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Description of HbA1c Levels in Diabetes Mellitus Patients at Husada Utama Surabaya Hospital

Gambaran Kadar HbA1c pada Pasien Diabetes Melitus di Rumah Sakit Husada Utama Surabaya

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ABSTRACT

Background: Diabetes Mellitus (DM) is a chronic disease characterized by elevated blood glucose levels and can lead to serious health complications if not properly managed. HbA1c measurement is an accurate method for assessing glycemic control over the past 2–3 months and evaluating long-term blood glucose levels.
Objectives: To analyze the description of HbA1c levels in patients with DM at Husada Utama Hospital Surabaya.
Methods: A descriptive design with a cross-sectional approach was used. The sample consisted of 118 patients with DM who had checked their HbA1c, selected using the accidental sampling method. Secondary data were obtained from the patient's medical records recorded at Husada Utama Hospital.
Results: The results showed that 73.7% of the respondents had uncontrolled HbA1c levels (≥6.5%) with an average HbA1c value of 8.18%. The majority of uncontrolled HbA1c levels were found in the elderly (62.1%), female patients (70.1%), patients who had suffered from diabetes mellitus for ≥5 years (57.5%), and those using a combination of oral antidiabetic drugs (39.1%).
Conclusion: Based on the findings, it can be concluded that most respondents with uncontrolled HbA1c levels were elderly, female, had been living with DM for ≥5 years, and were using a combination of oral antidiabetic drugs. This indicates that diabetes management still needs improvement.

Keywords: Characteristics, Diabetes Mellitus, HbA1c Levels, Health

ABSTRAK

Latar Belakang: *Diabetes Melitus (DM) merupakan penyakit kronis yang ditandai dengan meningkatnya kadar glukosa dalam darah dan dapat menyebabkan komplikasi Kesehatan yang serius jika tidak dikontrol dengan baik. Pengukuran HbA1c merupakan cara yang akurat untuk mengetahui kontrol glikemik selama 2-3 bulan terakhir dan untuk menilai tingkat gula darah dalam jangka panjang.*
Tujuan: *Guna menganalisa gambaran kadar HbA1c pada pasien diabetes melitus di Rumah Sakit Husada Utama Surabaya.*
Metode: *Memakai desain deskriptif berpendekatan cross-sectional. Sampelnya ada 118 pasien DM yang telah sudah memeriksa HbA1c, dipilihnya memakai metode accidental sampling. Data sekundernya didapati dari rekam medis pasiennya yang tercatatkan di Rumah Sakit Husada Utama Surabaya.*
Hasil: *Hasil menunjukkan bahwa sebanyak 73,7% responden memiliki kadar HbA1c tidak terkontrol (≥6,5%) dengan rata-rata kadar HbA1c sebesar 8,18%. Proporsi kadar HbA1c tidak terkontrol paling banyak ditemukan pada kelompok lansia (62,1%), perempuan (70,1%), pasien den lama menderita diabetes melitus ≥5 tahun (57,5%), dan pasien yang menggunakan kombinasi OAD oral (39,1%).*

Kesimpulan: *Berdasarkan hasil penelitian, dapat disimpulkan bahwa respoden dengan kadar HbA1c tidak terkontrol sebagian besar berusia lansia, berjenis kelamin perempuan, telah lama menderita diabetes melitus ≥5 tahun, dan mengonsumsi kombinasi OAD oral. Hal ini menunjukkan bahwa pengelolaan diabetes melitus masih perlu ditingkatkan.*

Kata kunci: *Diabetes Melitus, Kadar HbA1c, Karakteristik, Kesehatan*

INTRODUCTION

Diabetes Mellitus (DM), also known as diabetes, is a chronic disease characterized by high blood glucose levels (hyperglycemia) because the body cannot produce enough insulin or cannot use insulin effectively. Diabetes mellitus is a serious threat to global health regardless of socioeconomic status or national boundaries (Yulia et al., 2022). Recent data published in the 11th edition of the International Diabetes Federation (IDF) Diabetes Atlas shows that approximately 589 million adults aged 20-79 years are living with diabetes in 2024. This number is expected to increase to 853 million people by 2050 with diabetes. Indonesia ranks 5th as the country with the highest number of people with diabetes in the world, reaching 20.4 million in 2024. With a total population of 281.6 million, this figure shows a prevalence of diabetes in Indonesia is 7.25% (IDF, 2025.)

According to data from the 2018 Basic Health Research (Riskesdas), the prevalence of DM in Indonesia in the population aged ≥15 years diagnosed by a doctor is 2.0% (Riskesdas, 2018). These data shows an increase, as recorded in the Indonesian Health Survey (IHS) in 2023, to 2.2%. Based on doctor's diagnosis, the five provinces with the highest prevalence of diabetes mellitus in the population aged ≥15 years are DKI Jakarta with the highest prevalence (3.9%), followed by DI Yogyakarta (3.6%), East Kalimantan (3.1%), Bangka Belitung (2.8%), East Java (2.7%), and North Sulawesi (2.7%) (IHS, 2023.)

Based on data from the East Java Provincial Health Profile in 2022, the number of people with DM in East Java was recorded at 863,686 cases, which decreased to 854,453 cases in 2023. The highest prevalence of diabetes mellitus in East Java is in Surabaya City. In 2022, the number of patients was recorded at 96,732 cases and increased to 104,363 cases in 2023 (Dinkes Jatim, 2023; Dinkes Jatim, 2024). This increase in the number of cases is also reflected in the rise in the prevalence of DM, from 3.35% in 2022 to 3.47% in 2023, based on the population of Surabaya City, which was 2.88 million in 2022 and 3.01 million in 2023**.**

The main risks associated with DM are hypoglycemia, hyperglycemia, diabetic ketoacidosis, dehydration, and thrombosis. Hypoglycemia and hyperglycemia are major risks that patients with DM often suffer from (Yulia Annisa & Suropati, 2023). Blood sugar control in patients with DM can be performed in two ways, instantaneous blood sugar monitoring and long-term blood sugar. Instantaneous blood sugar monitoring can be seen from fasting blood sugar 2 hours PP (Post Prandial) and long-term blood sugar monitoring through HbA1c examination.Although DM cannot be cured, but blood sugar levels can be controlled (Syahrul et al., 2022).

Good diabetes control is characterized by pre-prandial capillary blood glucose levels between 80-130 mg/dL, 2-hour postprandial blood glucose <180 mg/dL, and HbA1c levels <6.5%. HbA1c or glycated hemoglobin is formed when glucose in the blood binds to hemoglobin and reflects the average blood glucose level over the past 2-3 months, corresponding to the life span of erythrocytes 100-120 days (PERKENI, 2021). Patients with HbA1c levels above 7% have a double risk of developing complications. The United Kingdom Prospective Diabetes Study (UKPDS) study showed that a 1% decrease in HbA1c can reduce the risk of peripheral vascular disease by 43%, complications by 35%, death by 21%, and myocardial infarction by 14% (Martina et al., 2024).

Based on this, HbA1c testing is very important to be done and monitored because it can help establish the diagnosis, management, and prognosis of DM. However, several studies in Indonesia found that the majority of people with diabetes mellitus have HbA1c levels that are not well controlled, including in Surabaya (Akuba et al., 2024.; Sahela et al., 2025; Sugondo et al., 2019). Previous research conducted by Amalia et al. (2018) at RSUD Dr Soetomo Surabaya showed an average HbA1c level of 8.14% with a median value of 7.8%, which is included in the uncontrolled category. The recorded HbA1c values ranged from a minimum of 5.4% to a maximum of 13.8%. Therefore, this study aims to determine the description of HbA1c levels in patients with DM at Husada Utama Surabaya Hospital.

METHODS

This is a descriptive study with a cross-sectional design. The population in this study were all patients with diabetes mellitus who had undergone HbA1c examination and did not use drugs that could cause an increase in blood sugar, such as steroids, at Husada Utama Surabaya

Hospital. Data collection was conducted during the period of February-March 2025.Samples in this study were selected using the accidental sampling method, which is sampling by chance, where patients who come for control and meet the inclusion criteria can be used as research samples. Determination of the number of samples was determined using Epi Info software with the StatCalc feature, resulting in 118 samples.

The data used in this study were HbA1c levels (controlled: <6.5%; uncontrolled: ≥6.5%) (PERKENI, 2021), age (non-elderly: <60 years; elderly ≥60 years), gender (male and female), duration of DM (≥5 years and <5 years), and type of treatment (oral OAD, insulin, combination of oral OAD, and combination of oral OAD and insulin). All data were obtained from secondary data, namely, medical records of patientsat Husada Utama Surabaya Hospital. After the data were collected and recorded, analyses were conducted using SPSS version 26.0 to describe the results. This study has obtained ethical approval from the Ethics Committee of Husada Utama Surabaya Hospital with permit number No.10/KEP-RSHU/II/2025. Written informed consent was obtained from all participants prior to data collection.

RESULTS AND DISCUSSION

Characteristics of Respondents

Based on the research conducted on 118 respondents, the majority were female 83 people (70.3%) and aged 60 years or above 74 people (62.7%). In terms of disease duration, more than half of the respondents 62 people (52.5%) had been diagnosed with diabetes mellitus for five years or more. Regarding treatment type, the highest proportion 45 people (38.1%) were using a combination of oral OAD. Furthermore, 31 people (26.3%) have controlled HbA1c levels (<6.5%), while 87 people (73.7%) have uncontrolled HbA1c levels (≥6.5%). This indicates that the majority of diabetic patients in the study have not achieved optimal glycemic control. The high proportion of uncontrolled HbA1c levels suggests a significant risk for the development of diabetes related complications, as HbA1c is a key indicator of long-term blood glucose management. More detailed information regarding the respondents' characteristics can be found in Table 1. below:

Table 1. Sociodemographic and Clinical Characteristics of Patients with Diabetes Mellitus

Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	35	29.7
Female	83	70.3
Age		
Non-elderly (<60 years)	44	37.3
Elderly (≥60 years)	74	62.7
Duration of Diabetes Mellitus		
<5 years	56	47.5
≥5 years	62	52.5
Treatment Type		
Oral OAD	30	25.4
Insulin	10	8.5
Combination of Oral OAD	45	38.1
Combination of Oral OAD and Insulin	33	28.0
HbA1c Levels		
Uncontrolled (≥6.5%)	87	73.7
Controlled (<6.5%)	31	26.3

In addition, the HbA1c levels of the respondents ranged from 5.3% to 12.8%, with a mean value of 7.85% and an average of 8.18%. These averages indicate that patients are still above the normal range, indicating that the majority of patients have not achieved optimal glycemic control. More detailed information regarding the distribution of HbA1c levels in respondents can be found in Table 2. below:

Table 2. Distribution of Mean HbA1c Levels in Patients with Diabetes

Variable	Frequency (n)	Min	Max	Median	Mean
HbA1c (%)	118	5.3	12.8	7.85	8.18

Distribution of HbA1c Levels Based on Age, Gender, Duration of Diabetes Mellitus, and Treatment Type

Based on age, gender, duration of diabetes mellitus, and type of treatment, most respondents had uncontrolled HbA1c levels (≥6.5%) across all categories. In terms of age, elderly respondents (≥60 years) accounted for the highest proportion of uncontrolled HbA1c levels, with 54 people (62.1%). Among those with controlled HbA1c levels (<6.5%), 20 people (64.5%) were also from the elderly group. In the non-elderly group (<60 years), 33 people (37.9%) had uncontrolled levels, and 11 people (35.5%) had controlled levels. Regarding gender, most respondents with uncontrolled HbA1c levels were female 61 people (70.1%), while 22 people (71.0%) had controlled levels. Among male respondents, 26 people (29.9%) had uncontrolled HbA1c levels and 9 people (29.0%) had controlled levels. Based on the duration of diabetes mellitus, respondents with diabetes for ≥5 years had the highest proportion of uncontrolled HbA1c levels, totaling 50 people (57.5%). In contrast, among those with diabetes duration <5 years, 37 people (42.5%) had uncontrolled levels, while a greater proportion 19 people (61.3%) had controlled levels compared to those with longer disease duration. In terms of treatment type, uncontrolled HbA1c levels were most prevalent among respondents using a combination of oral OADs 34 people (39.1%), followed by those using a combination of oral OADs and insulin 29 people (33.3%). Respondents using oral OADs alone and insulin alone accounted for 15 people (17.2%) and 9 people (10.3%), respectively. Among those with controlled HbA1c levels, the largest proportion used oral OADs alone 15 people (48.4%), followed by a combination of oral OADs 11 people (35.5%), a combination of oral OADs and insulin 4 people (12.9%), and insulin alone 1 people (3.2%). More detailed information regarding the distribution of respondents' HbA1c levels based on these variables can be seen in Table 3 below:

Table 3. Distribution of Respondents HbA1c Levels Based on Age, Gender, Duration of Diabetes Mellitus, and Type of Treatment

Variables	HbA1c Levels					
	Uncontrolled (≥6.5%)		Controlled (<6.5%)		Total	
	n	%	n	%	N	%
Age						
Elderly (≥60 years)	54	62.1	20	64.5	74	62.7
Non-elderly (<60 years)	33	37.9	11	35.5	44	37.3
Gender						
Female	61	70.1	22	71.0	83	70.3
Male	26	29.9	9	29.0	35	29.7
Duration of Diabetes Mellitus						
≥5 years	50	57.5	12	38.7	62	47.5
<5 years	37	42.5	19	61.3	56	52.5
Treatment Type						
Oral OAD	15	17.2	15	48.4	30	25.4
Insulin	9	10.3	1	3.2	10	8.5
Combination of Oral OAD	34	39.1	11	35.5	45	38.1
Combination of Oral OAD and Insulin	29	33.3	4	12.9	33	28.0

HbA1c examination has a very important role in evaluating DM control because it is able to reflect the average blood glucose level in the last 2-3 months, not just daily fluctuations as in the test of blood sugar (Karimah et al., 2018). Therefore, HbA1c control is considered more representative and becomes the main reference in assessing the quality of blood glucose management in people with diabetes. In addition, the HbA1c test has become the gold standard in measuring glycemic levels because it meets the quality and accuracy criteria based on international reference standards (Silangit et al., 2018).

HbA1c Levels of Diabetes Mellitus patients based on Age

Based on table 3, the results showed that uncontrolled HbA1c levels occurred mostly in the elderly group (≥60 years). These results agree with research conducted by Rohmatullah et al. (2024)which showed that most of the respondents were in the age group ≥45 years as many as 81 people (93.1%). This finding highlights the increased vulnerability of older individuals to poor glycemic control, potentially due to age-related factors such as decreased insulin sensitivity and the presence of comorbidities. Additionally, elderly patients may experience challenges in managing

their diabetes, including limited mobility, cognitive decline, and difficulty adhering to treatment regimens.

Physiologically, the aging process has an impact on reducing the function of pancreatic beta cells in producing insulin. In addition, mitochondrial activity in muscle tissue also decreases with age, which contributes to fat accumulation in muscle and triggers insulin resistance (Adriani et al., 2023). When insulin resistance occurs, the effectiveness of the hormone insulin in helping glucose enter the body's cells is compromised. As a result, the body responds by increasing insulin production. However, if insulin production is no longer adequate, glucose cannot be optimally distributed into cells, leading to an increase in blood sugar levels (Kurdi et al., 2021).

HbA1c Levels of Diabetes Mellitus patients based on Gender

Based on table 4, the characteristics of elderly patients with DM in this study show that the number of females is greater than male. These findings echo the work of by Kane et al. (2018) who flaseed those women tend to face a steeper climb when it comes to developing DM clocking in at a notable 62.2% or 77 individuals. Likewise, Rahayu et al. (2020) spotted a similar trend with ladies making up the lion's share of their sample 81 out of 134 respondent or roughly 60.4%. It's not just a concidence, the data hints at a genderer tilt in diabetes prevalence. Whatever its down to hormonal factors. It's a red flag that begs for sharper gender focused strategies in both prevention and care because when patterns like this keep popping up its time to stop brushing them off.

Women are more likely to get diabetes and it's not just because they eat more cake or skip workouts, its way deeper than that. It's got a lot to do with whats going on inside their bodies and mind. Ladies usually end up with a higher BMI than blokes, and a big part of that is down to hormones going bonkers during menopause. That's when the fat starts stinking more than it should. Ramadhan et al. (2018) pointed out that BMI can jump 5%-10% during this phase alone, then there the headspace stuff women tend to carry more emotional weight. Theye're more likely to stress, overthink, or spiral into anxiety and depression, and we're not just chatting about bad moods here. This stress pump up cortisol the stress hormone that messes with how the body handles sugar. So, yeah, long-term stress can completely ruin your blood sugar game. It's like hormones and emotions are tag-teaming to make sugar levels go haywire. It's like a sneaky combo of body drama and mental chaos that makes diabetes more of a woman issue (Setiyorini et al., 2018).

HbA1c levels of Diabetes Mellitus patients based on the Duration of Diabetes Mellitus

From table 5 it's pretty clear that people who have been living with diabetes for 5 years or more tend to have the worst HbA1c result. That's not just a coincidence. A study by Nurgajayanti et al. (2024) backs this up, showing that nearly all of their participants about 93,3% had been dealing with diabetes for over 5 years. It's made sense when the think about the longer the disease sticks around, the more wear and tear happens inside the body, especially to those hardworking beta cells in the pancreas. Not only that, but other complications start piling on too, making it even harder to manage blood sugar. Study by Inoue et al., (2021)showing that long term suffers tend to have higher HbA1c numbers than those who've just been diagnose.

HbA1c levels of Diabetes Mellitus patients based on The Type of Treatment

The flip perspective from table 6 it appears that individuals undergoing combination treatment with both insulin and oral agents had the roughest time managing their HbA1c around 39.1% of them unable to maintain ideas levels. In the other end, those sticking strictly to oral drugs (OADs) seemed to fare better, with approximately 48.4% successfully keeping their HbA1c under control. This pattern supports the idea the patients prescribed with combined regimens are usually those whose diabetes is difficult to manage (Oktianti & Retno Karminingtyas, 2024). Insulin in fact isn't typically the first choice when oral medication no longer does the trick. Therefore, it makes sense that folks on insulin or combo therapy are already dealing with more advanced conditions. Moreover, juggling multiple medications often comes with challenges missed ones, confusion, or reluctance to follow through. Made et al., (2020) explained that metformin or other solo oral meds are usually the go-to at the beginning, with insulin added only if needed. That's why combo therapy patients often demand closer follow-up and personalized dose adjustments to keep their sugar levels in check.

This study has several limitations that should be considered. The use of secondary data from medical records limited the availability of important variables, such as dietary habits, physical activity, stress levels, medication adherence, and other factors known to influence HbA1c levels. In addition, the study was conducted in a single hospital setting with a relatively limited sample size, which may reduce the generalizability of the findings. Future research should include a broader range of variables to better understand the factors affecting HbA1c levels.

CONCLUSION

Based on the results of the study, it can be concluded that the majority of DM patients at Husada Utama Hospital Surabaya still have uncontrolled HbA1c levels, which is 73.7%. The proportion of uncontrolled HbA1c levels is mostly found in the elderly ≥60 years (62.1%), females (70.1%), have a duration of DM ≥5 years (57.5%), and those who use a combination of oral OAD treatment (39.1%). These findings highlight the need for focused interventions, particularly for elderly and long-standing patients, as well as gender specific strategies. Enhancing patient education on medication adherence and regular HbA1c monitoring, along with a multidisciplinary approach, is essential for improving glycemic control.

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Conflict of Interest and Funding Disclosure

None.

Author Contributions

TAP: conceptualization, investigation, methodology, data curation, formal analysis, writing-original draft; KDA: correspondence author, supervision, writing-review & editing.

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