

THE RELATIONSHIP BETWEEN RANDOM BLOOD SUGAR LEVELS AND SLEEP QUALITY OF ELDERLY PEOPLE WITH DIABETES MELLITUS AT THE PURWOSARI COMMUNITY HEALTH CENTER

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ABSTRACT

Background: Diabetes mellitus is a degenerative disease commonly experienced by the elderly and is characterized by elevated blood sugar levels above normal limits. Hyperglycemia can cause various complaints, one of which is sleep disturbances. Poor sleep quality in the elderly can worsen blood glucose control and reduce quality of life. This study aims to determine the relationship between random blood sugar levels and sleep quality in elderly with diabetes mellitus at Health center of Purwosari District. **Method:** This study used an observational analytical design with a cross-sectional approach. The population was all elderly people with diabetes mellitus at the Elderly Health at Purwosari Health Care Center, with a sample size of 33 respondents selected using accidental sampling. Random blood sugar levels were measured using a glucometer, while sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. Data were analyzed using the Spearman Rho correlation test. **Result :** The result of the study showed that most respondents had random blood sugar levels above the normal limit (>199 mg/dl) and poor sleep quality. The p-value was 0.000, meaning the significance value was <0.05. Meanwhile, the Correlation Coefficient value was 0.685. This means there is a positive relationship with a strong relationship. **Conclusion:** High random blood sugar levels can cause various complaints such as frequent urination at night, thirst, tingling, and pain, which impact the quality of sleep in the elderly. In order to enhance the quality of life of the elderly, healthcare facilities must establish educational programs that underscore the significance of glycaemic control and sleep quality as interrelated factors.

Keyword : Random Blood Glucose, Sleep Quality, Elderly, Diabetes Mellitus

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both (American Diabetes Association, 2023). It has become a major global public health issue, particularly among the elderly population. The prevalence of diabetes continues to increase globally, with older adults being disproportionately affected due to age-related physiological changes, including decreased insulin sensitivity and pancreatic beta-cell function (International Diabetes Federation, 2021).

According to the International Diabetes Federation (IDF), the global number of diabetes cases reached 589 million, with 215 million in the Western Pacific region, including Indonesia. The prevalence of diabetes in Indonesia is projected to reach 11.3% by 2024, with the number of adult cases reaching 20,426,400 (International Diabetes Federation, 2025). The estimated number of diabetes sufferers in East Java aged 15 years and older is 882,315, consisting of 882,315 people (East Java Health Office, 2024). The prevalence of diabetes in Bojonegoro Regency was 25,280 in 2024, while it reached 24,598 in 2023, indicating an increase in diabetes cases (Bojonegoro, 2024). Meanwhile, cases of diabetes mellitus in Purwosari District in 2024 reached 547 people (Bojonegoro, 2024)

Random blood glucose level is widely used as a practical and rapid indicator for assessing glycemic status in clinical and community settings. Poor glycemic control has been associated with a range of complications, including microvascular and macrovascular disorders, which can significantly impair quality of life (Forouhi and Wareham, 2019). In elderly patients, uncontrolled blood glucose levels may also contribute to functional decline and increased vulnerability to other health disturbances, including sleep disorders. High blood sugar levels can impact sleep quality. Poor sleep quality is common in the elderly, due to degenerative processes that lead to decreased physiological function. Poor sleep quality leads to impaired glucose tolerance (IGT), and when a person's sleep duration is low, insulin resistance increases. Several factors influence pancreatic beta response and insulin sensitivity, one of which is sleep. Sleep is one aspect of pancreatic beta response and insulin sensitivity (Rusdani et al., 2022).

Sleep quality is a crucial component of overall health, especially among older adults. Physiological aging is associated with alterations in sleep patterns, such as decreased sleep efficiency, increased sleep latency, and frequent nocturnal awakenings (Crowley, 2011). In patients with diabetes mellitus, sleep disturbances are often exacerbated by symptoms such as nocturia, neuropathic pain, and fluctuations in blood glucose levels, including hyperglycemia and hypoglycemia episodes (Reutrakul and Van Cauter, 2018).

Previous studies have demonstrated a bidirectional relationship between glycemic control and sleep quality. Poor sleep quality may adversely affect glucose metabolism through mechanisms involving hormonal imbalance, including increased cortisol secretion and reduced insulin sensitivity (Spiegel, Leproult and Van Cauter, 1999). Conversely, elevated blood glucose levels can disrupt sleep through physiological discomfort and metabolic instability, thereby creating a cycle that worsens both glycemic control and sleep quality (Knutson et al., 2007).

Although several studies have explored the relationship between diabetes and sleep disturbances, research specifically examining the association between random blood glucose levels and sleep quality in elderly patients remains limited. This is particularly relevant in developing countries, where the burden of diabetes continues to rise and comprehensive management approaches are still evolving.

Therefore, this study aims to analyze the relationship between random blood glucose levels and sleep quality among elderly patients with diabetes mellitus. The findings are expected to contribute to the development of holistic nursing interventions that address not only glycemic control but also sleep quality, thereby improving the overall well-being of elderly patients.

METHODS

The research design in this study uses a correlational research design that aims to develop relationships between variables and explain the relationships found. This study uses a quantitative research type with a cross-sectional approach. This study was conducted at the Elderly Health Post (Posyandu Lansia) in Purwosari Health Care Center, Purwosari District, Bojonegoro Regency in December 2025. The population in this study were 37 elderly people with a history of diabetes mellitus. The sampling technique used an incidental sampling technique that obtained a sample of 33 people. Data analysis was carried out using the Spearman Rho correlation test with a p value of 0.000, where the value is smaller than 0.05 so

that H1 is accepted. Which means there is a significant relationship between Random Blood Sugar Levels and Sleep Quality of Elderly with Diabetes Mellitus at the Purwosari Health Care Center. With a Correlation Coefficient of 0.685. This indicates that the higher the random blood sugar level, the higher the value of poor sleep quality.

RESULTS

This research was conducted at a community health center in Purwosari District, Bojonegoro Regency, East Java Province. The Posyandu (Integrated Health Post) for the elderly routinely includes several programs, including general health checks, health education, routine medication administration, and healthy exercise for the elderly. This Posyandu routinely conducts monthly random blood sugar checks. Several elderly people with a history of diabetes mellitus actively participate in the Posyandu. The monthly GDS checks revealed that many elderly people still have high random blood sugar levels. They also frequently complain of difficulty sleeping, aches and pains, frequent tingling sensations, and fatigue.

The results of the study indicate a relationship between random blood sugar levels and sleep quality in elderly people with diabetes mellitus. Elderly people with uncontrolled random blood sugar levels tend to experience poorer sleep quality compared to those with more stable blood sugar levels. Hyperglycemia can cause increased urination frequency (nocturia), excessive thirst, and physical discomfort that disrupts sleep. Furthermore, fluctuating blood glucose levels can also affect the autonomic nervous system and hormones, such as increased cortisol levels, which play a role in the sleep-wake cycle.

Respondent characteristics and study results can be seen in the following table:

Table1. Table of respondent characteristics

Characteristics	frequency	Percentage
Gender		
Male	8	24.2%
Female	25	75.8%
Age		
45-59 years	13	39.4%
60-74 years	19	57.6%
75-90 years	1	3%
Education		
Informal School	14	42,4%
Elementary school	10	30,3%
Junior high school	2	6,1%
Senior high school	5	15,2%
Diploma	1	3,0%
Bachelor’s degree	1	3,0%
Occupation		
No Occupation	5	15,2%
Farmer	28	84,8%

Table 2. Table of Random blood glucose level

Random blood glucose level	Frequency	Percentage
<90 mg/dl	0	0%

90-199 mg/dl	13	39,4%
>199 mg/dl	20	60,6%

Table 3. Table of Sleep quality

Sleep quality	Frequency	Percentage
Good sleep quality	11	33,33%
Bad sleep quality	22	66,7%

Table 3. Table of Spearman Rho test

		Random blood glucose level	Sleep quality
Spearman Rho	Random blood glucose level	Correlation Coefficient	1.000
		Sig. (2-tailed)	.685
		N	.000
	Sleep quality	Correlation Coefficient	.685
		Sig. (2-tailed)	1.000
		N	.000

DISCUSSION

A study conducted at the Purwosari Community Health Center found that of the 33 respondents, the majority had random blood sugar levels >199 mg/dl (20 respondents (60.6%), while the majority of respondents had poor sleep quality (22 respondents (66.7%). This study showed that of the 33 respondents who underwent cross-tabulation analysis, the majority of respondents with blood sugar levels exceeding the normal limit (GDS>199) had poor sleep quality (18 respondents (54.5%). This aligns with the results of research (Harianto et al., 2021), which stated a relationship between random blood sugar levels and sleep quality. Respondents with high random blood sugar levels had poor sleep quality. High random blood sugar levels will affect sleep quality.

Significantly, the results of this study indicate that the higher the random blood sugar level, the poorer the sleep quality in the elderly. This is not mere coincidence, but a relationship that can be explained physiologically and clinically. From a mechanistic perspective, uncontrolled blood sugar levels can lead to several conditions that disrupt sleep, such as: Polyuria due to hyperglycemia, which causes frequent awakenings in the elderly; Polydipsia, which disrupts sleep; Diabetic neuropathy, which causes pain or discomfort in the extremities; Glucose fluctuations that can affect the regulation of sleep hormones like melatonin. Furthermore, poor sleep quality can also worsen glycemic control. Sleep deprivation can increase stress hormones like cortisol, which contribute to insulin resistance. This suggests a bidirectional relationship between blood sugar levels and sleep quality.

High blood sugar levels cause urine to become thicker and require water to dilute it. Excretion accompanied by excessive fluid and electrolyte loss is called osmotic diuresis. As a result, the body becomes dehydrated, causing people with diabetes mellitus to drink more or experience increased thirst (polydipsia), leading to more frequent urination (polyuria) at night. High blood sugar levels can cause difficulty sleeping due to nocturia, restless leg syndrome, peripheral neuropathy, and sleep apnea at night. This is especially true with increasing age and the aging process, which disrupts sleep quality (Harianto et al., 2021).

This is in line with research (Siregar, 2023) which showed that 51 people (62.2%) were aged 60-74 years. Risk factors increase after the age of 45 years. This can occur because at this age individuals are less active, weight will increase and muscle mass will decrease, impacting pancreatic dysfunction which causes increased blood sugar levels because it cannot produce insulin (Nur, 2022). Increasing age causes changes in carbohydrate metabolism and changes in insulin release that are influenced by glucose in the blood and inhibited the release of glucose that enters cells because it is influenced by insulin. If we look at the age of respondents when they first suffered from DM, it can be seen that the increasing age of a person, the greater the incidence of type 2 DM (Siregar, 2023).

Lack of activity is also a risk factor for increased blood sugar levels in patients with diabetes mellitus. This study showed that of the 33 respondents, almost all (28 respondents) were employed, while a small proportion (5 respondents) were unemployed. In this study, most respondents worked as farmers, while others worked as traders, housewives, and retirees. Lack of activity can trigger obesity and weaken insulin sensitivity in the body, causing increased blood sugar levels. The mechanisms by which physical activity can prevent or inhibit the development of diabetes mellitus include reduced insulin resistance, increased glucose tolerance, decreased adipose fat, and reduced central fat; changes in skeletal muscle tissue (Nur, 2022).

Another risk factor that can increase blood sugar levels in diabetes mellitus patients is gender (Komariah & Rahayu, 2020). The results of this study showed that of the 33 respondents, the majority were female, namely 25 respondents (75.8%). Meanwhile, 8 respondents were male (24.2%). This is in line with research (Tajiwalar et al., 2023), which showed that there were more female respondents (108 people) than male respondents (73 people). Women have a greater potential to develop diabetes mellitus than men because physically, women are more likely to experience an increase in body mass index due to women experiencing premenstrual syndrome (PMS) and menopause. Premenstrual syndrome, often referred to as PMS, is discomfort felt by women who have menstruated or have entered their reproductive years. This discomfort can be felt physically and emotionally 7 to 14 days before menstruation (Kamilah et al., 2021).

Poor sleep quality was noted by respondents with high blood sugar levels. The quality of sleep might be adversely affected by elevated blood sugar levels. Urine becomes thicker and needs to be diluted with water when blood sugar levels are high. Osmotic diuresis is the term for this excessive loss of fluid and electrolytes. This causes the body to become dehydrated, which makes diabetics consume more water or have greater thirst (polydipsia), which causes them to urinate more at night (polyuria). Sleep apnoea, peripheral neuropathy, restless legs syndrome, and nocturia can all be brought on by high blood sugar.

Diabetes mellitus is a chronic hyperglycemic condition accompanied by various metabolic disorders resulting from hormonal disturbances that can lead to various chronic complications in the eyes, kidneys, nerves, and blood vessels (Indriyani et al., 2023). Degenerative processes can also affect hormonal processes in the body. Advanced age can result in decreased cortisol levels, increased parasympathetic nervous system activity, decreased glucose utilization by the brain, increased Non-Esterified Fatty Acids (NEFA), decreased leptin, and increased Growth Hormone (GH). Cortisol and leptin have the same function: forming glucose metabolism. At night, when sleep is difficult, cortisol levels increase and leptin levels decrease. The liver stimulates glucose production from fats and proteins

that do not contain carbohydrates and inhibits glucose utilization (Harianto et al., 2021). As elders age, their sleep quality deteriorates. This is because ageing affects physical health in a reciprocal manner. Ageing impairs the functioning of all organs, including the respiratory, digestive, visual, auditory, and cardiovascular systems. This causes a variety of complaints among seniors while resting, which can contribute to poor sleep quality (Harisa et al., 2022).

CONCLUSIONS

The study's findings suggest that in older adults with diabetes mellitus, random blood sugar levels and sleep quality are related. Symptoms including polyuria, frequent nightly awakenings, pain, and other physiological disruptions that affect sleep patterns in older adults can be brought on by hyperglycemia and glucose variations. In light of these results, it is advised that medical professionals especially nurses increase routine blood sugar monitoring and inform patients and their families about the significance of optimum glycaemic control for preserving sleep quality. Additionally, it is necessary to optimise nursing treatments including food modifications, therapy adherence, sleep hygiene, and light physical exercise. To get a more complete picture, more research is advised to look at additional variables that may affect sleep quality, such as stress, the length of the illness, and complications from diabetes.

REFERENCES

1. Akilakanya, W. (2021). Hubungan Antara Pola Makan Dan Kadar Glukosa Darah Sewaktu Pada Penderita Diabetes Melitus Tipe Dua. *Damianus Journal of Medicine*, 20(2), 135–143.
2. Arimbi, D. S. D., Lita, L., & Indra, R. L. (2020). Pengaruh Pendidikan Kesehatan Terhadap Motivasi Mengontrol Kadar Gula Darah Pada Pasien Dm Tipe Ii. *Jurnal Keperawatan Abdurrah*, 4(1), 66–76.
3. Bojonegoro, dinas kesehatan. (2024). *Data Morbiditas (Angka Kesakitan)*. Dinas Kesehatan Bojonegoro. <https://data.bojonegorokab.go.id/dinas-kesehatan.html@detail=morbiditas>
4. Bungawaliktrin, C. (2024). Gambaran Glukosa Darah Puasa Dan Kadar Hb1c Pada Penderita Diabetes Melittus Tipe 2 Di Rumah Sakit Advent Bandar Lampung Tahun 2023.
5. Darose, T. D. (2017). Hubungan Kadar Gula Darah Dengan tekanan Darah Ibu Hamil Di Wilayah Puskesmas Tlogosari Kulon Semarang. Muhammadiyah University of Semarang.
6. Dinas Kesehatan Jawa Timur. (2024). *Profil Kesehatan Provinsi Jawa Timur*. Analytical Biochemistry. [https://dinkes.jatimprov.go.id/userfile/dokumen/Profil Kesehatan Provinsi Jawa Timur Tahun 2023.pdf](https://dinkes.jatimprov.go.id/userfile/dokumen/Profil%20Kesehatan%20Provinsi%20Jawa%20Timur%20Tahun%202023.pdf)
7. Esprensa, A., & Ekacahyaningtyas, M. (2022). Gambaran Tingkat Stress pada Lansia di Era New Normal: Overview of Stress Levels in the Elderly in the New Normal Era. *Jurnal Keperawatan Notokusumo*, 10(1), 44–50.
8. Fauziah, E. (2019). Pengaruh Pemberian Minyak Esensial Aromaterapi Kenanga Terhadap Kualitas Tidur Lansia Di Dusun Karang Tengah Nogotirto Gamping Sleman Yogyakarta. Universitas' Aisyiyah Yogyakarta.
9. Federasi Diabetes Internasional. (2025). *Diabetes di Indonesia (2024)*. Federasi Diabetes Internasional. <https://idf.org/our-network/regions-and-members/western-pacific/members/indonesia/>
10. Ferawati, Rahayu, yayuk I., Alfirdaus, S. A., & Sari, I. R. (2020). Hidup Sehat & Bahagia Dengan Diabetes (*Kenali, Cegah, Obati*). Guepedia.

11. Fitriana, N. (2021). Terapi SEFT (*spiritual emosional freedom technique*) pada remaja dalam upaya peningkatan kualitas tidur pada kasus insomnia. Karya Ilmiah, Universitas Muhammadiyah Magelang.
12. Hanifa, A. L., & Romadhon, Y. A. (2019). Hubungan Aktivitas Fisik dan Jenis Kontrasepsi terhadap Gula Darah Sewaktu pada Wanita Peserta Posyandu Lansia di Kecamatan Kartasura. Universitas Muhammadiyah Surakarta.
13. Harianto, T. D., Yuliadarwati, N. M., & Yulianti, A. (2021). Hubungan Kadar Gula Darah Sewaktu Dengan Kualitas Tidur Pada Lansia Beresiko Diabetes Melitus Di Posyandu Desa Kincang Wetan Kota Madiun. *Fisio Mu: Physiotherapy Evidences*, 77–84.
14. Harisa, A., Syahrul, S., Yodang, Y., Abady, R., & Bas, A. G. (2022). Analisis faktor-faktor yang memengaruhi kualitas tidur pasien lanjut usia dengan penyakit kronis. *Jurnal Kesehatan Vokasional*, 7(1), 1.
15. Hasibuan, R. K., & Hasna, J. A. (2021). Gambaran kualitas tidur pada lansia dan faktor-faktor yang mempengaruhinya di kecamatan kayangan, kabupaten lombok utara, nusa tenggara barat. *Jurnal Kedokteran Dan Kesehatan*, 17(2), 187–195.
16. Hastuti, R. Y., Sari, D. P., & Sari, S. A. (2019). Pengaruh melafalkan dzikir terhadap kualitas tidur lansia. *Jurnal Keperawatan Jiwa*, 7(3), 303.
17. Hutahaeen, R. G. (2021). Hubungan Stres dengan Kualitas Tidur pada Mahasiswa/i Fakultas Kedokteran Universitas HKBP Nommensen Medan.
18. Indriyani, E., Ludiana, L., & Dewi, T. K. (2023). Penerapan Senam Kaki Diabetes Melitus Terhadap Kadar Glukosa Darah Pada Penderita Diabetes Mellitus Di Puskesmas Yosomulyo. *Jurnal Cendikia Muda*, 3(2), 252–259.
19. Kamilah, Z. D., Utomo, B., & Winardi, B. (2021). Pengaruh aktivitas fisik dan usia menarche dengan kejadian premenstrual syndrome pada remaja putri. *Indonesian Midwifery and Health Sciences Journal*, 3(2), 160–166.
20. Kemenkes, R. (2019). Pedoman Pelayanan Kefarmasian Pada Diabetes Melitus. Kementerian kesehatan RI.
21. 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*, 41–50.
22. Lestari, L., & Zulkarnain, Z. (2021). Diabetes Melitus: Review etiologi, patofisiologi, gejala, penyebab, cara pemeriksaan, cara pengobatan dan cara pencegahan. *Prosiding Seminar Nasional Biologi*, 7(1), 237–241.
23. Maghfuri, A. (2016). Buku Pintar Perawatan Luka Diabetes Melitus. Salemba Medika.
24. Manafe, L. A., & Berhimpon, I. (2022). Hubungan tingkat depresi lansia dengan interaksi sosial lansia di BPSLUT Senja Cerah Manado. *Jurnal Ilmiah Hospitality*, 11(1), 749–758.
25. Nur, H. (2022). Analisis Faktor Yang Mempengaruhi Self Management Pada Pasien Diabetes Melitus Tipe 2 Di Wilayah Kerja Puskesmas Buduran Kab. Sidoarjo. Stikes Hang Tuah Surabaya.
26. Nursalam. (2020). Metodologi Penelitian Ilmu Keperawatan Pendekatan Praktis Edisi 5. Salemba Medika.
27. Oktavia, K. S. (2022). Hubungan Kualitas Tidur Dengan Kejadian Hipertensi Pada Ibu Hamil Di Wilayah Kerja Puskesmas Bangetayu Semarang. Universitas Islam Sultan Agung Semarang.
28. Oktora, S. P. D., & Purnawan, I. (2018). Pengaruh Terapi Murottal Al Qur'an terhadap Kualitas Tidur Lansia di Unit Rehabilitasi Sosial Dewanata Cilacap. *Jurnal Keperawatan Soedirman*, 11(3), 168–173.
29. Resti, D. (2018). Hubungan Kualitas Tidur Dengan Kadar Glukosa Darah Pada Pasien Diabetes Mellitus Tipe II. *Prosiding Seminar Kesehatan Perintis*, 1(1).

30. Rosares, V. E., & Boy, E. (2022). Pemeriksaan Kadar Gula Darah untuk Screening Hiperglikemia dan Hipoglikemia. *Jurnal Implementa Husada*, 3(2), 65–71.
31. Rusdani, R., Esmiralda, N., & Febrianti, K. Y. (2022). Hubungan Kualitas Tidur dengan Kadar Gula Darah Sewaktu Pada Lansia di Panti Jompo Tresna Werda Kota Bengkulu. *Zona Kedokteran: Program Studi Pendidikan Dokter Universitas Batam*, 12(2), 156–163.
32. Sari, R. Y., Suherman, A., Nadatien, I., Kamariyah, N., & Hasina, S. N. (2024). Pengaruh Aromaterapi Lavender terhadap Kadar Gula Darah pada Lansia Diabetes Mellitus Tipe-2. *Jurnal Keperawatan*, 16(1), 147–156.
33. Sihaloho, W. H. B., Taslim, M. A., & Saptawati, T. (2023). Hubungan Kadar Glukosa Darah Dengan Kualitas Tidur Pada Pasien Diabetes Mellitus Tipe 2. *Jurnal Ilmu Kesehatan Dan Gizi*, 1(4), 133–145.
34. Siregar, D. A. (2023). Hubungan Kualitas Tidur Dengan Kadar Gula Darah Pada Pasien Diabetes Mellitus Tipe 2 Di Wilayah Kerja Puskesmas Pijorkoling Kota Padangsidempuan. javascript:void(0)
35. Sugiyono, P. D. (2023). Metode penelitian kuantitatif kualitatif dan r&d. Alfabeta.
36. Sumakul, V. D. O., Suparlan, M. S. R., Toreh, P. M., & Karouw, B. M. (2022). Edukasi Diabetes Melitus Dan Pemeriksaan Kadar Glukosa Darah Umat Paroki St. Antonius Padua Tataaran. *Jurnal Pengabdian Kepada Masyarakat MAPALUS*, 1(1), 18–25.
37. Sungkono, R. (2016). Hubungan Antara Profil Lipid Darah Dengan Terjadinya Nefropati Diabetikum Pada Penderita Diabetes Melitus Tipe 2.
38. Susanti, E. T., & Indrajati, U. (2022). Tingkat pengetahuan tentang menopause dengan kesiapan menghadapi menopause pada ibu premenopause. *Jurnal Keperawatan Karya Bhakti*, 8(2), 78–84.
39. Tajiwalar, M. S., Adnyana, I. G. A., & Pratiwi, M. R. A. (2023). Hubungan Kualitas Tidur Dengan Kadar Glukosa Darah Sewaktu Pada Pasien Diabetes Melitus Tipe 2. *Journal of Pharmaceutical and Health Research*, 4(1), 134–140.
40. Tanjung, M. F. C., & Sekartini, R. (2016). Masalah tidur pada anak. *Sari Pediatri*, 6(3), 138–142.
41. Trianawati, L., Widiyono, W., & Sutrisno, S. (2023). Hubungan Indeks Massa Tubuh Dan Rasio Lingkar Pinggang Panggul Dengan Kadar Gula Darah Sewaktu Pada Masyarakat Di Dusun Trowangsan. Universitas Sahid Surakarta.
42. Yana, N. S., Wahyuningsih, B. D., & Yuniarti, E. V. (2023). Hubungan kualitas tidur dengan kadar gula darah pada penderita diabetes di poli interna rsi sakinah mojokerto. Perpustakaan Universitas Bina Sehat PPNI.