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Effect of Supplementary Food Intake of Type 2 Diabetes Mellitus Patients on Blood Sugar Levels at UKI General Hospital

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ABSTRACT

Non-Insulin Dependent Diabetes Mellitus (NIDDM) is a metabolic disease characterized by increased blood sugar due to decreased insulin secretion by pancreatic beta cells or insulin resistance. One of the four pillars of NIDDM management is the regulation of dietary intake. The nutrients that most affect the increase of blood glucose are carbohydrates. The absorption of liquid carbohydrates will be different if given in solid form. The emptying of the liquid food is gastric faster than emptying the solid food, and the purpose of this study is to determine the effect of liquid and solid additional dietary intake on HbA1c levels. The total number of samples in the study was 60 respondents divided into two groups, 30 respondents who consumed other liquid food and 30 respondents who consumed other solid food with primary data from the questionnaire and secondary data generated from the medical record. The data is processed and analyzed by a simple linear regression test. Respondents who consumed liquid dietary intake showed significantly increased HbA1c levels ($p < 0.001$) with a coefficient of correlation (r) of 0.652, but solid food and HbA1c did not correlate significantly ($p < 0.2$) with the coefficient of correlation results (r) of 0.262. Most people with NIDDM add liquid foods to their daily menu, which will leave the patient feeling unsatisfied and quickly getting hungry, and also they assume that liquid-based foods such as diabetes-specific milk are medications. It will help to lower their blood sugar levels so that the patient will remain to consume heavy foods that will result in excessive caloric supply that will impact the blood sugar levels. From this study, it can be concluded that the dietary intake of liquid food increased HbA1c.

Keywords: Non-Insulin Dependent Diabetes Mellitus, additional dietary intake, HbA1c level.

INTRODUCTION

Indonesia is ranked 5th out of 10 countries with the most significant Diabetes Mellitus in the world, with an estimated number of adult Diabetes sufferers of 9.1 million people, up to two ranks compared to IDF data in 2013, which was ranked 7th in the world with 7.6 million people with DM [1]. According to the 2013 Basic Health Research (RISKESDAS) report, the prevalence of Diabetes Mellitus in Indonesia is 1.5%. In 2030, it is estimated that Indonesia will have 21.3 million people with Diabetes. The 2014 Sample Registration Survey data also shows that Diabetes is the third largest cause of death in Indonesia with a percentage of 6.7%, after stroke (21.1%) and coronary heart disease (12.9%) [2]. In the coming years, it is estimated that the prevalence of Diabetes will continue to increase rapidly due to changes in lifestyle and food consumption patterns, such as fast food, which is poor in fiber, as well as in the middle age and elderly, and generally affects urban residents compared to rural residents [3].

Diabetes Mellitus (DM) is a chronic metabolic disease characterized by

hyperglycemia due to defects in insulin secretion, insulin action, or both [4]. DM is divided into four types: 1) DM type 1 Insulin Dependent Diabetes Mellitus (IDDM) as the primary market is a lack of insulin production or not at all, due to destruction of pancreatic beta cells, and usually caused by autoimmune or idiopathic diseases; 2) Type 2 DM Non-Insulin Dependent Diabetes Mellitus (NIDDM), caused by a decrease in the sensitivity of target tissues to insulin, is often called insulin resistance; 3) Gestational Diabetes can occur when glucose intolerance is first discovered during pregnancy, and 4)) other types of DM (genetic defects in beta cell function, genetic defects in insulin action, diseases of the exocrine pancreas, endocrinopathy due to drugs/chemicals, infections, immunology, and other genetic syndromes) [5; 6].

Factors that contribute to the emergence of insulin resistance such as obesity (especially excess visceral adiposity), lack of exercise, dietary factors that are generally high in carbohydrates and fat and low in fiber, genetic factors, dyslipidemia, excess glucocorticoids (Cushing's syndrome), excess hormones growth (acromegaly), autoantibodies to insulin receptors, insulin receptor mutations, age, high blood pressure and so on [7].

NIDDM is the most common type of DM compared to other types, about 85% of patients. The clinical features of patients presenting with polyuria and polydipsia are that 80% are overweight or obese. However, sometimes DM patients suggest after they experience weight loss, and 20% are current with complications such as acute metabolic complications, microvascular, macro-vascular, macrovascular complications, and peripheral neuropathy [8]. However, usually, NIDDM sufferers often do not show typical symptoms at first; usually, the occurrence of DM symptoms is seven years before the diagnosis is made, so the diagnosis can only be made when the patient is treated for complaints of other diseases which are complications of the DM [9].

The incidence magnitude, prevalence, and complications due to DM illustrate the importance of preventing and managing the disease. One of them is carrying out the four pillars of DM management, namely education, diet regulation, exercise, and pharmacology. Education is essential for DM patients, where patients must understand the steps of treatment and DM complications, so it is hoped that DM sufferers have the will to make changes, especially in their lifestyle [6].

Apart from giving oral hyperglycemic drugs, one of the managements for DM patients is the regulation of food intake patterns so that blood sugar levels are kept under control. The type of food determines how a person's blood glucose levels rise. In one serving of the food menu, many nutrients are contained, such as carbohydrates, fats, and fiber. The actual nutrient content that can affect the increase in blood glucose is carbohydrates. Carbohydrates are essential and contribute about half of the daily calorie intake. However, not all carbohydrates are absorbed at the same rate depending on the amount or amount of carbohydrates in the food consumed, be it in glucose, fructose, or galactose. Excessive intake of simple carbohydrates, such as high-fructose corn syrup or honey, is associated with increased metabolic health risks. Therefore, various DM dietary guidelines suggest reducing the consumption of simple carbohydrates and replacing them with complex carbohydrates [8; 9].

The Glycemic Index (GI) concept is a simple way to characterize carbohydrates based on their impact on the glycemic response. Foods that raise blood sugar levels quickly have a high GI. In contrast, foods that are more slowly digested, absorbed, metabolized, and increase blood glucose levels gradually, have a lower GI (below 55) [9]. The European Association for the Study of Diabetes recommends low GI carbohydrate intake in people with Diabetes.

Consumption of carbohydrates with low GI as a substitute for high GI can improve control of fasting blood sugar, HbA1c, and c-urine peptide, regulate body weight, and improve appetite control in DM patients [8].

Initially, patients will be advised to change their diet (DM diet), especially for patients who are overweight or obese, to achieve ideal body weight (optimal body weight to maintain health and fitness, based on body mass index), which aims to achieve glucose concentrations normal blood pressure and control hyperlipidemia and blood pressure [8]. Weight loss in patients with DM with excess body weight, 10-15%, can significantly control the patient's blood glucose levels. In a 12-year prospective study of nearly 5000 type 2 DM patients, it was found that weight loss reduced mortality by about 25% [10].

For DM patients to achieve ideal body weight, the calories given to people with Diabetes must be sufficient and balanced according to their nutritional status and needs. Various professional organizations have agreed that the composition of Medical Nutrition Therapy (TNM) is based on the distribution of macronutrient protein, total fat, Saturated Fatty Acid (SFA), Mono Unsaturated Fatty Acid (MUFA), Poly Unsaturated Fatty Acid (PUFA), and carbohydrates. The main goal of TNM is to achieve as near-normal (postprandial and fasting) blood glucose regulation as possible [6].

The American Diabetes Association (ADA) recommends several types of food for DM patients, such as 1) Carbohydrates must come from whole grains, vegetables, fruits, and low-fat dairy. The number and possible carbohydrates in the diet affect overall glucose control. The total amount of carbohydrates (CHO) consumed had the most substantial influence on the glycemic response. Substituting low-glycemic foods for high-glycemic foods may slightly improve glycemic control; 2) Fiber-rich foods. Fiber moderates how the body digests and helps control blood sugar levels. High-fiber foods include vegetables, fruits, nuts, flour, whole grains, and 3) "good" fats. Foods contain good fats such as avocado, almonds, candlenuts, walnuts, canola, olive oil, and nuts. However, it is still advisable not to overconsume because all fats are high in calories [11].

The DM diet is given using three main meals and three additional meals (snacks), with an interval of three hours. Planning meals is essential for managing Diabetes, as are complementary foods. Supplementary foods can help reduce hunger while adding nutritious energy, such as whole grain biscuits, fresh fruit, soybeans, cassava, taro, yogurt, and milk.6 Several studies have shown that dairy products or calcium consumption affect the treatment of DM patients. The Coronary Artery Risk Development in Young Adults (CARDIA) study stated that increasing consumption of dairy products was found to have lower insulin resistance in young adults. This study implies that a more significant percentage of fat calories should be obtained through dairy products [12]. The composition in special diabetes milk itself, such as calcium and vitamin D, magnesium, and vitadegest, has a low GI, which is claimed to lower or maintain blood sugar levels. Experts recommend two to three servings of low-fat or nonfat dairy products each day. Adding milk to the diet of diabetic patients can lower blood pressure by three to five points [11; 12]. When given in liquid form absorption, Carbohydrates will be different if presented in the solid form. Gastric emptying of liquid food is faster than gastric emptying of solid food [6]. Problems that occur when people with DM add additional types of liquid food to the daily menu will make the patient feel not full and hungry quickly so that the patient will continue to consume heavy food, which will result in an excess supply of calories so that it will have an impact on the patient's blood sugar level. In addition, the lack of awareness, inaccuracy in eating schedules, the amount of food that is not limited and socioeconomic factors make it difficult for patients to carry out diets. Therefore,

researchers are interested in examining the effect of additional food intake in type 2 Diabetes Mellitus patients on blood sugar levels at UKI General Hospital.

Based on the background of the problem above, the research problem can be formulated as follows: Is there an effect of additional food intake of type 2 Diabetes Mellitus patients on blood sugar levels at the General Hospital of the UKI General Hospital Cawang? This study aims to determine the effect of liquid and solid supplementary food intake in type 2 Diabetes Mellitus patients on blood sugar levels (HbA1c) at the General Hospital of the UKI General Hospital Cawang.

LITERATURE REVIEW

Chemical reactions in cells consist of anabolism and catabolism. Anabolism is the formation or synthesis of larger organic macromolecules from subunits of small organic molecules. Anabolic reactions generally require energy intake in the form of ATP, and catabolism is the breakdown or degradation of large organic molecules in the body. These two processes control and maintain blood glucose within a normal range of carbohydrate metabolism. When the state after eating, glucose is available in abundance in the blood, a process occurs that aims to lower the blood glucose level.

While in the fasting state, the opposite happens [13; 14]. Maintaining blood glucose homeostasis is an essential function of the pancreas. Insulin itself has four effects that can lower blood levels and increase carbohydrate storage, namely: a) Insulin facilitates the entry of glucose into most cells. Glucose molecules do not readily penetrate cell membranes in the absence of insulin. Glucose can enter cells only through carriers in the plasma membrane known as glucose transporters.

Some tissues that do not depend on insulin to absorb glucose are the brain. The brain needs a continuous supply of glucose to meet its energy needs, easy to enter; b) Insulin stimulates glycogenesis, the formation of glycogen from glucose in both muscle and liver; c) Insulin inhibits glycogenolysis, the breakdown of glycogen into glucose. By inhibiting the breakdown of glycogen, insulin increases carbohydrate storage and decreases glucose excretion by the liver; and d) Insulin also reduces the release of glucose by inhibiting gluconeogenesis, the conversion of amino acids to glucose in the liver. Insulin does this by decreasing the number of amino acids in the blood available to the liver for gluconeogenesis and inhibiting the liver enzymes needed to convert acids to glucose [13]. Therefore, insulin reduces blood glucose concentration for use and storage and simultaneously inhibits two mechanisms of glucose release by the liver into the blood (glycogenolysis and gluconeogenesis). Insulin is the only hormone capable of lowering blood glucose levels [13; 14].

Non-Insulin Dependent Diabetes Mellitus (NIDDM) is a group of disorders with characteristics such as insulin resistance, impaired insulin secretion, and increased glucose production. NIDDM is preceded by a period of abnormal glucose homeostasis, namely Impaired Fasting Glucose (IFG) or Impaired Glucose Tolerance (IGT) [15]. NIDDM includes individuals who have insulin resistance and usually have relative insulin deficiency or insulin deficiency initially and throughout their lifetime; most individuals do not require insulin treatment to survive. Many different possibilities lead to the onset of this Diabetes. Although the specific etiology is unknown, in this type of Diabetes, there is no beta cell destruction. Various genetic and lifestyle factors appear to be important in forming NIDDM. Obesity is the most significant factor about 90% of people with NIDDM are obese, although sometimes patients come after losing weight [16].

Clinically insulin resistance was found to have metabolic syndrome. The metabolic syndrome includes a cluster of features suggesting a high risk of Diabetes and cardiovascular disease in these individuals. Metabolic syndrome, according to the

National Education Program Adult Treatment Panel II (NCEP ATP II), is established by the presence of at least three of the following criteria: a) Waist circumference >90 cm for men or >80 cm for women; b) Plasma triglycerides >150 mg/dL or currently taking cholesterol-lowering drugs; c) plasma HDL <40 mg/dL in men or <50 mg/dL in women; d) Blood pressure > 130/85 mmHg or currently taking antihypertensive drugs; and e) Fasting blood glucose >100 mg/dL [17; 18; 19].

Early in the development of the disease, decreased sensitivity to insulin is overcome by increased insulin secretion. However, continued pancreatic overactivation eventually depletes beta cells' genetically weakened reserve secretory capacity. Although insulin secretion may be typical or even increased, symptoms of insulin insufficiency develop because the amount of insulin remains insufficient to prevent hyperglycemia. Symptoms of NIDDM usually appear later and are milder than IDDM [20; 21]. Although NIDDM patients are generally not dependent on exogenous insulin, they may require it if blood glucose levels are not controlled either by diet alone or oral hypoglycemic drugs [22].

There are four pillars of DM management: 1) education. Optimal DM management requires the patient's active participation in changing unhealthy behavior. The health team must accompany the patient in this behavior change, which lasts a lifetime. Success in achieving behavior change requires education, skills development, and efforts to increase motivation; 2) Regulation of diet; 3) Sports, the recommended physical activity is moderate intensity (50-70% maximum pulse rate) at least 150 minutes/week or aerobics 75 minutes/week. Activities are divided into three days per week and no two consecutive without physical activity. NIDDM patients are educated to do resistance training at least 2x/week if there are no contraindications. Daily physical activities can also be done, for example, walking to work, using stairs (not using an elevator); and 4) Pharmacologically, six classes of drugs are currently available for use as needed in treating NIDDM along with diet and exercise [23; 24]. These drugs help the patient's body use their insulin more effectively, each by a different mechanism, as follows: a) By stimulating beta cells to secrete more insulin than it does on their own (Sulfonylureas; e.g., Glucotrol); b) By suppressing glucose production by the liver (Metformin; e.g., Glucophage); c) By inhibiting the enzymes that digest complex carbohydrates so that glucose absorption into the blood is slower and there is no spike in glucose immediately after eating (alpha-glycosidase inhibitors; e.g., Precose); d) By making fat and muscle cells more sensitive to insulin (Tiazolidinediones; Actos). Although some require insulin, people with NIDDM may require more dietary and pharmacological adjustments.

RESEARCH METHOD

The research design used is a correlation study where this study aims to determine the effect or statistical correlation between variables, namely the impact of additional food intake of patients with type 2 diabetes mellitus on HbA1c levels. It is done by distributing questionnaires to patients related to this study and taking documents from medical records. This research was conducted at the Internal Medicine Polyclinic of the UKI general hospital. Sampling was carried out from September 2017 to January 2018. The population in this study were patients with Type 2 Diabetes Mellitus at the Internal Medicine Polyclinic at the UKI General Hospital. The number of research samples was 60 patients diagnosed with type 2 Diabetes Mellitus at the UKI General Hospital who met the inclusion and exclusion criteria of the study. Researchers obtained primary data directly through interviews and questionnaire results on type 2 DM patients at UKI General Hospital. Secondary data is data obtained by researchers indirectly through the effects of

medical records. Research data were collected through questionnaires and interviews. Data processing was carried out using the Statistical Package for Social Sciences (SPSS) version 23.0 program. The data processing steps obtained include editing, coding, processing, and cleaning.

RESULT AND DISCUSSION

Based on 60 respondents, it was found that the gender of the respondents was as follows: Female 20% and Male 80%. (Table 1)

Table 1. Characteristics of Research Respondents by Gender

	Frequency	Proportion
Female	28	20,0
Male	32	80,0
Total	**60**	**100**

Table 2. Characteristics of Respondents by Age

	Frequency	Proportion
39 Years	1	1.7
40 Years	1	1.7
46 Years	2	3.3
47 Years	1	1.7
48 Years	1	1.7
49 Years	2	3.3
51 Years	1	1.7
52 Years	2	3.3
53 Years	1	1.7
54 Years	1	2.0
56 Years	1	1.7
57 Years	3	5.0
58 Years	4	6.7
60 Years	4	6.7
61 Years	3	5.0
62 Years	3	5.0
63 Years	2	3.3
64 Years	5	8.3
65 Years	2	3.3
66 Years	2	3.3
68 Years	1	1.7
70 Years	4	6.7
71 Years	1	1.7
72 Years	6	10.0
75 Years	2	3.3
77 Years	2	3.3
78 Years	1	1.7
80 Years	1	1.7
Total	**60**	**100.0**

Based on table 3, it can be seen that the majority of respondents who consumed liquid supplementary foods were in the DM category, as many as 25 people (83.3), and the minority of respondents who entered the pre-diabetic category were five people (16.7%).

Table 3. Characteristics of Respondents Based on HbA1c Levels in respondents who consume liquid food supplements

	Frequency	Proportion
Normal	0	0
Pre-Diabetes	5	16.7
DM	25	83.3
Total	**30**	**100.0**

Based on table 4, it can be seen that the majority of respondents who consumed solid supplementary foods were in the DM category, as many as 19 people (63.3%), and the minority of respondents who entered the pre-diabetic category were nine people (30.0%).

Table 4. Characteristics of Respondents Based on HbA1c Levels in respondents who consume solid supplementary foods

	Frequency	Proportion
Normal	2	6.7
Pre-Diabetes	9	30.0
DM	19	63.3
Total	**30**	**100.0**

The reliability test results on 20 DM patients outside the original sample.

Table 5. Reliability Test

Cronbach Alpha	N of Items
.638	35

Based on table 5, it was found that with the calculation of the Cronbach Alpha value of 0.638> 0.6, it can be concluded that the instrument in the form of a questionnaire about the attitudes, behavior, and actions of DM patients can be relied upon as a data collection tool. Thus the questionnaire can be used for research.

The results of a simple linear regression test on 30 patients with type 2 Diabetes Mellitus at the UKI General Hospital who consumed liquid supplementary foods and 30 people who consumed additional solid foods.

Table 6. Anova

	df	F	Sig.
Regresi	1	20.669	.000
Residual	28		
Total	**29**		

ANOVA or analysis of variance, namely the regression coefficient test together (F test) to test the significance of the effect of several independent variables on the dependent variable. The test uses a significance level of 0.05.

Based on table 6, the F value is 20,669 with a significance (Sig.) of 0.000. Because

the significance test value is less than 0.05, it can be concluded that the form of the linear equation Y = a + bX is correct and can be used.

Table 7. Coefficients

	Unstandardized Coefficients		*Standardized Coefficients*		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	48.040	6.106		7.867	.000
Liquid Supplements	.072	.016	.652	4.546	.000

Dependent Variable: HbA1c levels

The endless number of unstandardized coefficients in the Coefficients table above is 48,040. This number is a constant number which means that if there is no liquid food supplement (X), the consistent value of the HbA1c (Y) level is 48,040.

In addition, the regression coefficient figures obtained a value of 0.072. This figure means that for every 1% addition of the independent variable, the intake of liquid Supplementary Food (X) will increase the dependent variable HbA1c (Y) by 0.072.

Table 8. Coefficients

	Unstandardized Coefficients		*Standardized Coefficients*		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	37.394	20.360		1.837	.077
Solid Supplements	.307	.214	.262	1.437	.162

Dependent Variable: HbA1c. levels

In the Coefficients table above, the constant number of unstandardized coefficients is 37,394. This number is a constant number which means that if there is no solid food supplement (X), then the consistent value of the HbA1c (Y) level is 37,394.

In addition, the regression coefficient figures obtained a value of 0.307. This figure means that every 1% addition of the independent variable intake of solid food additives (X) will increase the dependent variable HbA1c (Y) levels by 0.307.

The hypothesis test that the writer proposes in this simple linear regression analysis is:

Ho = There is no effect of liquid supplementary food intake (X) in type 2 diabetes
mellitus patients on HbA1c levels (Y).

Ha = There is an effect of liquid additional food intake (X) in type 2 diabetes
mellitus patients on HbA1c levels (Y).

Table 9. Hypothesis Testing Comparing Sig Value with 0.05

	Unstandardized Coefficients		*Standardized Coefficients*		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	48.040	6.106		7.867	.000
Liquid Supplements	.072	.016	.652	4.546	.000

The test uses a significance level of 0.05. In the table above, the significance value (Sig.) of 0.000 is smaller than (<) the probability of 0.05, so it can be concluded that Ho is rejected and Ha is accepted, which means that "There is an Effect of Intake of Liquid Supplementary Food (X) in Diabetes Patients Type 2 diabetes on HbA1c (Y) levels".

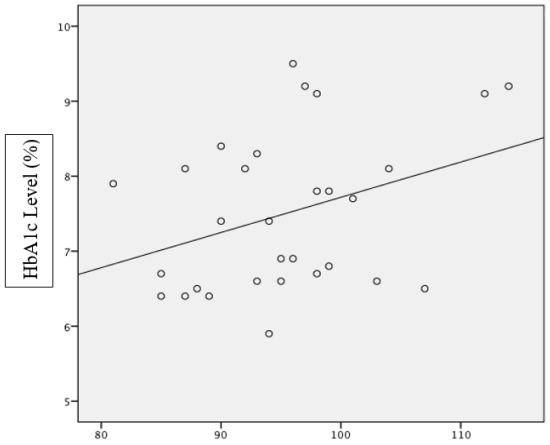

Figure 1. Total score of liquid supplementary food questionnaire

Based on the figure above shows a positive relationship and a significant increase in respondents who consume liquid food supplements on HbA1c levels ($p < 0.001$) and a correlation coefficient (r) of 0.652. An increase also followed the increase in the liquid supplementary food variable in the HbA1c variable.

The hypothesis test that the writer proposes in this simple linear regression analysis is:

Ho = There is no effect of solid supplementary food intake (X) in type 2 diabetes
mellitus patients on HbA1c levels (Y).
Ha = There is an effect of solid supplementary food intake (X) in type 2 diabetes
mellitus patients on HbA1c levels (Y).

Table 10. Hypothesis Testing Comparing Sig Value with 0.05

	Unstandardized Coefficients		*Standardized Coefficients*		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	37.394	20.360		1.837	.077
Solid Supplements	.307	.214	.262	1.437	.162

The test uses a significance level of 0.05. In the table above, the significance value (Sig.) of 0.162 is greater than (>) probability of 0.05, so it can be concluded that Ha is rejected and Ho is accepted, which means that "There is no Effect of Intake of Solid Supplementary Foods (X) in patients Type 2 Diabetes Mellitus on HbA1c (Y) Levels".

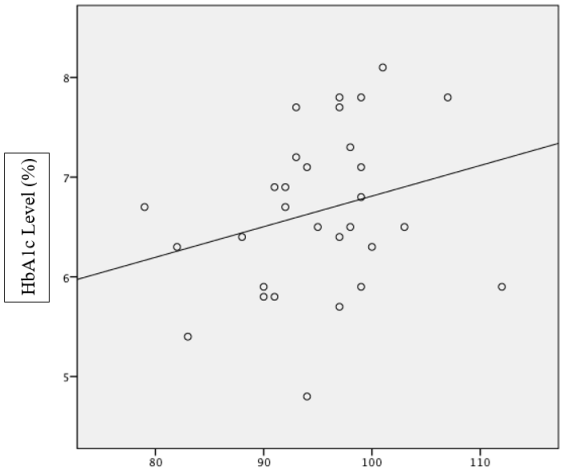

Figure 2. Total score of solid supplementary food questionnaire

Based on the figure above shows a positive but not significant relationship in respondents who consume solid supplementary foods on HbA1c levels ($p < 0.2$) and a correlation coefficient (r) of 0.262. Blood glucose results from carbohydrate absorption in the digestive tract that circulates in the blood, and its levels are calculated by blood examination. When given in liquid form absorption, Carbohydrates are different from when given in the solid form. Gastric emptying of liquid food is faster than gastric emptying of solid food. Therefore, giving liquid food to DM patients with a high carbohydrate composition will cause blood sugar to rise quickly, causing the problem of postprandial hyperglycemia [25; 26]. The type of food determines how a person's blood glucose levels rise. In one serving of the food menu, many nutrients are contained, such as carbohydrates, fats, and fiber. The most crucial nutrient content that can affect the increase in blood glucose is carbohydrates. Blood glucose levels are easily increased in the human body [27]. It depends on the amount or amount of carbohydrates contained in the food consumed, be it glucose, fructose, or galactose. Their glycemic index can determine the number of carbohydrates in these foods.

The hormone insulin is produced by beta cells in the pancreas. Under normal circumstances, when beta cells stimulate, insulin is synthesized and secreted into the blood according to the body's needs for blood glucose regulation. One of the main components that provide stimulation to beta cells to produce insulin due to an increase in blood glucose levels.

In this study, questionnaires were distributed to 30 respondents who consumed liquid supplementary foods and 30

respondents to type 2 Diabetes Mellitus patients at the UKI General Hospital who consumed solid supplementary foods to determine whether there was an effect of liquid and solid supplementary food intake on HbA1c levels and to ensure that the researcher uses medical record data to see the patient's HbA1c levels.

CONCLUSION

Based on the results of the research and data analysis, it can be concluded: a) Gender and age in this study were primarily male (80.0%) with an average age of 72 years; b) HbA1c levels were found to be elevated with a mean HbA1c level of 7.7% in NIDDM patients; and c) From the results of a simple regression test as well as HbA1c levels and the total score of respondents' answers, it was found that there was an effect of additional liquid food intake in patients with type 2 Diabetes Mellitus. Then, patients with type 2 diabetes are recommended to have regular HbA1c tests to determine glycemic control and complications due to Diabetes. It is also necessary to search for the glycemic load of each food to be consumed so that it can be used as a complete reference.

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