JMU
Jurnal Medika Udayana
ISSN: 2597-8012 JURNAL MEDIKA UDAYANA, VOL. 14 NO.01, JANUARI, 2025
Received: 2023-12-01 Revision: 2024-10-10 Accepted:01-11-2024

TREATMENT COMPLIANCE AND BLOOD SUGAR LEVELS IN TYPE 2 DIABETES MELLITUS PATIENTS

Gede Ari Mahendra Mardaningrat[1], Ketut Parining[1], Made Aristia Utami[2]
[1]General Practitioner, Seririt I Health Center, Buleleng, Bali, Indonesia
[2] Doctor's Profession, Faculty of Medicine, Warmadewa University, Denpasar, Bali, Indonesia
e-mail: arimahendra28@gmail.com

ABSTRACT

Achieving acceptable levels of glycemic control to avoid short- and long-term complications requires comprehensive management of diabetes mellitus (DM), including medical, dietary, and lifestyle modifications. DM has become one of the most common chronic diseases worldwide. The relationship between blood glucose levels and medication adherence in patients with type II DM at the Seririt I Health Center was sought to be determined in this study. This research included an analytical study conducted at the Seririt I Health Center from June 2023 to August 2023. This study used a cross-sectional design where the number of samples was used a total of 75 people were taken using a sampling technique, namely total sampling. Data were collected by interviewing patients, viewing patient medical records, and conducting blood sugar checks. The research data were summarized in Microsoft Excel and then analyzed with SPSS 16.0 for descriptive statistics. The results of the study showed that at the Seririt I Health Center, the highest number of patients with DM were found in the female group (64%), the age group > 60 years (49.4%), DM from Patemon (25.3%), and DM sufferers accompanied by comorbid hypertension (53.3%), DM treatment with metformin and glibenclamide (44%). The study's results also showed that DM patients had a relatively good level of treatment compliance (82.7%), and normal blood sugar levels (77.3%). In this study, a correlation test was also carried out, and significant results were obtained ($p < 0.05$) between treatment compliance and blood sugar levels in type 2 DM patients. One effort to control blood glucose or prevent complications caused by DM is to implement treatment compliance behaviour for DM sufferers.

Keywords: *adherence, blood glucose, diabetes mellitus, diet, treatment*

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disease. This disease is characterized by increased blood sugar levels (hyperglycemia). DM is caused by decreased insulin action and/or insulin resistance. DM requires comprehensive treatment management, including medical treatment, dietary sugar control and lifestyle modification, to achieve reasonable blood sugar control.[1,2]

DM is divided into type 1 DM, type 2 DM, Gestational DM and other types of DM. Type 2 DM has an incidence that continues to increase every year.[3] The number of DM sufferers has increased yearly, with cases expected to reach 629 million in 2045. According to data from the International Diabetes Federation (IDF), it is reported that there will be an increase The number of DM sufferers was around 5 million people in 2017.[4]

Based on data from Basic Health Research (Riskesdas) in 2013, it shows that 6.9% of DM cases in Indonesia occur in people aged over 15 years. The incidence of DM in Indonesia continued to increase from 2007 to 2013, from 1.1% to 2.1%. The highest incidence of DM cases is found in Yogyakarta province, namely 2.6%, followed by Jakarta province, North Sulawesi province, and East Kalimantan province at 2.5%, 2.4%, and 2.0%, respectively. 3%.[5]

Data from the International Diabetes Federation predicts that there will be an increase in the incidence of DM in Indonesia, where in 2019, there were 10.7 million cases. The number is predicted to increase in 2030 to 13.7 million cases.[6]

In 2018, research conducted by Riskesdas indicated that the incidence of DM in the age group ≥ 15 years is around 2%. This shows an increase in DM cases in Indonesia because only approximately 1.5% is found in 2013. Type 2 DM, judging from age, in Indonesia, is mainly in the 55-74 year age group.[6] The incidence of Type II DM is relatively high in Bali. The Riskesdas report in 2018 found that the incidence of DM among people aged 15 years and over in Bali increased in 2013 by 1.5% and in 2018 by 1.8%. This age group has the lowest incidence of DM, with a rate of 1.0% in Karangasem and Gianyar regencies. Meanwhile, the highest DM cases in this group are recorded in Jembrana regency, reaching 2.0%. Klungkung regency is ranked third in terms of the highest incidence of DM in Bali, with a rate of 1.6%, after Buleleng and Jembrana regencies.[7]

One of the most essential treatment optimizations that needs to be considered is adherence to taking medication. Type 2 DM

sufferers having difficulty achieving blood sugar control through lifestyle modifications (e.g. diet and exercise) require pharmacological treatments, such as oral anti-diabetic agents (OAA) and/or insulin treatment.[8] The mechanism of action of anti-diabetic drugs, whether oral or injectable, is by stimulating the release of insulin from the pancreas, increasing insulin sensitivity, reducing insulin absorption in the blood, or administering insulin from outside the body, increasing insulin levels in the blood.[9]

DM treatment is important to control blood sugar and prevent or delay the emergence of DM complications, such as nephropathy, neuropathy, and retinopathy. However, poor medication adherence remains a significant problem in DM patients.[10]

MATERIALS AND METHODS

A cross-sectional study was used as the research design. Interviews were used with patients to collect data, then look at the patient's medical record data and carry out blood sugar checks when the patient visits the health center. This study was conducted at the Seririt I Health Center from June to August 2023.

The population of this study were DM sufferers from June 2023 to August 2023 at Seririt I Health Center. The research samples were selected using a total sampling method, where all patients who visited Seririt I Health Center from June 2023 to August 2023 were sampled. Therefore, 75 people were the research sample size.

The data were then collected and summarized using the Microsoft Excel application. The data that has been summarized were then analyzed descriptively and inferentially using the SPSS Version 16 application for statistical tests.

RESULTS

Table 1 explains the characteristics of DM patients at the Seririt I Health Center. It was found that age 59 years was the average age of DM patients, with a standard deviation of around 9.24. Age 86 years was the age of the oldest patient, while age 35 years was the age of the youngest patient. The gender of patients with DM was distributed, with 36% being men and 64% being women. Looking at the age group, the majority of DM patients was in the age range > 60 years, namely 49.4%, then followed by the 40-60 year age group, namely 48%, and the least was in the age range < 40 years, namely as many 2.6%. Based on regional origin, the most patients with DM came from the Patemon area at 25.3%, followed by the Pengastulan area at 17.3%, Kalianget and Seririt areas each at 9.3%, and the least came from the Temukus area as much as 1.3%. DM patients with comorbidities in the form of hypertension were 53.3%. DM patients at the Seririt I Health Center were mainly treated with metformin and glibenclamide as much as 44%, and patients treated with one anti-diabetic drug in metformin were 25.3%. Treatment of DM with insulin was 17.3%, treatment of DM with metformin and glimepiride was 8%, treatment of DM with one anti-diabetic drug, namely glibenclamide, was 2.7%, and treatment of DM patients with metformin and glizalizide was 2. 7%. Based on the level of compliance in undergoing treatment, DM patients at Seririt I Health Center can be said to be compliant in undergoing treatment with a compliance percentage of 82.7%. Based on the results of blood sugar checks, 77.3% of DM patients at the Seririt I Health Center had reasonable blood sugar control, with around 22.7% of DM patients having high blood sugar levels.

Table 1. Characteristics of DM patients at Seririt I Health Center

Characteristics	Amount (n)	Percentage (%)
Average age	59.77 ± 9.24	
Gender		
Male	27	36.0
Female	48	64.0
Age		
< 40 year	2	2,6
40-60 year	36	48.0
> 60 year	37	49.4
Demography		
Bubunan	5	6.6
Kalianget	7	9.3
Lokapaksa	1	1.3
Patemon	19	25.3
Pengastulan	13	17.3
Seririt	7	9.3
Sulanyah	11	8.0
Temukus	1	1.3
Tangguwisia	9	4.0
History of Hypertension		
Yes	40	53.3
No	35	46.7
DM Treatment		
Metformin	19	25.3
Glibenclamide	2	2.7
Metformin, Glibenclamide	33	44.0
Metformin, Glizalizide	2	2.7
Metformin, Glimepiride	6	8.0
Insulin	13	17.3
Medication Adherence		
Comply with Treatment	62	82.7
Failure to comply with treatment	13	17.3
Blood Sugar Levels		
Normal	58	77.3
High	17	22.7

Table 2 explains the relationship between DM patient treatment compliance and blood sugar levels. Based on Table 2, it can be seen that 54 people with DM regularly take anti-diabetic drugs and have normal blood sugar levels. A total of 8 people with DM also regularly took anti-diabetic drugs, but still experienced high blood sugar levels. Four DM patients do not routinely undergo treatment but have normal blood sugar levels. There were nine DM sufferers with high blood sugar levels who

do not regularly take anti-diabetic drugs. In Table 2, a chi-square test was carried out, and it was found that the p-value with a significance value was 0.001, with an α confidence level of 0.05. These results show that at the Seririt I Health Center, there is a significant correlation between type II DM patients' blood sugar levels and their medication adherence.

Table 2. The relationship between medication adherence and blood sugar at the Seririt I Health Center

Variable	Blood Sugar Levels		p-value
	Normal n (%)	High n (%)	
Medication Adherence			
Comply with Treatment	54	8	< 0,001
Failure to comply with treatment	4	9	< 0,001

DISCUSSION

DM is a metabolic disease arising from insulin resistance or secretion, which causes blood sugar levels to increase. Macrovascular and microvascular complications in patients with DM can occur over a long time. [11]

At the Seririt I Health Center, the study on the correlation between blood sugar levels of DM patients and treatment compliance shows that female patients are more likely to suffer from DM than male patients. Prasetyani's findings in 2016 and Nina's in 2017 show that type II DM occurs more often in female patients. The increased prevalence of DM in women may be explained by differences in body composition and hormone levels between women and men. More adipose tissue is found in women than men, reflected in the difference in normal fat levels between the sexes. Usually, compared to body weight, a figure of around 15 to 20% indicates the fat content of men, while on the weight scale, a figure of 20 to 25% indicates the fat content of women.[12]

In addition, in post-menopausal women, lower hormone estrogen levels can cause increased accumulation of body fat, especially in the abdominal area. Fat collected in this area can trigger the release of free fatty acids. This condition of increased adipose tissue and increased release of free fatty acids may contribute to the development of insulin resistance.[13]

A decrease in estrogen, which occurs more often in women, especially when approaching menopause, is one of the main causes of type 2 DM. The insulin response in the blood is increased by progesterone and estrogen to lower blood sugar levels. Progesterone and estrogen levels will decrease, causing a decrease in insulin response and an increase in blood sugar levels when women are in menopause.[14]

The results of this study also show that DM at the age of 40 is the age at which a person is more likely to suffer from DM. After 40 years, the risk of developing DM due to the aging process causes the risk to increase. For insulin production, the ability of pancreatic β cells is reduced by this process. In addition, mitochondrial activity in muscle cells decreases by up to 35% with age. This results in a 30% increase in muscle fat percentage and insulin resistance.[15]

Setyorogo and Trisnawati's research in 2013 also provided results that are following this study. Age correlates with blood sugar levels. The group with the most significant risk of increasing blood sugar levels is the age group over 45 years. Insulin sensitivity, which affects blood sugar levels, worsens as you age. At the age of over 40 years, the pancreas organ experiences a significant decline in physiological function, as do other organs.[16]

The results are statistically significant, namely the p-value obtained based on bivariate results, 0.001 ($p<0.05$), in which the blood sugar levels of Type 2 DM patients and treatment compliance strongly correlate. The results of this study are consistent with research conducted by May in 2013, which states that 62.8% of research participants routinely used DM medication.[17] Management of DM disease must be taken seriously because it is crucial. Blood sugar levels will later be able to be controlled, so it is vital. Blood sugar levels can be influenced by administering insulin or oral anti-diabetic drugs.[18]

Anti-diabetic drugs work in various ways, such as stimulating insulin receptors, reducing sugar absorption, inhibiting carbohydrate digestion, reducing sugar production, and increasing insulin production by the pancreas.[19] Research in 2017 by Astari reports that there is an influence the blood sugar levels of Type II DM sufferers on treatment compliance at the Purnama Pontianak Health Center.[20]

Compliance in managing DM patients is very important in preventing complications or chronic conditions and controlling blood sugar levels. DM patients are expected to be compliant while undergoing treatment. If DM patients are not treated, adverse impacts on their disease status will occur and promote the development of diabetes-related complications.[21]

CONCLUSION

Based on the results of research findings at the Seririt I Health Center, the characteristics of patients with DM disease are primarily found in the female group (64%), the age group > 60 years (49.4%), DM originating from Patemon (25.3%), sufferers DM accompanied by comorbid hypertension (53.3%), and DM treatment with metformin and glibenclamide (44%). The results of this study stated that DM patients had a relatively good level of treatment compliance (82.7%) and normal blood sugar levels (77.3%). In this study, the correlation test finds significant results ($p < 0.05$) between treatment compliance and blood sugar levels in type 2 DM patients at Seririt I Health Center.

REFERENCE

1. Tominaga Y, Aomori T, Hayakawa T, Morisky DE, Takahashi K, Mochizuki M. Relationship between medication adherence and glycemic control in Japanese patients with Type 2 diabetes. Pharmazie. 2018;73(10):609–12.
2. Fayed A, AlRadini F, Alzuhairi RM, Aljuhani AE, Alrashid HR, Alwazae MM, et al. Relation between

diabetes related distress and glycemic control: The mediating effect of adherence to treatment. Prim Care Diabetes. 2022;16(2):293–300.
3. Fitriani Y, Pristianty L, Hermansyah A. Patients' characteristics and their adherence to insulin therapy. J Basic Clin Physiol Pharmacol. 2020;30(6):1–6.
4. Presley B, Groot W, Pavlova M. Pharmacy-led interventions to improve medication adherence among adults with diabetes: A systematic review and meta-analysis. Res Soc Adm Pharm. 2019;15(9):1057–67.
5. Toharin SNR, Cahyati S, M Kes WH, Kes ZMH. Hubungan modifikasi gaya hidup dan kepatuhan konsumsi obat antidiabetik dengan kadar gula darah pada penderita diabetes melitus Tipe 2 Di RS Qim Batang Tahun 2013. Unnes J Public Heal. 2015;4(2):153–61.
6. Militia F, Handayani S, Setiaji B. Kejadian diabetes mellitus Tipe II pada lanjut usia di Indonesia (Analisis Riskesdas 2018). J Kedokt dan Kesehat. 2021;17(1):9–20.
7. Sugiarta IGRM, Darmita IGK. Profil penderita diabetes mellitus Tipe-2 (DM-2) dengan komplikasi yang menjalani rawat inap di Rumah Sakit Umum Daerah (RSUD) Klungkung, Bali tahun 2018. Intisari Sains Medis. 2020;11(1):7–12.
8. Jannoo Z, Mamode Khan N. Medication adherence and diabetes self-care activities among patients with Type 2 diabetes mellitus. Value Heal Reg Issues. 2019;18:30–5.
9. Cecilia Regina C, Mu A, Fitriany E. Systematic review tentang pengaruh obesitas terhadap kejadian komplikasi diabetes melitus Tipe Dua. J Verdure. 2021;3(1):8–17.
10. Yuhelma, Hasneli I Y, Annis N F. Identifikasi dan analisis komplikasi makrovaskuler dan mikrovaskuler pada pasien diabetes mellitus. J Online Mhs. 2015;2(1):569–79.
11. Almaini A, Heriyanto H. Pengaruh kepatuhan diet, aktivitas fisik dan pengobatan dengan perubahan kadar gula darah pada pasien diabetes mellitus Suku Rejang. J Keperawatan Raflesia. 2019;1(1):55–66.
12. Arania R, Triwahyuni T, Esfandiari F, Nugraha FR. Hubungan antara usia, jenis kelamin, dan tingkat pendidikan dengan kejadian diabetes mellitus di Klinik Mardi Waluyo Lampung Tengah. J Med Malahayati. 2021;5(3):146–53.
13. Sahlan Zamaa M, Sainudin S. Hubungan kepatuhan pengobatan dengan kadar gula darah sewaktu pada pasien diabetes melitus Tipe II. Jambura Nurs J. 2019;1(1):11–8.
14. Komariah K, Rahayu S. Hubungan usia, jenis kelamin dan indeks massa tubuh dengan kadar gula darah puasa pada pasien diabetes melitus Tipe 2 di Klinik Pratama Rawat Jalan Proklamasi, Depok, Jawa Barat. J Kesehat Kusuma Husada. 2020;(Dm):41–50.
15. Putri LR. Gambaran self care penderita diabetes melitus (DM) di wilayah kerja Puskesmas Gamping I Sleman Yogyakarta. Skripsi. 2017;(DM):1–180.
16. Sipayung R, Siregar FA, Nurmaini. Hubungan aktivitas fisik dengan kejadian diabetes melitus Tipe 2 pada perempuan usia lanjut di wilayah kerja Puskesmas Padang Bulan Medan Tahun 2017. J Muara Sains, Teknol Kedokteran, dan Ilmu Kesehat. 2018;2(1):78–86.
17. Ariani N, Alfian R, Prihandiwati E. Tingkat perilaku pengobatan, kepatuhan minum obat, dan kadar gula darah pasien diabetes mellitus rawat jalan di RSUD Brigjend. H. Hasan Basry Kandangan. J Ilm Manuntung. 2022;8(1):156–62.
18. Rahayu KB, Saraswati LD, Setyawan H. Faktor-faktor yang berhubungan dengan kadar gula darah pada penderita diabetes melitus Tipe 2 (Studi di wilayah kerja Puskesmas Kedungmundu Kota Semarang). J Kesehat Masy. 2018;6(2):19–28.
19. Rismawan M, Made N, Handayani T, Rahayuni IGAR. Hubungan kepatuhan minum obat terhadap kadar gula darah sewaktu pada penderita diabetes mellitus Tipe II (Relationship between drug compliance with blood sugar levels in Type 2 diabetes mellitus patients). 2023;6(1):23–30.
20. Rahmayanti Y, Karlina P. Kepatuhan minum obat hipoglikemia oral terhadap kadar gula darah dan kualitas hidup pasien diabetes mellitus Tipe II. J Aceh Med. 2017;1(2):49–55.
21. Widodo C, Tamtomo D, Prabandari AN. Hubungan aktifitas fisik, kepatuhan mengkonsumsi obat anti diabetik dengan kadar gula darah pasien diabetes mellitus di Fasyankes Primer Klaten. J Sist Kesehat. 2016;2(2):63–9.