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The Contribution of Family History and Overview of the Early Age of Diabetes Mellitus (Case Study in Urban Areas of Central Java Indonesia)

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Abstract*— Indonesia is the seventh country with 8.5 million DM patients, with a prevalence that tends to increase. History in families suffering from DM and being carried away in one's genes is inevitable and is a potential for symptoms and signs of diabetes. This study aims to determine how much the contribution of genes assessed from the presence of family history and description of the age of the onset of symptoms of DM. The population of all Type 2 DM patients in Semarang Regency, and a sample of 428 people. The independent variable is the history of DM in the family and the dependent variable is DM pain. Instrument uses a questionnaire. Analysis of data using the Spearman non-parametric test formula, for data related to the initial age of DM is described descriptively. The results showed that the correlation between the history of DM in the family and the occurrence of DM in a person was significant, and there was a strong correlation between the history of DM in the family and the incidence of DM. The direction of the relationship has a positive value, so that a history of DM in the family will increase the incidence of DM.

Keywords—family history, diabetes mellitus, genes

I. INTRODUCTION

The tendency related to cases of people with diabetes mellitus (DM) worldwide, increases by 24.0% from 2003 to 2025. Diabetes mellitus (DM) is a degenerative disease, and according to WHO, in 2015 1 of 11 people is predicted adult with diabetes. By 2040 it is estimated that the number will be 642 million, and by 2030, about 366 million adults will suffer from diabetes, of which 75% of them will be in developing countries [1], [2]. Indonesia is on the 7th rank with 8.5 million DM patients and has a prevalence that tends to increase, from 5.7% in 2007 to 6.9% in 2013 [3].

Risk factors for diabetes mellitus can be grouped into risk factors that cannot be modified and can be modified. The risk factors that cannot be modified are family history, race and ethnicity, age, sex, delivery history of a baby weighing more than 4000 grams, and a birth history with a low birth weight (less than 2500 grams). While the risk factors that can be modified are closely related to unhealthy life behaviors, namely over weight, abdominal obesity, lack of physical activity, unhealthy diet, smoking, which can arise due to the socio-cultural environment [3]–[5]. Various socio-cultural and psychosocial problems are factors that play an important role in the incidence of diabetes and cause diabetes care to be ineffective [6], [7]. Family support and the role of relatives have an important role in improving disease [8], [9].While lifestyle is the main reason for the increase in diabetes cases [6], [10]–[12]. In a family having DM and being inherited in one's genes is unavoidable and is a potential for the symptoms and signs of diabetes, although this incident can be prevented from appearing as long as possible, controlled or even avoided by maintaining a healthy lifestyle.

Genes are hereditary units transmitted from one generation to the next or inherited or passed down. Genes are contained in long molecules deoxyribonucleic acid (DNA) found in all cells. Together with protein matrix, they form nucleoproteins and is organized into a chromosome structure found in the nucleus or cell nucleus. Evidence for the genetic determinants of diabetes is related to specific HLA (human leukocyte antigen) histocompatibility types. The type of histocompatibility gene that is in diabetes (DW 3 and DW 4) is what codes for proteins that play an important role in the interaction of monocytes. These proteins regulate the T cell response which is a normal part of the immune response. If an abnormality occurs, the T lymphocytes will be disrupted and play an important role in the pathogenesis of damage to Langerhans island cells as a producer of insulin which functions in controlling sugar in the blood circulation [13].

The objective of thisresearchis to find out the contribution of genes assessed from the presence of family history and description of the emerge of DM symptoms.

II. METHODS

The research was conducted in Semarang Regency which was an area with DM cases above the national prevalence. The population is all Type 2 DM patients in Semarang Regency. Sample obtained were 428 respondents, with minimum samples calculation used a formula from Naing et al. 2006. Samples were determined by accidental sampling technique during the examination at the Puskesmas. The independent

variable in this study was the history of DM in the family and the dependent variable was DM condition. Instrument used is a questionnaire containing the history of DM in the G1 and G2 families (parents and grandparents), whether diagnosed as a DM patient by the health center, and the initial age of DM condition diagnosed, with interview data collection techniques. Data obtained in the form of nominal data. After the data normality testing by the Kolmogorov-Smirnov formula, theywere not normally distributed, so the data thenbeen analyzedby the Spearman non-parametric test formula [14]. Whereas for data related to the initial age affected by DM, it is processed descriptively.

III. RESULT & DISCUSSION

The results of data collection from DM patients who went to the health center when the research was conducted were 428 people. The people who were diagnosed as DM patients by the health center were 396 people (349 people had a family history of DM and 47 people had no family history), while those who were not diagnosed as DM patient as many as 32 people (3 people have a history of DM in the family and 29 people there is no history of DM in the family). The description of DM initial age diagnosed in the group with a history of DM in the family occurred at the youngest at 33 years and the oldest at 77 years, and the largest percentage occurred in the age group of 51 years to 60 years, which was 43%, at 53 years old is 26% and 54 years old at 25%. In the group with no history of DM in the family, the youngest occurred at the age of 49 years and the oldest at the age of 83 years and the largest percentage occurred at the age of 61 years.

TABLE 1. STATISTICAL TEST RESULT

	Incident		Total
	No DM	DM	
History			
- No history	29	47	76
- Have history	3	349	352
Total	32	396	428

Based on the results of statistical tests, the sig value0.00 is obtained which indicated that the correlation between the history of DM in the family and the occurrence of DM in a person is significant. The strength of the relationship is 0.542, so it can be concluded that there is a strong correlation between the history of DM in the family and the incidence of DM. The direction of the relationship has a positive value, or the direction of the relationship is unidirectional, so that a history of DM in the family will increase the incidence of DM.

IV. DISCUSSION

Based on the data obtained, the initial age of DM occurrence in patients with DM history in families has a tendency at younger age (34 years) than in patients without a history of DM (49 years). Family history in DM showed a strong correlation with the occurrence of DM in a person, a history of DM in the family would increase the chance of DM incidence.

Many factors can trigger the emergence of DM symptoms both in people with a history of DM in the family and them who do not have a history of DM in the family, only in this case they can be said to have a history of DM in the family, making it easier to have the symptoms occurs at a relatively younger age. But if the other factors are controlled then the emergence of the symptoms can occur at the older age or even absolutely no symptoms of DM. Lifestyle is the main reason for the occurance of DM symptoms, which causes an increase in diabetes cases [6], [10]–[12]. As well as the results of research that states, in addition to the history of the disease in the family (gene), as a trigger of diabetes is mainly determined by obesity and lifestyle factors such as diet and exercise. Obesity causes insulin receptors in target cells throughout the body to be less sensitive and the amount decreases so that insulin in the blood cannot be utilized, while exercise or physical activity can control body weight and blood glucose is burned into energy [15]. In some DM type 2 patients, high blood sugar often arises due to stress, this is because stress causes the hormone counter insulin (which works opposite insulin) to be more active so that blood glucose will increase [16]. Like the results of qualitative data stating:

> "I do not have family history of diabetes, accidentally when I check blood cholesterol, because the body feels bad, it is only discovered that the blood sugar is also high, and this always rises if there are many thoughts, most often ..."

The result of other study says type 2 diabetes mellitus is the group of diabetes with the highest prevalence. This is because various factors including those that need attention are environmental factors and heredity. Environmental factors caused by urbanization, changing the lifestyle of a person who initially consumes healthy and nutritious foods from nature into fast food consumption which is at risk of causing obesity so that someone is at risk for type 2 diabetes. Obese people have a 4 times greater risk of developing type 2 diabetes than people with normal nutritional status [17], [18]. As mentioned from the research that has been done, type 2 DM is a multifactorial disease and because of a combination of environmental and genetic risk factors or family history of DM (many environmental risk factors contribute to the pathogenesis of type 2 diabetes), including lifestyle such as sedentary behavior, diet, alcohol consumption and smoking, internal environmental factors such as inflammatory factors, adipositokine, and hepatocyte factors, external environmental factors such as environmental endocrine disruptors [19]

The genetic basis in type 2 DM is defined as no defect that dominates; as is the case with HLA connections in type 1 DM. Type 2 DM is more common in certain ethnic and racial groups. It was found that the risk of diabetes in African-Americans, Hispanics, and Native Americans was around 2, 2.5, and 5 times greater, than in Caucasians. People often have diabetes and are totally unconscious, because they feel the

symptoms appear to be harmless. However, the earlier diabetes is diagnosed, the greater the likelihood of serious complications can be avoided [10]). As well as the results in this research related to the initial age DM diagnosed, it can indeed be the beginning of DM symptoms, or an early diagnosis. But it can also be diagnosed after a long period of time or even after mild complications are found, because of their ignorance, as some respondents stated from the additional qualitative data obtained, as follows:

> "My parents were old people, did not know what the disease wasuntil theypassed away.Rarelyhave their health checked as well. I also found out that I have diabetesaaccidentally, when there was a medical examination facilitated by the office"

Classically, type 2 diabetes develops mainly in older populations. However, there is increasing evidence for the high prevalence of type 2 diabetes in young people, and the influence of multi factors. The results of a study conducted in China said that about 29% of sample patients were diagnosed with type 2 diabetes at the age of ≤35 years, which was defined as early onset. Compared with patients diagnosed at age> 35 years (this is defined as slow onset). A positive history of father and mother diabetes allows younger age at diagnosis [20], [21]. In this study there were two people with an early age onset category, which was found in 2 samples, one was diagnosed early at the age of 33 years and one at the age of 34 years. Most are diagnosed at the age between 51 years and 60 years (43%) or called slow onset.

V. CONCLUSION

Based on the results of statistical tests, the sig value of 0.00 is obtained which indicates that the correlation between the DM history in the family carried in the gene and the occurrence of DM in a person is significant. The existence of a strong correlation between the history of DM in the family with the incidence of DM as evidenced by statistical tests, namely the level of relationship strength of 0.542. The history of DM in the family will increase the incidence of DM, where the direction of the relationship has a positive value, or the direction of the relationship is unidirectional.

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PAGE 1

PAGE 2

PAGE 3