The 4th International Conference on Nursing and Public Health (ICONPH)

Hereditary History with Age, Duration of DM, and Blood Glucose Levels in Patients with Diabetes Mellitus

Anita Joeliantina[1*], Dwi Adji Norontoko[2], Indriatie[3], Endang Soelistyowati[4]
Department of Nursing, Poltekkes Kemenkes Surabaya, Indonesia
*Corresponding author: anita@poltekkesdepkes-sby.ac.id

ABSTRACT

Diabetes Mellitus (DM) is a metabolic disease characterized by elevated glucose levels. Genetic factors manifested by the presence of a hereditary history are one of the factors related to the incidence of DM. The purpose of this study was to explain and describe the presence of family history factors in patients with diabe-tes. The design of this study is descriptive correlational with a cross-sectional ap-proach, which was carried out at Puskesmas in the Surabaya City area from June to August 2023, with a total of 122 patients with DM selected through conven-ience sampling techniques. Data collection uses questionnaires and is analyzed using descriptive analysts and Pearson correlation tests. The results showed that most patients with DM were less than 6 years old (65.57%) and had a blood glu-cose level value of more than 200 mg/dL. Data on family history with DM showed that 45.90% had a family history of disease with DM of which 24.59% were from the maternal lineage. The results of the correlation test showed that the hereditary history was related to the age of the patient with DM ($p = 0.003$) and the length of DM ($p = 0.049$), but not related to blood glucose levels ($p = 0.227$). This study showed that almost half of the patients had a history of heredity. There are more hereditary histories from the mother than from the father or both. Pa-tients with DM who have a hereditary history have DM earlier than those who have no hereditary history. Based on these data, people who have a family history of DM need to be vigilant and improve a healthy lifestyle to delay the develop-ment of DM disease or prevent it.

Keywords: Blood Glucose; Hereditary; Diabetes Mellitus

INTRODUCTION

Diabetes Mellitus (DM) is a chronic disease that occurs when the pancreas is unable to produce enough insulin, or when the body is unable to use the insulin it produces effectively [1]. DM that is not managed properly will develop into complications, both acute and chronic, that can threaten health and endanger life. Acute complica-tions are a significant contributor to mortality, cost, and poor quality of life. Over time diabetes can damage the heart, blood vessels, eyes, kidneys, and nerves, as well as increase the risk of heart disease and stroke. Such damage can result in reduced blood flow, which – combined with nerve damage (neuropathy) in the legs – increases the chances of leg ulcers, infections, and eventually the need for amputation. Diabet-ic retinopathy is an important cause of blindness and occurs as a result of long-term accumulation of damage to small blood vessels in the retina. Diabetes is one of the leading causes of kidney failure [1].

The risk of type 2 diabetes is determined by the interaction of genetic and meta-bolic factors. Ethnicity, family history of diabetes, and previous gestational diabetes combined with older age, overweight and obesity, unhealthy diet, lack of physical activity, and smoking to increase the risk. There is often a period of delay in detecting diabetes cases and as many as a third to half of DMT2 cases in the population may go undiagnosed

because they may remain asymptomatic for many years. When not recognized for a long time, complications of chronic hyperglycemia can develop. Some patients with DMT2 are first diagnosed with this condition when they experi-ence complications from hyperglycemia such as leg ulcers, vision changes, kidney failure, or infections [2].

Although the exact cause of DMT2 is unknown, there is a clear correlation between the disease and being overweight or obese, getting older, coming from a particular ethnicity, and having a family history of the condition. One of the known risk factors for developing DMT2 is having a family history of the disease [3]. People who have a family history of T2DM in their parents are two to three times more likely to develop T2DM than people who have no family history [4]. A family history of diabetes can increase the risk by 15% if one parent has diabetes, and by 75% if both parents have diabetes. Having a first-degree relative with type 2 diabetes increases the chances of developing diabetes by 40%. The family history of the mother and father is associat-ed with earlier age of onset and poor glycemic control [3].

Each disease has an impact on how a person internalizes the importance of family history. People's health behaviors can improve if they are aware of their family histo-ry and evaluate their relationship to a diabetic condition [4]. People with a family history of diabetes have an early onset of developing diabetes. In contrast to those who do not have a family history of diabetes, those who have a family history of diabetes are shown to be more likely to develop diabetes complications [3]. Other research reveals that a family history of diabetes is a powerful predictor of the onset of the disease and its potential complications at a young age [5] [6].

Although diabetes runs in families, it is possible to delay or prevent DMT2 in chil-dren and adolescents by living a healthy lifestyle. Type 2 diabetes can be caused by a combination of genetic and environmental factors. The risk of developing type 2 diabetes is higher in children if the mother and not the father have diabetes. Based on existing research, not much has been revealed about who the ancestral history comes from, whether from the mother, father, or both. This study aims to explain and de-scribe the existence of family history factors in patients with diabetes.

RESEARCH METHOD

This study was correlational descriptive research with a cross-sectional approach, which was conducted at Puskesmas in the Surabaya City area from June to August 2023. The sample in this study was part of the DM patients who visited the Health Center with a total of 122 patients with DM selected through convenience sampling techniques. The inclusion criteria of this study were patients who have suffered from DM for more than 1 year, were in stable condition (vital signs within normal limits, no history of heart failure, kidney failure, and liver disorders), and > age 30 years.

The data collection procedure begins with applying for a permit to the Surabaya City Health Office and Balitbangkesmas. Then it was continued with an application for permission to the Puskesmas whose area will be used as a location to find research subjects. DMT2 patients who were selected as research subjects will be given a ques-tionnaire. Before the patient was asked to fill out the questionnaire, the researcher first explained the research procedure and asked for the patient's consent by filling out the patient consent form that had been provided by the researcher. The instru-ment used in this study was a questionnaire containing data on the patient's identity (age, gender, education, and marital status) and clinical characteristics (duration of DM, age diagnosed, hereditary history, and blood glucose levels).

Data analysis using descriptive analysis using frequency distribution tables, per-centages, averages, and standard deviations were used to describe the characteristics of patients. In addition, it also presents cross-tabulation data between genetic history and blood sugar levels. A correlation test was carried out to determine the relationship between hereditary history and age, length of DM, and blood glucose levels.

Ethical approval was obtained from the Poltekkes Ethics Institute of the Ministry of Health Surabaya: No.EA/1533/KEPK-Poltekkes_Sby/V/2023 and administrative were obtained from the Surabaya Health Office for each selected PHC before data collection

RESULT AND DISCUSSION

Table 1. Patient Identity with DM (n=122)

Characteristic	Frequency (f)	Percentage (%)
Age		
36-45	17	13,93
46-55	36	29,51
56-65	52	42,62
>65	17	13,93
Gender		
Male	39	31,97
Female	83	68,03
Education		
College	20	16,39
High School	50	40,98
Junior High School	21	17,21
Primary school	21	17,21
Not attending school	10	8,20
Marital status		
Married	102	83,61
No	1	0,82
Widow	19	15,57

Patient identity data showed that almost some of the patients have an age range of 56 – 60 years (42.62%) and have a high school education (4098%). Other data shows that more than half of them were female (68.03%) and married (83.61%) (Table 1).

Table 2. Clinical Characteristics of Patients with DM

Characteristic	Frequency (f)	Percentage (%)
Duration of DM (years)		
< 6	80	65,57
6 - 10	21	17,21
> 10	21	17,21
History of hereditary		
No	66	54,10
Mother	30	24,59
Father	20	16,39
Both	6	4,92
Blood glucose levels (mg/d)		
≤200	48	39,34
>200	74	60,66

The clinical characteristics data of DM patients from this study showed that most patients had DM less than 6 years old (65.57%) and had a blood glucose level value of more than 200 mg/dL. Data on family history with DM showed that 45.90% had a family history of disease with DM of which 24.59% were from the maternal lineage.

Table 3. Cross-tabulation and correlation between family history, age at diagnosis, and blood sugar levels

Characteristic	Hereditary History				Sig.
	Mother	Father	Both	No	
Age (years)					0,003
36-45	5	6	2	4	
46-55	9	6	2	19	
56-65	16	7	2	27	

>65	0	1	0	16	
Duration of DM (years)					0,049
< 6	17	10	4	49	
6 - 10	6	5	2	8	
> 10	7	5	0	9	
Blood glucose levels (mg/dl)					0,227
≤200	10	7	1	30	
>200	20	13	5	36	

The results of the correlation test showed that the hereditary history was related to the age of the patient with DM (p = 0.003) and the length of time with DM (p = 0.049), but not related to blood glucose levels (p = 0.227).

The results of the study showed that almost all DM patients had a hereditary history of DM disease. This data is in line with other studies that show that patients with DM mostly have a history of descendants from parents who have DM [7] [8] [9]. Of the patients who have a history of offspring from their parents, most of these offspring come from the mother. This data is from other studies that explain that as many as 21% of respondents have a history of DM lineage from fathers, 54.9% of respond-ents have a history of DM lineage from mothers and 23.5% have lineages from fa-thers & mothers [10]. In contrast, qualitative research shows that out of 10 patients, 3 patients have a history of descent and 2 people have a history of descent from the father [11].

The risk of getting DM from the mother is 10-30% greater than for the father with DM. This is because the decrease in genes during pregnancy is greater for mothers than for fathers. In the female sex, the composition of estradiol will activate the ex-pression of the estrogen receptor β gene (ERβ). This gene will be responsible for insulin sensitivity and increased glucose uptake. As we age, estrogen levels in a woman's body will decrease. A decrease in estrogen will decrease the activation of ER gene expression so that insulin sensitivity and glucose uptake will also decrease [10] [12]

The results showed that the existence of a history of descent from parents with DM was related to the age at which DM was diagnosed younger than those without a history of descent. This is in line with previous research that shows the early onset of type-2 diabetes among patients with both parents with diabetes when compared to other patients whose parents are non-diabetic [5]. Based on the results of other stud-ies, it was shown that 52.7% of the age of DM patients with a family history of dis-ease were in the age range of 45-54 years [9].

CONCLUSION

DM is a chronic disease where one of the risk factors is the history of parental de-scent. This study showed that almost half of the patients had a history of heredity. There are more hereditary histories from the mother than from the father or both. DM patients who have a hereditary history have DM earlier than those who have no hereditary history. Based on these data, people who have a family history of DM need to be vigilant and improve a healthy lifestyle to delay the development of DM disease or prevent it.

REFERENCES
1. World Health Organization: Global Report on Diabetes. (2016). https://doi.org/ISBN 978 92 4 156525 7.
2. International Diabetes Federation: IDF Diabetes Atlas Eighth edition 2017. (2017).
3. A., G., S., G., R., U.: Study on the impact of family history of diabetes among type 2 diabetes mellitus

patients in an urban area of Kancheepuram district, Tamil Nadu. Int. J. Community Med. Public Heal. 4, 4151 (2017). https://doi.org/10.18203/2394-6040.ijcmph20174819.

4. Ard, D., Tettey, N.-S., Feresu, S.: The Influence of Family History of Type 2 Diabetes Mellitus on Positive Health Behavior Changes among African Americans. Int. J. Chronic Dis. 2020, 1–8 (2020). https://doi.org/10.1155/2020/8016542.

5. Jali, M. V, Kambar, S., Jali, S.M., Gowda, S.: Familial early onset of type-2 diabetes mellitus and its complications. N. Am. J. Med. Sci. 1, 377–80 (2009). https://doi.org/10.4297/najms.2009.7377.

6. Cole, J.B., Florez, J.C.: Genetics of diabetes mellitus and diabetes complications. Nat. Rev. Nephrol. 16, 377–390 (2020). https://doi.org/10.1038/s41581-020-0278-5.

7. Yusnanda, F., Rochadi, R.K., Maas, L.T.: Pengaruh Riwayat Keturunan terhadap Kejadian Diabetes Mellitus pada Pra Lansia di BLUD RSUD Meuraxa Kota Banda Aceh Tahun 2017. J. Healthc. Technol. Med. 4, 18 (2019). https://doi.org/10.33143/jhtm.v4i1.163.

8. Joeliantina, A., Proboningsih, J., Anugrahini, H.N., Mejilla, J.L.: The Behavior of Patients with Type 2 Diabetes Mellitus in Monitoring Blood Glucose Levels and Foot Care : A Cross-sectional , Community-Based Study. Int. J. Adv. Heal. Sci. Technol. 104–109 (2022). https://doi.org/https://doi.org/10.35882/ijahst.v2i2.9.

9. Fitri, N., Mukhtar, D., Arsyad, M., Memiliki…, G.K.D.P.P.Y.: Gambaran Kejadian Diabetes pada Pasien yang Memiliki Riwayat Keluarga Diabetes Mellitus di Puskesmas Pasirukem Kec. Cilamaya Kulon-Karawang Tahun 2018-2020. Maj. Kesehat. PharmaMedika. 13, 24–28 (2021).

10. Santosa, A., Trijayanto, P.A., Endiyono: Hubungan Riwayat Garis Keturunan Dengan Terdiagnosis Diabetes Melitus Tie II. 4, 1–6 (2019).

11. Joeliantina, A., Hamid, I.N., Soelistyowati, E.: The experiences of patients with diabetes and strategies for their management during the first COVID-19 lockdown: a qualitative study. Int. J. Adv. Heal. Sci. Technol. 3, 33–40 (2023). https://doi.org/https://doi.org/10.35882/ijahst.v3i1.214.

12. Alonso-magdalena, P., Ropero, A.B., García-arévalo, M., Soriano, S., Quesada, I., Muhammed, S.J., Salehi, A., Gustafsson, J., Nadal, Á.: Antidiabetic Actions of an Estrogen Receptor b Selective Agonist. 62, 2015–2025 (2015). https://doi.org/10.2337/db12-1562.