



THE RELATIONSHIP BETWEEN BLOOD GLUCOSE LEVELS AND SLEEP QUALITY IN PATIENTS WITH DIABETES MELLITUS

Friska^{1*}, Eri Fazriani²

¹Akademi Keperawatan Al-Ikhlas, Jl. Hankam, Jogjogan, Cisarua, Bogor, West Java 16750, Indonesia

²Klinik Amanda Medika, Ambarketawang, Jl. Letda Natsir No.21, Bojong Kulur, Gn. Putri, Bogor, West Java 16969, Indonesia

*friska@akper-alikhlas.id

ABSTRACT

Diabetes mellitus is a public health problem with high morbidity and mortality rates worldwide. DM is predicted to increase in 2030 by 643 million people and in 2045 by 783 million people. Diabetes is characterized by an increase in blood glucose levels, with frequent micturition and excessive thirst at night which makes diabetics experience sleep disturbances and has an impact on the quality of sleep of diabetics. Objectives: to determine the relationship of blood glucose levels to the quality of sleep of patients with diabetes mellitus. Methods: Quantitative research using a correlational design with a cross sectional approach. The number of samples in this study was 64 people. The research instrument used a questionnaire and a blood sugar level checker as a screening of current blood sugar levels in patients with diabetes mellitus. Data analysis using the spearman rank test. Results: The majority of respondents were female with an age range of 51-60 years and had high blood glucose levels >200mg/dL by 89.1%, and poor sleep quality by 67.2%. In this study there was a significant relationship between blood glucose levels and sleep quality with a value of ρ value = 0.0001 (<0.05). Conclusion: Symptoms of diabetes mellitus due to increased blood glucose levels can worsen the quality of sleep of people with diabetes mellitus.

Keywords: bad lifestyle; diabetes symptoms; uncontrolled blood glucose

How to cite (in APA style)

Friska, F., & Fazriani, E. (2025). The Relationship between Blood Glucose Levels and Sleep Quality in Patients with Diabetes Mellitus. *Indonesian Journal of Global Health Research*, 7(2), 681-688. <https://doi.org/10.37287/ijghr.v7i2.5721>.

INTRODUCTION

Diabetes mellitus (DM) is a major health problem that attracts attention in both developed and developing countries. Changes in lifestyle that are practical, instant and sophisticated are one of the factors in the occurrence of diabetes mellitus (Mulyadi et al., 2021). Diabetes mellitus is a disease characterized by high blood sugar levels in the urine due to metabolic disruption because the production and function of the hormone insulin does not run properly (Basir, 2020). DM is predicted to continue to increase in 2030 by 643 million people and in 2045 by 783 million people from the world's population (International Diabetes Federation, 2022). Based on Basic Health Research Data (Riskesdas) in 2018, the prevalence of DM in Indonesia based on doctor's diagnosis in the population over the age of 15 years increased to 2% in 2018 compared to 1.5% of the total population in 2013.

Sudden increases or decreases in blood glucose levels in people with DM can provide discomfort while sleeping at night. This condition is characterized by a drop in blood sugar levels that is too low during the night's sleep. As a result, people with diabetes may wake up or feel tired in the morning (Nurhanifah et al., 2023). If blood glucose levels increase at night it can cause dehydration, frequent urination and sometimes excessive thirst, thus increasing the frequency of waking up and making it difficult to start sleeping again (Bingga, 2021). DM is a chronic disease that is related to sleep activity, because in diabetes sufferers, nocturnal urination, polydipsia, polyphagia will occur which causes sleep disorders (Tamornpark et al.,

2022). Sleep quality is a satisfaction from the sleep experience, which integrates aspects of sleep onset, sleep organization, sleep quantity and feeling refreshed when waking up (Herianto, 2021). One of the challenges in managing diabetes mellitus is keeping blood glucose levels within a healthy range and maintaining good sleep quality. Blood glucose control can provide adequate sleep, good sleep quality, reduce the occurrence of diabetic complications, and improve quality of life (Barakat et al., 2019).

Based on preliminary studies conducted in the work area of the Cibulan health center, 6 out of 10 patients with diabetes mellitus experienced symptoms of frequent urination at night, often felt thirsty and had difficulty starting back to sleep. DM sufferers also say they are often sleepy in the morning around 9 or 10 in the morning, and sometimes DM sufferers often fall asleep again in the morning even though they only wake up around 5 in the morning. Excessive sleepiness in the morning is often felt by people with DM, and 2 out of 10 people with DM say they are not satisfied with their sleep. In addition, health workers at the Cibulan health center said that people with DM rarely do routine checks of blood sugar levels, and often DM patients are found to be non-compliant with taking medication which is indicated by the presence of elevated blood sugar levels during the examination. Based on the data above and the high prevalence of diabetes mellitus cases, researchers are interested in raising this phenomenon to see the relationship between blood sugar levels and sleep quality in diabetes sufferers.

METHOD

This research uses quantitative methods with correlational types. This research approach uses cross sectional, which is a study of the relationship between independent and dependent variables with measurements once and at the same time (Ali et al., 2022). This study aims to examine the relationship between 2 variables, namely blood glucose levels and sleep quality. The independent variable is blood glucose level and the dependent variable is sleep quality. The population in this study was 181 people with DM in the last 1 year. The instrument used in this study was the sleep quality questionnaire (KKT) adopted from Evi Karota Bukit and has been modified from the Pittsburgh Sleep Quality Index (PSQI) and St. Mary's Hospital sleep questionnaire instruments. The KKT questionnaire consists of 7 questions containing 7 sleep components that have been modified and have been tested for reliability, including: 1) total hours of sleep at night (0.96); 2) time to start sleeping (0.89); 3) frequency of waking up (0.94); 4) feeling fresh when waking up in the morning (0.85); 5) depth of sleep (0.98); 6) satisfaction with sleep at night (0.92); 7) feeling tired/sleepy during the day (0.83). The second research instrument used a blood glucose level observation sheet based on the results of a random blood glucose level examination with a standardized glucometer measuring instrument and is intended for measuring random blood glucose levels. Data processing techniques used in this study are editing, coding, processing, cleaning and for analysis techniques, namely univariate and bivariate analysis.

RESULT

Univariate Analysis

Age

The frequency distribution of respondents according to the age studied can be seen in the following table:

Tabel 1.
Frequency Distribution of Respondents Based on Age (n=64)

Age	f	%
30-40 years	3	4,7
41-50 years	14	21,9
51-60 years	25	39,1
>60 years	22	34,3

Based on the table 1, the majority of respondents aged 51-60 years were 39.1% and more than 60 years were 34.4%. While respondents who suffered from diabetes mellitus at the age of 30-40 years amounted to 4.7%

Gender

The frequency distribution of respondents according to the gender studied can be seen in the following table:

Tabel 2.
Frequency Distribution of Respondents Based on Gender (n=64)

Gender	f	%
Male	21	32,8
Female	43	67,2

Based on the table 2, the majority of respondents were female at 67.2% while male respondents were 32.8%.

Education

The frequency distribution of respondents according to the education studied can be seen in the following table:

Table 3.
Frequency Distribution of Respondents Based on Education (n=64)

Education	f	%
SD	33	51,6
SMP	18	28,1
SMA	10	15,6
Lainnya	3	4,7

Based on the table above, it shows that the average respondent has elementary school education as much as 51.6%, while other education or equivalent to college level is 4.7%.

Occupation

The frequency distribution of respondents based on occupation was obtained as shown in the following table:

Tabel 4.
Frequency Distribution of Respondents Based on Occupation (n=64)

Pekerjaan	f	%
Wiraswasta	19	29,7
PNS/POLRI	1	1,6
IRT	41	64,1
Lainnya	3	4,7

Based on the table 4, it shows the occupation of self-employed (29.7 civil servants / police officers (1.6%), housewives (64.1%) and other jobs (4.7%).

History of Diabetes Mellitus

The frequency distribution of respondents based on a history of diabetes mellitus is as follows:

Table 5
Frequency Distribution of Respondents Based on History of Diabetes Mellitus (n=64)

History of Diabetes Mellitus	f	%
History DM	24	37,5
No History DM	40	62,5

Based on the table 5, it can be seen that the majority of respondents did not have a history of diabetes mellitus amounting to 40 62.5%, while those who had a history amounted to 37.5%.

Blood Glucose Levels

The frequency distribution of respondents based on blood glucose levels is as follows:

Tabel 6.

Frequency Distribution Based on Blood Glucose Levels (n=64)

Blood Glucose Levels	f	%
<200 normal	7	10,9
>200High	57	89,1

Based on the table above, it was found that the majority of respondents had high blood glucose levels (>200mg/dL) at 89.1%

Sleep Quality

The frequency distribution of respondents based on sleep quality is obtained as follows:

Tabel 7.

Frequency Distribution of Respondents Based on Sleep Quality (n=64)

Sleep Quality	f	%
Good	21	32,8
Bad	43	67,2

Based on the table 7, it was found that the average respondent had poor sleep quality of 67.2%, while in the good quality category only 32.8%.

Bivariate Analysis

Relationship of blood glucose levels to sleep quality

Based on the results of research conducted in Kopo Village, Cisarua District, the relationship between sleep quality and blood glucose levels in patients with diabetes mellitus is found in the table below:

Table 8.

Relationship of blood glucose levels to sleep quality (n=64)

Blood glucose	Sleep Quality						Pvalue
	Good		Bad		Total		
	f	%	f	%	f	%	
<200 (Normal)	7	10,9	0	0	7	10,9	0,000
>200 (High)	14	21,8	43	67,1	57	89,1	

Based on the results of the spearman test, the pvalue is 0.0001 (<0.05), which means that there is a relationship between blood glucose levels and sleep quality in Kopo Village, Cisarua sub-district.

DISCUSSION

The results of the univariate analysis obtained an average age of respondents in the study of 51-60 years of 39.1% and over 60 years of 34.3%. Age is one of the factors that can affect a person's health behavior. At the age of over 45 years, a person's risk of developing diabetes

mellitus will increase. Increasing age can cause insulin resistance conditions, resulting in unstable blood sugar levels (Susanti, Nazli, et al., 2024). Therefore, the increase in cases of diabetes mellitus is due to the factor of increasing age which degeneratively causes decreased body function, especially pancreatic dysfunction (Ramadhan, 2020). Risk factors for diabetes mellitus that can be changed and cannot be changed. One of the risk factors that cannot be changed is gender. Women are more likely to develop diabetes mellitus than men due to hormonal and metabolic factors (Susanti, Maulida, et al., 2024). The majority of respondents in this study were women compared to men at 67.2%. Women have a higher body fat composition than men, which has an impact on increasing excess weight or obesity (Komariah & Rahayu, 2020).

This study also obtained data that the majority of respondents' education was equivalent to elementary school (SD) level of 51.6%. Increasing the level of education will increase awareness of healthy living and paying attention to lifestyle and diet (Nugroho & Pahlawati, 2019). Low education will find it difficult to capture information about health that they want to obtain (Qusyairi et al., 2022). According to the researcher's assumption, the importance of good education for DM sufferers is because good knowledge will increase knowledge and awareness in implementing a healthy lifestyle by regulating the levels of sweet foods consumed every day. Diabetes mellitus is a hereditary disease that is polygenic or multi genetic factors, which means not just one gene but the interaction between genes (Maspupah et al., 2022). However, it is different from the results of this study where the majority of respondents did not have a genetic history in DM sufferers by 62.5%. This can occur due to a bad lifestyle, a diet that is all instant, high in calories and an increased interest in consuming sweet foods is a trigger factor for diabetes mellitus (Kabosu et al., 2019).

Based on the results of research conducted in Kopo Village, Cisarua District, the majority of respondents with DM had high blood glucose levels (>200 mg/dL) of 89.1%. Diabetes mellitus can cause metabolic disorders characterized by an increase in blood glucose levels. Blood glucose levels will increase after eating and will drop again after 2 hours (Norma Lalla & Rumatiga, 2022). Uncontrolled blood glucose levels in patients with diabetes mellitus will cause various complications, both acute and chronic (Nuzulia, 2021). Acute complications are usually unconscious patients with a high mortality rate, and acute complications such as macroangiopathy, affecting the heart, stroke, diabetic retinopathy (affecting the retina of the eye) and diabetic nephropathy (affecting the kidneys), glaucoma, and diabetic foot / ulcer (Sumakul et al., 2022). Therefore, it is very important for patients to monitor their blood glucose levels regularly. Based on the results of this study using a sleep quality questionnaire, the majority of respondents with DM experienced poor sleep quality as much as 67.2%. Patients with diabetes mellitus mostly experience typical symptomatic signs, namely frequent urination, excessive hunger, frequent thirst, itching and pain. This is because people with DM experience an increase in blood sugar levels which results in glucose reaching the urine and the kidneys will release additional water to dilute the wasted glucose as a result of which people with DM often urinate (Yazia & Suryani, 2023). Some calories are also wasted with urine resulting in excessive hunger and people with DM also experience pain. This can all make people with DM wake up frequently and have difficulty falling back asleep so that the quality of sleep of people with DM is disturbed (Bingga, 2021; Nuzulia, 2021). According to the researcher's assumption, the symptoms of frequent micturition, excessive hunger and frequent thirst experienced by people with DM are one of the causes of a person's poor sleep quality.

Based on the results of bivariate analysis using the spearman test, there is a relationship between blood glucose levels and sleep quality with a pvalue of 0.0000 (<0.05). Increasing or

decreasing blood glucose levels is one of the factors that can affect the quality of sleep in a person to be poor. This is in line with Aisyah (2019) who said that there was a relationship between blood glucose levels and the quality of sleep of patients with diabetes mellitus at the Trangkil Pati Regency Health Center with a Pvalue of 0.000 (<0.05). Gunawan & Rahmawati, (2021) said that if someone is able to control blood glucose levels in people with diabetes mellitus, it can make sleep quality good. However, there are differences in the results of research conducted by Nurhanifah et al. (2023) that there is no significant relationship between blood glucose levels and sleep quality with a p value of 0.693 (0.05). This is likely due to the limitations of respondents in their research being one of the factors affecting the results of the study. Uncontrolled blood sugar levels can cause sleep disorders in diabetics. Poor glycemic control will result in poor sleep quality. This relationship may be explained by the fact that half of diabetics with poor glycemic control may suffer from diabetic neuropathy and osmotic pain (Barakat et al., 2019). Diabetics who undergo insulin treatment are 2.17 times more likely to complain of poor sleep quality than patients who only receive oral hyperglycemic drugs (Lavery et al., 2023). Therefore, it is important for people with diabetes mellitus to manage factors that affect both their blood sugar levels and their sleep quality.

Another factor that can affect DM sufferers experiencing sleep disorders is environmental factors. Comfortable environmental factors greatly affect sleep, with a comfortable environment when sleeping will make someone get a good night's sleep and their eyes fall asleep easily (Yazia & Suryani, 2023). Room humidity also needs to be regulated so that the lungs do not dry out because if the humidity of the room is not regulated, a person will not be able to sleep, even if they can sleep, a person will wake up with a dry throat as if the person is suffering from tonsillitis (Suryani, 2018; Simarmata et al., 2020). According to researchers, in addition to paying attention to blood glucose levels in DM sufferers so that they are within the normal range, there are environmental factors that need to be considered in DM sufferers so that DM sufferers avoid sleep disorders at night and get good quality sleep.

CONCLUSION

Based on the distribution of characteristics In diabetes mellitus sufferers, the majority of respondents were aged 51-60 years, 39.1%, female gender 67.2%, elementary school graduates 51.6% and housewives 64.1%. Based on the frequency distribution of blood glucose levels in Kopo Village, Cisarua District, with a high category of 89.1%. The quality of sleep in diabetes mellitus sufferers mostly experienced poor sleep quality of 67.2%. Based on the analysis of the relationship between blood glucose levels and sleep quality in diabetes mellitus patients in Kopo Village, Cisarua District, the results of the Spearman rank data obtained a ρ -value of 0.0001 (<0.05).

REFERENCES

- Aisyah, S. (2019). Hubungan Kadar Gula Darah Dengan Kualitas Tidur Pada Pasien Dm Di Puskesmas Trangkil Kabupaten Pati.
- Ali, M. M., Hariyati, T., Pratiwi, M. Y., & Afifah, S. (2022). Metodologi Penelitian Kuantitatif dan Penerapannya dalam Penelitian. *Education Journal*, 2(2), 1–6.
- Barakat, S., Abujbara, M., Banimustafa, R., Batieha, A., & Ajlouni, K. (2019). Sleep Quality in Patients With Type 2 Diabetes Mellitus. *Journal of Clinical Medicine Research*, 11(4), 261–266. <https://doi.org/10.14740/jocmr2947w>
- Basir, A. A. (2020). Hubungan Antara Pola Tidur Terhadap Kadar Glukosa Darah Pada Penderita Diabetes Melitus Di Wilayah Kerja Puskesmas Leworeng Kecamatan Donri

- Donri Kabupaten Soppeng. *Journal of Health, Nursing, Midwifery Science Adpertisi*, 1(2), 1–8.
- Bingga, I. A. (2021). Kaitan Kualitas Tidur dengan Diabetes Melitus Tipe 2. *Medika Utama*, 2(4), 1047–1052.
- Gunawan, S., & Rahmawati, R. (2021). Hubungan Usia, Jenis Kelamin dan Hipertensi dengan Kejadian Diabetes Mellitus Tipe 2 di Puskesmas Tugu Kecamatan Cimanggis Kota Depok Tahun 2019. *ARKESMAS (Arsip Kesehatan Masyarakat)*, 6(1), 15–22. <https://doi.org/10.22236/arkesmas.v6i1.5829>
- Herianto, H. (2021). artikel pengaruh tatlaksana tidur dan kualitas tidur pada penderita diabetes mellitus. 8(2), 19–28.
- International Diabetes Federation. (2022). Diabetes around the world in 2021. <https://Diabetesatlas.Org/Data/En/Country/94/Id.Html>.
- Kabosu, R. A. S., Adu, A. A., & Hinga, I. A. T. (2019). Faktor Risiko Kejadian Diabetes Melitus Tipe Dua di RS Bhayangkara Kota Kupang. *Timorese Journal of Public Health*, 1(1), 11–20. <https://doi.org/10.35508/tjph.v1i1.2122>
- Komariah, K., & Rahayu, S. (2020). 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. *Jurnal Kesehatan Kusuma Husada, Dm*, 41–50. <https://doi.org/10.34035/jk.v11i1.412>
- Laverty, B., Puthethath Jayanandan, S., & Smyth, S. (2023). Understanding the relationship between sleep and quality of life in type 2 diabetes: A systematic review of the literature. *Journal of Health Psychology*, 28(8), 693–710. <https://doi.org/10.1177/13591053221140805>
- Maspupah, T., Nina, N., Siagian, T. D., Pakhpahan, J., & Octavianie, G. (2022). Perilaku Pencegahan dan Risiko Kejadian Diabetes Melitus Tipe 2 pada Usia Produktif di Kabupaten Bogor Tahun 2021. *Journal of Public Health Education*, 2(1), 242–253. <https://doi.org/10.53801/jphe.v2i1.66>
- Mulyadi, M., Mulyono, D., & Sriyatun, S. (2021). The Relationship Between Level of Knowledge About Diet With Diabetes Mellitus Diet Compliance at Pangkur Public Health Center, Ngawi Regency. *Jurnal Midpro*, 13(1), 69. <https://doi.org/10.30736/md.v13i1.292>
- Norma Lalla, N. S., & Rumatiga, J. (2022). Ketidakstabilan Kadar Glukosa Darah Pada Pasien Diabetes Melitus Tipe II. *Norma Lalla, Nu Syamsi, Rumatiga*, 11, 473–479. <https://doi.org/10.35816/jiskh.v11i2.816>
- Nurhanifah, D., Sasarari, Z. A., & Azza, A. (2023). Kadar Glukosa Darah Terhadap Kualitas Tidur Penderita Diabetes Millitus : Cross-Sectional Study Pendahuluan. 474–480. <https://doi.org/10.35816/jiskh.v12i2.1130>
- Nuzulia, A. (2021). Hubungan Kualitas Tidur Dengan Kadar Gula Darah Puasa Pada Penderita Obesitas Dewasa Skripsi. *Angewandte Chemie International Edition*, 6(11), 951–952., 5–24.
- Qusyairi, R., Andi Sani, & Chaeruddin Hasan. (2022). Hubungan Tingkat Pengetahuan dengan Aktivitas Self Care pada Penderita Diabetes Melitus di Wilayah Kerja

- Puskesmas Batua Kota Makassar. *Window of Public Health Journal*, 3(4), 595–606. <https://doi.org/10.33096/woph.v3i4.61>
- Ramadhan, M. (2020). Faktor-Faktor Yang Berhubungan Dengan Kejadian Diabetes Melitus Di Wilayah Kerja Puskesmas Karang Mekar Kota Banjarmasin Tahun 2020 Skripsi Diajukan Untuk Memenuhi Sebagian Syarat Memperoleh Gelar. 11–40.
- Riskesdas. (2018). Kementerian Kesehatan Badan Penelitian dan Pengembangan Kesehatan.
- Simarmata, P. C., Sitepu, K., Sitepu, S. D. E. U., Sitepu, A. L., & Ginting, R. (2020). Factors Affecting Sleep Disorders in Diabetes Mellitus Patients. *Jurnal Keperawatan Dan Fisioterapi (Jkf)*, 3(1), 65–70. <https://doi.org/10.35451/jkf.v3i1.528>
- Sumakul, V., Suparlan, M., Toreh, P., & Karouw, B. (2022). Edukasi Diabetes Melitus Dan Pemeriksaan Kadar Glukosa Darah Umat Paroki St. Antonius Padua Tataaran. *Jurnal Pengabdian Kepada Masyarakat MAPALUS Sekolah Tinggi Ilmu Kesehatan Gunung Maria Tomohon*, 1(1), 64–70. https://doi.org/10.56338/sambulu_gana.v2i2.3542
- Suryani, R. (2018). Kualitas Tidur dan Faktor-Faktor Gangguan Tidur Pasien dengan Gangguan Saluran Pencernaan Yang dirawat di Ruang Sakit. Universitas Sumatera Utara.
- Susanti, N., Maulida, P., Rizqi, S., Dewi, S., & Barokah, W. (2024). Hubungan usia, jenis kelamin terhadap pola makan dan risiko diabetes melitus di desa air hitam. 5(September), 7484–7491.
- Susanti, N., Nazli, A. H., Wahyuni, D., & Yasmin, W. Y. (2024). Faktor – Faktor Yang Mempengaruhi Diabetes Mellitus Di Puskesmas Tuntungan. 8, 4293–4299.
- Tamornpark, R., Utsaha, S., Apidechkul, T., Panklang, D., Yeemard, F., & Srichan, P. (2022). Quality of life and factors associated with a good quality of life among diabetes mellitus patients in northern Thailand. *Jurnal Ilmu Keperawatan Komunitas*, 20(1), 1–12. <https://doi.org/10.1186/s12955-022-01986-y>
- Yazia, V., & Suryani, U. (2023). Faktor-Faktor Yang Berhubungan Dengan Kualitas Tidur Penderita Diabetes Melitus. *Jurnal Keperawatan Jiwa (JKJ): Persatuan Perawat Nasional Indonesia Volume 11 No 4, November 2023, e-ISSN 2655-8106, p-ISSN2338-2090 FIKKes Universitas Muhammadiyah Semarang Bekerjasama dengan PPNI Jawa Tengah*, 11(4), 983–994.