http://heanoti.com/index.php/hn

RESEARCH ARTICLE

URL of this article: http://heanoti.com/index.php/hn/article/view/hn21015

Effectiveness of LPK Composite Flour as an Additive in the Formula of Enteral Diabetes Mellitus on Blood Glucose Levels of Type 2 Diabetes Mellitus Patients

I Gde Narda Widiada[1(CA)], I Ketut Swiryajaya[2]

[1(CA)]Department of Nutrition, Health Polytechnic of Mataram, Indonesia; g.widiada@yahoo.co.id (Corresponding Author)

[2]Department of Nutrition, Health Polytechnic of Mataram, Indonesia; mail-mang_ira@yahoo.co.id

ABSTRACT

Diabetes Mellitus (DM) is a group of metabolic diseases, more than 90-95% are Type 2 DM. Commercial enteral DM formulas such as diabetasol are quite expensive and there is a need for enteral DM formulas made from local foods that have the potential to be antihyglycemic and antidiabetic. Development of local food based enteral DM formulas with the addition of composite flour Labu Kuning, Kepok Banana and Green Beans (LPK). The food has a low glycemic index so that it can be used to control blood glucose levels in DM patients. The study was conducted to determine the effectiveness of LPK composite flour in the enteral DM formula for blood glucose levels in type 2 DM patients. Quasi experimental research, with a pre-post test with control group design. The treatment group was given FDM-LPK and the control group was given diabetasol, each 60 g per serving then measured blood glucose level 2 hours postprandial. Interventions are given for 5 consecutive days. The number of research subjects was 60 people consisting of 30 treatment people and 30 control people. Blood glucose in type 2 DM patients after 2 jpp in the treatment group and the control group showed a high average value (above 200 mg / dL). The treatment group ranged from 283.83 ± 103.62 mg / dL, while the control group ranged from 359.87 ± 134.43 mg / dL. On the second day there was a significant decrease in blood glucose levels ($p < 0.05$). While the 6th day there was a decrease in blood glucose levels but was not significant ($p > 0.05$). The provision of FDM-LPK by adding 85 g of LPK composite flour was effective to reduce blood glucose levels 2 jpp in type 2 DM patients. Reduction of blood glucose level of 2 jpp was 18.56%.

Keywords: LPK composite flour, FDM-LPK, Diabetes mellitus, Blood glucose

INTRODUCTION

Diabetes is one of the chronic health problems and the main cause of death in most countries. Diabetes mellitus (DM) is a metabolic disorder caused by abnormalities in insulin secretion, an imbalance between supply and insulin requirements, which is characterized by hyperglycemia. Several types are available, type 2 DM is one of the most found types, which is more than 90-95%[(1)]. According to the 2013 Basic Health Research (Riskesdas) report, the prevalence of DM in Indonesia was 1.5% and NTB was 0.9%[(2)].

Hyperglycemia is a condition that is often experienced by people with DM, which is indicated by an increase in blood glucose after meals or postprandial. One attempt to control postprandial blood glucose is to consume foods containing a low glycemic index and high in fiber[(3)]. Provision of nutrition in patients with DM needs to be considered, one of which is enteral therapy. Enteral formulas consist of various types, one of which is a standard enteral formula. Requirements for standard enteral formulas are energy content ± 1.0 - 1.2 kcal/ml, 40-60% carbohydrate, 30-40% fat, and protein 12-20%[(4)]. Standard enteral formulas made by hospitals are usually liquid and given to patients who cannot consume solid foods. The current commercial enteral DM formula (such as diabetasol) is quite expensive and currently there is no enteral DM formula based on local food which has the potential to be antihyglycemic and also antidiabetic.

West Nusa Tenggara is one of the provinces in Indonesia which is rich in local food, among others: beans such as green beans, bananas and pumpkin. Pumpkin (Cucurbita moschata) is one of many local foods from a class of vegetables that are antidiabetic and antihyperglycemic[(5)]. Pumpkin contains soluble fiber pectin and bioactive compounds such as proteins, peptides, polysaccharides, sterols, and acid aminobenzoates [(6)]. The content of polysaccharides is reported to increase serum insulin levels, and glucose tolerance, thereby reducing

blood glucose levels. Research in China in 2013 reported giving pumpkin extract 75 mg / kg body weight of rabbits for 21 days can improve blood glucose control, and repair pancreatic cells[7]. Pectin is said to be able to control glycemic levels because it has the ability to form gels[8].

Banana (*Musa paradisiaca L.*) is one example of local food from fruit groups. Bananas that flourish in NTB, can provide health benefits, both from fruit and flowers. Banana flowers are reported to reduce blood glucose levels[9], and as antidiabetic and can be used as a food supplement for diabetics[10]. Whereas in bananas, if consumed as much as 250 g every day for 4 weeks can significantly reduce fasting blood glucose[11]. Giving banana fruit (under cooked) with a high starch content, as much as 120 g / one meal for three meals, gives a low glycemic response when compared with mature bananas (low starch content)[12]. In addition bananas have a low glycemic load, so consumption of bananas can be recommended as a snack for diabetic patients who are under diet management with the aim of regulating blood glucose response between meals[13].

Other local foods are green beans. Mung bean (Vigna radiata L.) is a food that is rich in vegetable protein, minerals and dietary fiber. Green beans have been recommended as an alternative food for diabetics, because they are included in food with a low glycemic index and have shown the potential effects of hypocholesterolemia [14]. Mung beans both in the form of seeds and sprouts have antidiabetic properties[15]. Green beans also contain high amounts of isoflavones. The content of isoflavones in fresh green beans of 70.74 mg per 100 g of ingredients consisted of daidzein 35.88 mg, genistein 21.81 mg, and glycitein 13.05 mg[16].

Based on the above background and no previous research related to the use of LPK composite flour as an additive in enteral DM formula and its application to patients with Diabetes Mellitus (DM), it is necessary to conduct research on the effectiveness of LPK composite flour as an additive in the enteral DM formula to levels blood glucose 2 jpp type 2 DM patients.

The purpose of this is knowing the effectiveness of LPK composite flour in enteral DM formulas for blood glucose levels in type 2 DM patients.

METHODS

This study uses quasi experimental, with the control group pre-post test design. The treatment group was given FDM-LPK as much as 60 g per serving, then measured blood glucose levels 2 hours postprandial. While the control group was given diabetasol as much as 60 g per serving. Interventions are given for 5 consecutive days. This study used research subjects with type 2 DM patients in Pejeruk Urban Village, Mataram City. How to determine research subjects with purposive sampling. The number of research subjects was 60 people with type 2 diabetes mellitus, consisting of 30 people for treatment and 30 people for control. The research variables included the administration of FDM-LPK as an independent variable and the 2-hour postprandial blood glucose level as the dependent variable. Blood glucose data was collected by measuring blood glucose in patients with type 2 diabetes mellitus. Blood glucose measurements were carried out before and after the intervention. Blood glucose measurement using a Glucometer. To test the effect of FDM-LPK on blood glucose levels, type 2 DM patients were processed and analyzed using paired t-test. Whereas to see differences in blood glucose levels between treatment groups and the control group Independent Samples-T Test was used.

RESULTS

Table 1. Results of Blood Glucose Measurement for Patients with Type 2 DM

No	Blood glucose measurement	Average blood glucose (mg/dL)	
		Treatment	Control
1.	Blood glucose 2 jpp day 1	348,53 ± 87,94	368,50 ± 107,93
2.	Blood glucose 2 jpp day 2	283,83 ± 103,62	359,87 ± 134,43
3.	Blood glucose 2 jpp day 6	332,57 ± 90,39	389,57 ± 121,38
4.	Fasting blood glucose day 1	216,30 ± 91,63	257,23 ± 114,18
5.	Fasting blood glucose day 6	230,37 ± 88,32	263,63 ± 131,57
6.	Δ Blood glucose 2 jpp day 1 with day 2	- 64,70 ± 84,89	- 8,63 ± 92,13
7.	Δ Blood glucose 2 jpp day 1 with day 6	- 15,96 ± 72,38	21,06 ± 101,24
8.	Percentage Δ Blood glucose 2 jpp day 1 with day 2	18,56% (decrease)	2,34% (decrease)
9.	Percentage Δ Blood glucose 2 jpp day 1 with day 6	4,58% (decrease)	5,72% (increase)

The test results of the effect of FDM-LPK (pre and post) on blood glucose levels 2 jpp type 2 DM patients as shown in Table 2.

Table 2. Significance of the results of testing of blood glucose levels 2 jpp of type 2 DM patients

No.	Testing	Treatment			Control		
		Mean (mg/dL)	p	Sig.	Average (mg/dL)	p	Sig.
1.	Blood glucose 2 jpp day 1 with day 2	6,47 ± 15,5	0,000	S	8,63±92,14	0,612	NS
2.	Blood glucose 2 jpp day 1 with day 6	15,96±72,38	0,23	NS	-2,11±101,24	0,264	NS

Information: S = significant NS = non significant

DISCUSSION

The data in Table 1 the results of blood glucosa measurements in type 2 DM patients after 2 jpp in the treatment group (FDM-LPK) and the control group (Diabetasol) showed that on average it was quite high (above 200 mg / dL) ie ranging from 283.83 ± 103.62 mg/dL to 348.53 ± 87.94 mg/dL for the treatment group, while in the control group it ranged from 359.87 ± 134.43 mg/dL. 389.57 ± 121.38 mg / dL. The results of measurement of fasting blood sugar in patients with type 2 DM, also on average are quite high (above 126 mg/dL), which ranges from 216.30 ± 91.63 mg/dL. 230.37 ± 88.32 mg/dL. for the treatment group, while in the control group ranged from 257.23 ± 114.18 mg / dL. 263.63 ± 131.57 mg/dL.

Based on the data in Tables 1 and 2. it can be seen that the results of blood glucose measurements in patients with type 2 diabetes after 2 jpp of FDM-LPK administration showed a decrease. On the second day, measurements of blood glucose levels decreased significantly ($p < 0.05$). While on the 6th day the measurement of blood glucose levels decreased but was not significant ($p > 0.05$). Giving FDM-LPK can reduce blood glucose levels 2 jpp type 2 DM patients by 18.56% on day 2 and 4.58% on day 6.

In the control group given commercial formula (Diabetasol), blood glucose measurement results in patients with type 2 diabetes after 2 jpp of Diabetasol showed a decrease of 2.34% on day 2 of measurement, but the decrease in blood glucose levels was not significant ($p > 0, 05$). While on the 6th day of measurement, it showed an increase of 5.72% and the increase was not significant ($p > 0.05$).

CONCLUSION

Addition of 85 g composite LPK flour to FDM-LPK, has the effectiveness to reduce blood glucose levels 2 jpp type 2 DM patients. FDM-LPK administration in patients with type 2 diabetes can significantly reduce blood glucose levels 2 jpp on day 2 ($p < 0.05$). Decrease in blood sugar levels of 2 jpp by 18.56%.

REFERENCES

1. ADA. Diagnosis and Classification of Diabetes Melitus. Diabetes Care.2015;38.
2. MoH-RI. Basic Health Research 2013. Jakarta: MoH-RI; 2013.
3. IDF. Guideline for Management of Postmeal Glucose in Diabetes. IDF; 2011.
4. Rolfes SR, Pinna K, Whitney E. Understanding Normal and Clinical Nutrition. USA: Wadsworth Cengage Learning. 2006;113-115.
5. Liu Y, Jin H, Xu ZQ., Nan WK, Wang T, Cheng YY. Effects of pumpkin polysaccharides on blood glucose and blood lipids in diabetic rats. Zhongguo Yingyong Shenglixue Zazhi. 2006;22(3):358–61.
6. Adams GG, Imran S, Wang S, Mohammad A, Kok S, Gray DA. The hypoglycaemic effect of pumpkins as anti-diabetic and functional medicines. Food Research International. 2011;44:862-867.
7. Zhang Y, Chen P, Zhang Y, Jin H, Zhu L, Li J. Effects of polysaccharide from pumpkin on biochemical indicator and pancreatic tissue of the diabetic rabbits. Intern Journ of Bio Macro. 2013;62:574–581.
8. Guillon F, Champ M. Structural and physical properties of dietary fibres, and consequences of processing on human physiology. Food Research International. 2000;33:233–245.
9. Pari L, Umamaheswari J. Antihyperglycaemic activity of Musa sapientum flowers: effect on lipid peroxidation in alloxan diabetic rats.Sitasi. Phytotherapy Research: PTR [Phytother Res]. 2000;14(2):136-8.
10. Bhaskar JJ, Shobha MS, Sambaiah K., Salimath PV. Beneficial effects of banana (Musa sp. var. elakki bale) flower and pseudostem on hyperglycemia and advanced glycation end-products (AGEs) in streptozotocin-induced diabetic rats. Journal of Physiology And Biochemistry [J Physiol Biochem]. 2011;67(3):415-25.
11. Cressey R, Kumsaiyai W, Mangklabruks A. Daily consumption of banana marginally improves blood glucose and lipid profile in hypercholesterolemic subjects and increases serum adiponectin in type 2 diabetic patients. Indian J.Exp. Biol. 2014;52:1173–1181.
12. Hermansen K, Rasmussen O, Gregersen S, Larsen S. Diabetic Medicine: A Journal Of The British Diabetic Association [Diabet Med]. 1992;9(8):739-43.
13. Hettiaratchi UP, Ekanayake S, Welihinda J. Chemical compositions and glycemic responses to banana varieties. International Journal of Food Sciences and Nutrition [Int J Food Sci Nutr]. 2011;62(4):307-9.

14. Trinidad TP, Mallillin AC, Loyola AS, Sagum RS, Encabo RR. The potential health benefits of legumes as a good source of dietary fibre. The British Journal of Nutrition [Br J Nutr]. 2010;103(4):569-74.
15. Yao Y., Chen F.,Wang M., Wang J. and Ren G. Antidiabetic activity of Mung bean extracts in diabetic KK-Ay mice. Journal Of Agricultural And Food Chemistry [J Agric Food Chem]. 2008;56(19):8869-73.
16. Iswandari, R. Study of Isoflavone Content in Mung Beans (*Vigna radiata L*), Mung Bean Tempe, and Mung Bean Porridge. Essay. Bogor: IPB; 2006.