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HbA1c Levels in Diabetes Mellitus Screening and Diagnosis

Ima Rahmawati, Emyk Windartik
Universitas Bina Sehat PPNI Mojokerto

ABSTRACT

Diabetes Mellitus is a metabolic disorder characterized by increased blood sugar due to decreased insulin secretion by pancreatic beta cells and impaired insulin function (insulin resistance). By measuring glycohemoglobin (HbA1c) you can find out what percentage of the red blood cell dye (hemoglobin) contains sugar. To analyze HbA1c levels in screening and early diagnosis of diabetes mellitus. Observational descriptive research design. The population in this study were all type 2 DM sufferers at Bangil Pasuruan Regional Hospital, totaling 79 respondents. The sample consisted of 47 respondents taken using a purposive sampling technique. The research instrument was an examination of HbA1c levels and an observation sheet. With controlled HbA1c levels, all of them have a normal BMI, eat a regular diet regularly take insulin medication, and adopt more regular exercise habits. Meanwhile, respondents with uncontrolled HbA1c had a BMI of underweight, normal, overweight, and most did not exercise regularly and did not regularly take antidiabetic drugs.

Keywords: *HbA1c, Diabetes mellitus, Screening*

Correspondent author
Name : Ima Rahmawati
Email: imarahmawatiok@gmail.com

INTRODUCTION

The World Health Organization report, estimated in 2004 that around 194 million people with diabetes will reach 333 million people with diabetes in 2025, with the largest population in Asia and Oceania (Ayele et al., 2012; S Mohebi et al., 2013). In diabetes mellitus in Southeast Asia in 2015, the percentage of adults with diabetes mellitus was 8.5% (Kemenkes, 2019). Indonesia also contributed quite a large prevalence regarding the number of people with diabetes from 2007, 2013, and 2018 which has increased, which can be seen from Basic Health Research (Riskesdas) data that it was 5.7% in 2007, 6.9% in 2013 and to 8.5% in 2018. This phenomenon is a challenge for health services because if not treated it will have an impact on the quality of life of people with diabetes (Trisnawati & Setyorogo, 2013). International Diabetes Management Practices Study (IDMPS) shows that

people with diabetes will experience disruption to work productivity such as being absent from the workplace (9.5%), not being able to do work or not coming to work due to DM complications (2.4%), not having a permanent job (53.3%), as well as causing short-term and long-term complications.

Good blood glucose levels do not yet indicate that blood glucose regulation is also good. Monitoring the long-term glycemic status of DM sufferers can be done by measuring glycated protein in the form of HbA1c, which will determine the quality of long-term blood glucose control between 2-3 months (Siamak Mohebi et al., 2014). HbA1c is also recommended as the final goal of therapy and is recommended to be done at least twice a year. If the treatment target has not been achieved, it is recommended to check HbA1c 4 times a year. Normal HbA1c levels in the blood are between 4-6% of blood sugar. Higher HbA1c levels cause complications. The Diabetes Control and Complications Trial (DCCT) and the United Kingdom Prospective Diabetes Study (UKPDS) revealed that reducing HbA1c would provide many benefits. Every 1% decrease in HbA1c will reduce the risk of death due to diabetes by 21%, heart attack by 14%, microvascular complications by 37%, and peripheral vascular disease by 43%, in people with diabetes the HbA1c level is targeted at less than 7% (Ghandour et al., 2018).

The aim of controlling blood glucose levels in DM is to minimize the occurrence of cardiovascular complications and improve the sufferer's quality of life. The benchmark for whether DM is controlled or not is by checking HbA1c in the blood. If the level is more than 7% then it needs to be treated with insulin or anti-diabetic drugs. Within 6 months the levels should return to normal. Reducing HbA1c levels to within normal limits is believed to reduce the risk of cardiovascular disease (Tan et al., 2019). Optimal glycemic control is very important, however in Indonesia, the target for achieving glycemic control has not been achieved. Average HbA1c is still 8%, still above the desired target of 5% (Sodipo et al., 2017). Prevention and management are needed which can be a reference for managing diabetes mellitus. There are four pillars of Diabetes Mellitus management, namely education, medical nutritional therapy, physical exercise, and pharmacological intervention. Diabetes treatment can be said to be successful if fasting blood glucose is 80 to 120 mg/dl, blood glucose levels two hours after eating are 80 to 140 mg/dl, and HbA1c levels are <5.9% (Franke et al., 2019). HbA1c measurement is the most accurate way to determine high blood sugar levels over the last 2-3 months. HbA1c is also the best single test to assess the risk of tissue damage caused by high blood sugar levels (Barzkar et al., 2019).

METHOD

The design of this research is descriptive observational, namely analyzing HbA1c levels in screening and initial diagnosis of Diabetes mellitus. The variable in this study was the HbA1c level in screening and initial diagnosis of diabetes mellitus. The population used in this study were all type 2 diabetes mellitus patients at RSUD Bangil. The sample consisted of 47 respondents with the sampling method being purposive sampling. The research instrument was the results of the HbA1c laboratory examination; Tourniquet, EDTA tube, 3

ml syringe, plaster, alcohol swab, tube rack, cuvette, sample cup, reagent rack, sample rack, Clinicpipette 100 and 500 Yellow tip, Blue tip, Indiko tool.

FINDING AND DISCUSSION

Characteristics of Respondents

Table 1 Frequency Distribution of Respondents Based on General Data

Characteristics of respondents	Respondents (n = 47)	
	f	%
Age		
26 - 35 year	1	3
36 - 45 year	4	8
46 - 55 year	18	38
56 - 65 year	22	47
> 65 year	2	4
Gender		
Female	26	55
Male	21	45
Long Suffering DM		
2 - 4 year	6	13
4 - 6 year	15	32
6 - 8 year	14	30
> 8 year	12	25

Table 2 Frequency Distribution of Respondents Based on Special Data

Characteristics of respondents	Kadar HbA1c (n= 47)			
	Controlled		Not Controlled	
	f	%	f	%
IMT				
Underweight	0	0	7	15
Normal	15	32	18	38
Overweight	0	0	7	15
Exercise				
Routine	10	21	3	7
Not Routine	9	19	25	53
Food Intake Diet				
Diet	19	40	14	30
Not Diet	0	0	14	30

Source: Primary Data

1. Body Mass Indeks (BMI)

Type 2 diabetes mellitus is closely related to obesity. In patients with type 2 diabetes, the pancreas still produces insulin in sufficient quantities to maintain blood glucose levels at normal levels, but the insulin cannot work optimally to carry glucose into cells due to high levels of cholesterol and triglycerides in people who are obese. The presence of fat deposits in the body can reduce sensitivity to insulin work in the muscles and liver it can cause the body to be resistant to insulin. This is in accordance with the results of research showing that all overweight respondents have uncontrolled HBA1c.

However, normal and underweight BMI were also found in respondents with uncontrolled HbA1c. Obesity described by body mass index is not very sensitive in describing metabolic disorders that occur. Central obesity described by waist circumference is more sensitive in predicting metabolic disorders. Uncontrolled DM patients can experience weight loss for no apparent reason. As a result, when the examination of HbA1c levels is carried out, the patient's BMI is not overweight.

2. Exercise

Sports or physical exercise is one of the pillars of DM management in addition to education, medical nutrition therapy, and pharmacological interventions. When someone does physical exercise, the body will increase the body's fuel needs by active muscles and complex body reactions including circulatory functions, metabolism, and the autonomic nervous system. Glucose stored in the muscles and liver as glycogen is quickly accessed to be used as an energy source in physical exercise, especially at the beginning of physical exercise, so that after 30 minutes there will be a decrease in blood glucose levels compared to before physical exercise. At the same time, lack of physical activity causes less burning of energy by the body so that excess energy in the body will be stored in the form of fat in the body.

3. Food Intake Diet

Food is needed as fuel in the formation of ATP. During digestion, many nutrients are absorbed to meet the body's energy needs. Blood sugar levels are partly listed on what is eaten and therefore during meals a balanced diet is required. Maintaining blood sugar to be close to normal values can be done with balanced food intake according to needs. Food planning is one of the pillars of diabetes mellitus management because of the limited ability of the body to regulate carbohydrate metabolism. If carbohydrate tolerance is exceeded, the patient will experience increased blood glucose levels that will cause glycosuria. Glycosuria will cause osmotic diuresis which causes loss of water and electrolytes such as sodium, potassium, chloride, calcium, magnesium and phosphate. Severe dehydration will occur which will result in pre-renal uremia and the risk of hypovolemic shock.

4. Drug or Insulin Consumption

The administration of antidiabetic drugs in the form of oral antidiabetic drugs and insulin is given if non-pharmacological therapy carried out cannot control blood sugar levels close to normal limits. The provision of this therapy still does not leave non-pharmacological therapies that have been applied before. Medication adherence has a 4 times better chance

of managing type 2 diabetes compared to non-adherence to medication is statistically meaningful. In general, antidiabetic drugs work to increase insulin secretion and are only effective in type 2 diabetes that is not overweight. Metformin which belongs to the biguanid group works to improve insulin sensitivity, inhibit the formation of glucose in the liver, reduce Low Density Lipoprotein (LDL) cholesterol and triglycerides, and is able to suppress appetite so that it becomes the main drug of choice. Akarbose works to inhibit the enzyme glucosidase thus the formation and absorption of glucose.

CONCLUSION

There were more respondents with uncontrolled HbA1c levels (60%) than respondents with controlled HbA1c levels (40%). Respondents with controlled HbA1c levels all had normal BMIs, regular food intake regularly consumed insulin medication, and adopted more regular exercise habits. Meanwhile, respondents with uncontrolled HbA1c had underweight, normal and overweight BMI, most did not exercise regularly and did not regularly take antidiabetic drugs.

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