201.6±66.6 | -14.1±52.1 | 0.189 |
| control | 179.5±48.5 | 174.6±44.0 | 4.9±39.3 | |

Table 1 can be seen that there was no difference in the mean blood glucose levels of the samples before and after yobetamtreatment in the control group (4.9±39.3) and in the intervention group (-14.1±52.1). The statistical analysis is known that the value of p = 0.189 means p> 0.05.

**Table 2**.The results of the mean difference in *MDA* levels

before and after giving Yobetam

| group | Before (mean±SD) | After (mean±SD) | Differences(mean±SD) | p-value |
|---|---|---|---|---|
| intervention | 2.39±0.37 | 1.93±0.10 | 0.46±0.37 | 0.006 |
| control | 2.30±0.44 | 2.18±0.34 | 0.16±0.39 | |

Table 2 can be seen that there is a difference in the mean levels of malondialdehyde (MDA) in the sample before and after yobetamtreatment in the control group (0.16±0.39) and in the intervention group (0.46±0.37). Statistical analysis is known that the value of p = 0.006 means p <0.05.

The results showed that statisticall, the yobetam treatmenthad no effect on blood glucose levels with a p-value of 0.189 (p>0.05). This is due to the small mean difference between the two groups, namely 8.3 which shows almost the same mean, so that the results of the significance test between the two groups have no significant difference. Blood glucose values in the control and intervention groups were close to the normal limits, namely 179.5 mg/dL and 187.8 mg/dL. In addition, the blood glucose value in the intervention group which did not increase significantly increased while the controlled group experienced an insignificant decrease.

Yoghurt is referred to as a probiotic drink, containing good bacteria while yam contains inulin which acts as a probiotic component because it can increase the growth of good bacteria, so that if yam juice is used in making yoghurt, synbiotic drink products will be produced [26]. Probiotics can lower blood glucose by increasing inflammation and preventing -cell destruction in animals. However, human clinical studies using various probiotics have had mixed results, some studies finding no effect, while other studies have identified a significant glucose-lowering effect.

The second assumption is that the research subjects are less obedient to their diet. Diet in maintaining theconsumedfoodis often an obstacle for people with type II diabetes mellitus, because they are still tempted by all forms of food that can worsen health. The weakness of this study was that it could not strictly control the diet of the research subjects.

The results showed that statistically, the treatment yobetam had an effect on malondialdehyde levels with a p-value of 0.006 (p≤0.05) [22] showed a decrease in plasma MDA levels after 12 weeks, in diabetic subjects who were treated with physical exercise and dietary restrictions.

Malondialdehyde is the end product of PUFA whose levels increase due to an increase in acyl-CoA activity. This causes oxidative stress, which is a state of imbalance between pro-

oxidants and antioxidants by the formation of Reactive Oxygen Species (ROS) that exceeds the ability of the antioxidant defence system, or decreases or persists the ability of antioxidants. The reaction between ROS and polyunsaturated fatty acids (on the cell wall) will result in the formation of aldehydes such as MDA through the lipid peroxidation process [27].

MDA is used as a marker of oxidative stress in people with diabetes mellitus and several other diseases. MDA can be found in plasma, serum, tissue and urine. Several indications of oxidative stress are related to lipid peroxidation and cellular damage. A high concentration of MDA indicates an oxidation process in the cell membrane. High antioxidant status is usually followed by a decrease in MDA levels. MDA was measured as the lipid peroxidase index in the patient's plasma. An increase in antioxidant activity will be able to reduce malondialdehyde levels in the body. Illustrates that antioxidants such as vitamin C, vitamin E, carotenoids present in fruits and vegetables provide protection against oxidative damage to lipid peroxidation and antioxidant status in this case was found to decrease. MDA value as an indicator of lipid peroxidation and antioxidant status.

## 4. Conclusion

There was no difference in the mean blood glucose levels of the samples before and after yobetamtreatment in the control group (4.9±39.3) and in the intervention group (-14.1±52.1). There was a difference in the mean levels of malondialdehyd (MDA) of the samples before and after treatment of yobetam in the control group (0.16±0.39) and in the intervention group (0.46±0.37).

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