

THE RELATIONSHIP BETWEEN KNOWLEDGE AND MEDICATION ADHERENCE IN TYPE 2 DIABETES MELLITUS PATIENTS

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ABSTRACT

Diabetes Mellitus (DM) is a chronic disease characterized by high blood sugar levels due to the body's inability to produce or use insulin effectively. This disease is one of the top ten causes of death worldwide, and its prevalence continues to rise. Adherence to treatment is crucial for controlling blood sugar levels and preventing serious complications. The aim of this study is to examine the correlation between knowledge and medication adherence in Type 2 Diabetes Mellitus patients at the Sukadana Health Center, East Lampung Regency. This study uses a cross-sectional design with 84 respondents selected through purposive sampling. Data were collected using a questionnaire consisting of two parts: knowledge about diabetes and adherence to treatment. Data were analyzed using the chi-square test and Odds Ratio (OR) calculation. The research results indicate a significant relationship between knowledge about diabetes and medication adherence ($p=0.017$). Among Type 2 DM patients, 5.5% had high knowledge and high adherence, while 7.4% had low knowledge and low adherence. An Odds Ratio (OR) of 0.010 indicates that respondents with high knowledge were more likely to adhere to treatment compared to those with low knowledge. Therefore, there is a significant relationship between the knowledge of type 2 DM patients and adherence to treatment, with a low level of correlation.

Keywords: blood sugar control; health education; knowledge about diabetes mellitus; medication adherence; type 2 diabetes mellitus

INTRODUCTION

Diabetes Mellitus (DM) is a chronic disease caused by the body's inability to produce the hormone insulin or due to improper use of insulin production. This is characterized by high blood sugar levels in the body. Diabetes Mellitus is currently the chronic disease with the highest increase in prevalence and is among the top 10 diseases causing death worldwide, with its prevalence also continuing to rise (WHO, 2016). Diabetes consists of two types: type 1 and type 2. Type 2 diabetes is more prevalent than type 1. Type 2 diabetes accounts for 90-95% of all diabetes cases. This is a common and serious global health issue in 2019 that has developed in relation to rapid cultural, economic, and social changes, an aging population, increasing and uncontrolled urbanization, changes in dietary patterns such as increased consumption of highly processed sugary foods and sweetened beverages, obesity, decreased physical activity, unhealthy lifestyles and behaviors, fetal malnutrition, and increased fetal exposure to hyperglycemia during pregnancy. Type 2 diabetes is most prevalent among adults, but the increasing number of children and adolescents is also affected. (WHO, 2019).

International Diabetes Federation (IDF) in 2021 estimated that there were 537 million adults (aged 20-79 years) living with diabetes, or about 10.5% of the world's population. This figure is projected to increase to 643 million in 2030 and 783 million in 2045. The majority of diabetes sufferers (more than 75%) live in low- and middle-income countries. (IDF, 2021). Meanwhile, according to data from the International Diabetes Federation (IDF), it is estimated that there are 19,465,100 adults aged 20-79 years in Indonesia who suffer from diabetes, with a prevalence of

10.6% in that age group (IDF, 2021). Meanwhile, the Ministry of Health of the Republic of Indonesia recorded that the prevalence of diabetes in the 20-79 age group in Indonesia in 2021 was around 10.6%, which means 1 in 9 adults suffers from diabetes. (IDF, 2021). Meanwhile, according to the Basic Health Research (Riskesmas) data in 2023, the prevalence of diabetes mellitus among the Indonesian population increased to 11.7%. This figure is based on blood sugar level examinations in individuals aged 15 years and older. In 2018, the prevalence of diabetes mellitus was recorded at 10.9%, indicating an increase of 0.8% over the past five years. Type 2 diabetes is the most commonly suffered, especially among the elderly. (Survei Kesehatan Nasional, 2023).

The prevalence of Diabetes Mellitus patients in Lampung Province is 1.4% with a total of 91,693 individuals. Meanwhile, the prevalence of Diabetes Mellitus patients in East Lampung is 1.6% with a total of 13,403 individuals from the population in that area. The prevalence data for the population aged ≥ 15 years in East Lampung is 825,206 individuals out of a total population of 1,669,994. The number of Diabetes Mellitus cases receiving outpatient treatment in 2023 was 10,092 or 75.3% of the total estimated cases. (Kemenkes RI, 2023). Then, based on the coverage data of the Sukadana Health Center's working area in 2023, the prevalence of Diabetes Mellitus among the population aged ≥ 15 years was 8.1%, with a total of 1,098 patients from the total number of cases. Figure 2. Data on Diabetes Mellitus service results based on distribution location (Puskesmas Sukadana, 2023). The impact of the increasing incidence of diabetes mellitus will lead to a rise in the global mortality rate because diabetes mellitus has various life-threatening complications, including hyperglycemic coma due to very high glucose levels, and ketoacidosis. Hypoglycemic coma due to excessive or uncontrolled insulin therapy, microangiopathy (peripheral nerve damage), cardiovascular disorders such as myocardial infarction or heart function impairment due to arteriosclerosis, disturbances in the brain's vascular system or stroke, diabetic gangrene due to neuropathy and non-healing wounds. (Tarwoto dkk., 2012).

Diabetes Mellitus (DM) is a chronic disease that requires lifelong management. One important aspect of managing DM is medication adherence. Medication adherence refers to the extent of patients' behavior in taking medication, following a diet, or changing their lifestyle according to the recommendations given by healthcare professionals. This adherence is very important to ensure the effectiveness of treatment, especially for chronic diseases such as diabetes. Adherence to medication is very important to keep blood sugar levels within normal limits and to prevent serious complications. (Saibi et al., 2020). Medication adherence can be defined as the patient's ability to follow the doctor's instructions in taking medication according to the prescribed dosage, schedule, and guidelines. Identifying patients who are non-compliant with outpatient medication is very important in order to provide effective therapy. In the study conducted by Mokolomban et al., in 2018, it was shown that out of 45 respondents with type 2 Diabetes Mellitus accompanied by hypertension, 37.78% (18 patients) were compliant and 62.22% (27 patients) were non-compliant. (Putri et al., 2021). Based on the above, the researchers conducted a study titled "The Relationship Between Knowledge and Medication Adherence in Patients with Type 2 Diabetes Mellitus at Sukadana Health Center, East Lampung in 2024."

METHOD

The design in this study uses an analytical study design or quantitative study with a cross-sectional approach. The location of this research was conducted in the working area of Puskesmas Sudha,

East Lampung Regency, from July 15 to July 20, 2024. The research population consists of diabetes patients in the working area of UPTD Puskesmas Sudha, totaling 643 individuals based on data from January to December 2023. After that, the population specifically targeted in this study is type 2 diabetes mellitus patients with a total of 106 individuals. The sampling technique in this study used purposive sampling, where the selection was based on diabetes mellitus patients receiving treatment at Puskesmas Sudha who met the inclusion and exclusion criteria of the study. With the inclusion criteria being patients located in the Working Area of Sukadana Health Center, who are prescribed oral anti-diabetic medications with or without insulin, respondents aged between 18-75 years, and patients receiving outpatient treatment at Sukadana Health Center. The exclusion criteria are respondents with hearing impairments and patients who are pregnant. Data analysis used univariate analysis to determine the characteristics of respondents based on age, gender, and knowledge. And bivariate analysis to determine the relationship between knowledge and medication adherence in patients with type 2 diabetes mellitus.

RESULT AND DISCUSSION

Table 1.
Frequency Distribution of Gender

| Gender | f | % |
|--------|----|------|
| Male | 40 | 47,6 |
| Female | 44 | 52,4 |

Table 1, the number of male respondents was 40 (47.6%), while the number of female respondents was 44 (52.4%).

Table 2.
Age Frequency Distribution

| Age | f | % |
|-------|----|------|
| 19-24 | 1 | 1.2 |
| 25-29 | 3 | 3.6 |
| 30-34 | 2 | 2.4 |
| 35-39 | 9 | 10.7 |
| 40-44 | 15 | 17.9 |
| 45-49 | 13 | 15.5 |
| 50-54 | 20 | 23.8 |
| 55-59 | 9 | 10.7 |
| 60-64 | 7 | 8.3 |
| 65-69 | 4 | 4.8 |
| 70-75 | 1 | 1.2 |

Table 2, the majority of respondents with type 2 diabetes mellitus are in the age group of 50-54 years, totaling 20 people (23.8%). Meanwhile, the age group of 40-44 years (17.9%) has 15 respondents and the age group of 45-49 years (15.5%) has 13 respondents, with a total proportion of 33.4%. The age groups of 19-24 years and 70-75 years are each represented by only 1 respondent (1.2%).

Table 3.
Frequency Distribution Based on Knowledge

| Knowledge | f | % |
|-----------|----|------|
| Low | 24 | 28.6 |
| Medium | 37 | 44 |
| High | 23 | 27.4 |

Table 3, it is known that at the Sukadana Health Center, East Lampung Regency in 2024, the average respondent has a medium level of knowledge with 37 people (44.0%). There were also respondents with low and high knowledge, each numbering 24 people (28.6%) and 23 people (27.4%), respectively. Low and high knowledge each accounted for 28.6% and 27.4% of the total respondents.

Table 4.
 Frequency Distribution Based on Compliance

| Compliance | f | % |
|------------|----|------|
| Low | 26 | 31 |
| Medium | 38 | 42.2 |
| High | 20 | 23.8 |

Table 4, it is known that at the Sukadana Health Center in East Lampung Regency in 2024, the average number of respondents with a self-medication adherence level was 38 people (45.2%). It was also found that the number of respondents with low and high adherence levels were 26 people (31.0%) and 20 people (23.8%), respectively.

Table 5.
 The Relationship between Knowledge and Medication Adherence in Type 2 Diabetes Mellitus Patients

| Knowledge | Medication Adherence | | | | | | | | OL (95% CI) | |
|-----------|----------------------|------|-----------|------|------|-----|-------|----|----------------|-------------------------|
| | low | | Currently | | high | | total | | | P Value |
| | N | % | N | % | N | % | N | % | | |
| Low | 11 | 7.4 | 8 | 10.9 | 5 | 5.7 | 24 | 24 | 0.0017 | 0.010 (5.024-13.277) |
| Currently | 9 | 11.5 | 23 | 16.7 | 5 | 8.8 | 37 | 37 | | |
| High | 6 | 7.1 | 7 | 10.4 | 10 | 5.5 | 23 | 23 | | |

Table 5, it is noted that at the Sukadana Health Center, East Lampung Regency in 2024, it can be observed that respondents with low knowledge and low adherence amounted to 11 respondents (7.4%) compared to respondents with high knowledge and high adherence, which amounted to 10 respondents (5.5%). This indicates that individuals with low knowledge have a smaller likelihood of adhering to medication compared to individuals with moderate or high knowledge.

Based on the statistical results using the chi-square test, a P-value of $0.017 < \alpha = 0.05$ was obtained, which means H_0 is rejected, indicating a relationship between knowledge and medication adherence among diabetes mellitus patients in the working area of Puskesmas Sukadana, Lampung Timur.

Gender Discussion

Based on the research results, it is known that at the Sukadana Health Center, East Lampung Regency in 2024, the study was dominated by female respondents, with 44 respondents (52.4%). According to Wade and Travis (2007:258), the terms sex and gender have different meanings, namely "sex" refers to the physiological and anatomical differences between males and females, while "gender" is used to indicate the differences between males and females being studied. According to Hungu (20016:43), sex is the biological difference between women and men from the moment a person is born. The biological differences and biological functions of men and women cannot be interchanged between the two, and their functions remain the same for men and women on earth (Winarsunu, 2008).

This result is consistent with the prevalence data from the study conducted by (Susanti, 2019) titled "Description of Risk Factors for Diabetes Mellitus in Patients with Type 2 Diabetes Mellitus," which found that the majority of the subjects were female, totaling 68 people (76.4%), compared to 21 males (23.6%). According to the researchers, it is known that gender does not affect the increase or decrease in blood sugar levels in patients with type 2 diabetes mellitus because both men and women have the same risk of developing diabetes mellitus, and blood sugar levels according to gender vary greatly, with the difference being due to other influencing factors.

Age Discussion

Based on the research results, it was found that at the Sukadana Health Center in East Lampung Regency in 2024, the respondents studied indicated that the average age of Type 2 Diabetes Mellitus patients was vulnerable in the age group of 50-54 years, with 20 people (23.8%). According to the theory of The American Diabetes Association (ADA) (2010), the risk of type 2 diabetes mellitus increases with age. The mechanism underlying the increased risk of type 2 diabetes mellitus in older individuals is the alteration in body fat composition that accumulates in the abdominal area, leading to central obesity. Central obesity subsequently triggers insulin resistance, which is the initial process leading to the development of type 2 diabetes mellitus. type 2 diabetes mellitus (Suastika et al., 2011). According to (Sasmita, 2021), age is considered a factor that influences medication adherence in diabetes mellitus patients. Memory is one of the cognitive functions that plays a significant role in the thinking process, problem-solving, and intelligence; in fact, almost all behaviors required by humans are influenced by memory. (Ulum et al., 2015).

According to research (Fahrudini, 2020) titled "The Relationship between Age, Family History, and Diet with the Incidence of Type 2 Diabetes Mellitus in the Flamboyan Room of RSUD Abdul Wahab Sjahranie Samarinda," the age category of type II DM patients was mostly ≥ 45 years old, with 21 respondents (80.8%). The same result was found in the study (PS Nugroho & Sari, 2020), which showed that the majority of diabetes mellitus patients were >45 years old, with 59 respondents (53.2%). According to the researcher, it is known that the age of type 2 diabetes mellitus patients is vulnerable between 40-59 years. This indicates that the average age of patients with type 2 diabetes mellitus is in adulthood or older age. With the presence of this age factor, the knowledge and adherence of patients need to be closely monitored because as age increases, a person's memory will decline over time. Therefore, supervision and education for type 2 diabetes mellitus patients are essential to improve medication adherence.

Discussion on Knowledge

Based on the research results, it was found that at the Sukadana Health Center in East Lampung Regency in 2024, the results showed that out of 84 respondents, the majority had a moderate level of knowledge with 37 people (44.0%), a high level of knowledge with 23 respondents (27.4%), and a low level of knowledge with 24 respondents (28.6%). Knowledge comes from the word "know," in the Indonesian Dictionary (2008) the word know means to understand, among other things, after seeing (witnessing, experiencing, etc.), to know and understand. According to (Darsini et al., 2019), knowledge is everything that is known based on human experience itself, and knowledge will increase in accordance with the process of experiences undergone. This is in line with the theory of (Notoadmojo, 2003) which states that experience can be used as a source of knowledge, namely a method to obtain the truth of knowledge by revisiting the knowledge gained in solving problems faced in the past.

Research conducted by (Ubaidillah et al., 2021) states that a person with a higher level of education will find it easier to receive information and reflects a higher ability to understand and accept information. Knowledge and a person's educational status are closely related. The higher a person's educational status, the more knowledge they will acquire. (Sasmita, 2021). Based on the research results, it was found that respondents with knowledge, totaling 24 respondents or 28.6%, have low knowledge related to Type 2 Diabetes Mellitus. This group likely does not understand the importance of regular treatment and good blood sugar control. This may be due to limited information or suboptimal health education in their area. Respondents with low knowledge are at a higher risk of non-compliance in adhering to treatment. According to the researcher, the temporary knowledge level found in 37 respondents (44.0%) in Table 4.3 indicates that nearly half of the study participants have a sufficient understanding of Type 2 Diabetes Mellitus. The current knowledge level suggests that most respondents have a good foundation, but there is a need for reinforcement in a more in-depth understanding of comprehensive diabetes management. According to the researcher, the high level of knowledge, as indicated by 23 respondents (27.4%), reflects a better understanding of Type 2 Diabetes Mellitus and its management. With high knowledge, it is highly likely to correlate with a greater level of adherence to medication and tends to absorb information provided by healthcare workers, thereby having self-awareness in maintaining their health.

Discussion on Compliance

Based on the research results, it was found that at Sukadana Health Center, East Lampung Regency in 2024, diabetes mellitus patients had a moderate level of medication adherence with 38 people (45.2%). It was also found that there were respondents with low and high adherence, each numbering 26 people (31.0%) and 20 people (23.8%), respectively. Compliance comes from the root word "patuh," which means obedient, to follow, or to obey orders. Compliance is the level at which patients follow the treatment methods and behaviors recommended by doctors or others. (Santoso, 2005). According to (Notoatmodjo, 2012), compliance is a change in behavior from non-compliant behavior to compliant behavior. According to Sarafino (in Tritiadi, 2007), compliance is defined as "the level at which patients follow the treatment methods and behaviors recommended by doctors or others." Based on the research conducted by (Rahayu & Herlina, 2021), diabetes mellitus patients with a high level of medication adherence tend to have controlled blood sugar levels. Patients with controlled blood sugar levels have a strong sense of responsibility towards their therapy, which makes them more compliant with their treatment. The researchers assume that the respondents' high adherence to medication is influenced by the duration of the disease. Based on the results of the tabulation of medication adherence with disease duration, it was found that most respondents with a disease duration of <5 years had high adherence to medication. Respondents with a disease duration of <5 years tend to be more compliant with therapy due to a strong sense of curiosity and a strong desire to recover.

Based on the research results, it was found that a high level of adherence, achieved by 20 respondents (23.8%), is usually present in groups with better knowledge of diabetes, making them more aware of the importance of adhering to the treatment for type 2 diabetes mellitus. Respondents with a high level of adherence demonstrate a high level of discipline in following the medication schedule recommended by healthcare professionals. According to the researchers, the low adherence level, found in 26 respondents (31.0%), reflects a significant problem in the management of Type 2 Diabetes Mellitus treatment. The low adherence level in some respondents indicates a

lack of understanding of the importance of medication. Respondents with low adherence levels indicated that they do not consistently take their medication according to the schedule set by the company's medical staff. This poses a significant risk of uncontrolled blood sugar levels, which can worsen their health condition. According to the researchers, the temporary compliance level found in 38 respondents (45.2%) indicates that nearly half of the respondents have moderate adherence to Type 2 Diabetes Mellitus treatment. Respondents with moderate adherence tend to exhibit inconsistent behavior. They sometimes adhere to the medication schedule, but at other times they tend to be negligent or not fully disciplined.

The Relationship between Knowledge and Medication Adherence in Type 2 Diabetes Mellitus Patients

Based on the research results, it was found that at the Sukadana Health Center, East Lampung Regency in 2024, the study revealed that out of 11 (7.4%) respondents with low knowledge and low adherence, and 5 (5.7%) respondents with low knowledge and high adherence. Meanwhile, out of 10 (5.5%) respondents with high knowledge and high medication adherence, and 23 (16.7%) respondents with moderate knowledge and medication adherence. Based on the results of the statistical test (chi-square), a Pearson chi-square value of $P = 0.017$ ($p < 0.05$) was obtained. This indicates that the p -value is greater than α (0.05), showing that there is a relationship between knowledge and adherence to diabetes medication. From the calculation of the Odds Ratio, an OR value of 0.010 with a 95% CI between (5.024-13.277) was obtained, indicating a significant relationship between diabetes knowledge and medication adherence. This means that respondents with good knowledge, leading to a significant relationship with good medication adherence, will have a reduced risk of suffering from diabetes. People with low knowledge tend to have significantly lower adherence compared to those with moderate or high knowledge. The very high and low Odds Ratio values indicate that insufficient knowledge is strongly associated with poor adherence. Thus, the hypothesis (H_a) stating that there is a relationship between knowledge and medication adherence in type 2 diabetes mellitus patients at Puskesmas Sudha, East Lampung Regency, can be accepted.

Knowledge is the result of curiosity through the sensory process, especially the eyes and ears towards a specific object. Knowledge is an important domain in the formation of open behavior (Donsu et al., 2017). Knowledge is the result of human perception or a person's understanding of an object through the five senses they possess. The five senses used by humans to perceive objects are sight, hearing, smell, taste, and touch. At the time of sensing to produce knowledge, it is influenced by the intensity of attention and perception towards the object. A person's knowledge is largely obtained through the sense of hearing and the sense of sight. (Notoatmodjo, 2014). Knowledge is influenced by factors such as formal education and very close relationships. It is expected that with higher education, one's knowledge will also expand. But a person with a low level of education does not necessarily have low knowledge as well. The increase in knowledge is not solely obtained from formal education, but can also be acquired from non-formal education. Knowledge of an object contains two aspects, namely the positive aspect and the negative aspect.

Compliance is the level of a person's adherence to rules and recommended behaviors. The definition of compliance is obedience to commands or rules. Compliance is the level of a person's adherence to care, treatment, and behaviors recommended by nurses, doctors, or other healthcare professionals. Compliance (adherence and obedience) describes how far a patient behaves in

following the rules in treatment and behaviors recommended by healthcare professionals. (Suswani & Hamid, 2019). The results of this study are in line with the research conducted at Puskesmas Mandau, which states that there is a relationship between knowledge and medication adherence in diabetes mellitus patients with a p-value of 0.022 (Nazriati et al., 2018). The study results indicate that medication adherence is categorized as high because health workers at Puskesmas Mandau always remind Prolanis members with diabetes mellitus to take their antidiabetic medication and control their diabetes mellitus at the health center every month.

The results of this study are supported by the research findings of Kusumaningrum & Azinar (2021), which obtained statistical test results showing that respondents with good knowledge levels are 2.98 times more compliant compared to respondents with poor knowledge, with a p-value of 0.020 ($p < 0.05$). Therefore, the null hypothesis (H_0) is rejected, concluding that there is a relationship between knowledge and medication adherence. Among the 32 respondents with good knowledge, 59.4% adhered to medication and 40.6% did not adhere, while among the 73 respondents with poor knowledge, 32.9% adhered to medication and 67.1% did not adhere. According to the researchers, most respondents already have a good level of knowledge and medication adherence. Of the 24 respondents with low knowledge, 11 people (7.4%) had low adherence, 8 people (10.9%) had moderate adherence, and only 5 people (5.7%) had high adherence. The largest proportion of the group with low knowledge falls into the low adherence category. This indicates that lower knowledge tends to be associated with low medication adherence. Among the 37 respondents with moderate knowledge, 9 people (11.5%) had low adherence, 23 people (16.7%) had moderate adherence, and 5 people (8.8%) had high adherence. Most respondents with current knowledge were at a moderate adherence level. This suggests that an increase in knowledge somewhat contributes to improved adherence, although it is still not optimal for achieving high adherence. Of the 23 respondents with high knowledge, 6 people (7.1%) had low adherence, 7 people (10.4%) had moderate adherence, and 10 people (5.5%) had high adherence. The majority of this group have high adherence, which indicates that good knowledge is closely related to high adherence in undergoing treatment.

Out of a total of 84 respondents, 26 people (26.1%) have low adherence, 38 people (30.4%) have moderate adherence, and 20 people (43.5%) have high adherence. This shows that overall, most respondents fall into the moderate adherence category. However, the relationship between knowledge and adherence is clear, where the higher the knowledge, the greater the likelihood of having high adherence. The researchers concluded that there is a significant relationship between the level of patients' knowledge about diabetes and their adherence to medication. The higher a person's knowledge about diabetes, the greater the likelihood of adherence to medication, as evidenced by the favorable OR results for the group with high knowledge. The importance of continuous educational interventions to increase patient knowledge, as the improvement in knowledge can directly impact medication adherence, which in turn can help control blood sugar levels and prevent further complications.

CONCLUSION

Based on the results of the statistical test, a p-value of 0.017 ($p < 0.05$) and an Odds Ratio of 0.010 with a 95% CI between (5.024-13.277) were obtained, which means there is a significant relationship between knowledge and medication adherence in patients with type 2 diabetes mellitus.

REFERENCES

- American Diabetes Association, 2019. Standar perawatan medis pada diabetes-2019.[online] Penelitian dan pendidikan klinis dan terapan, Amerika Serikat: America Diabetes Association.
- Alfian, R., & Putra, P.M.A. (2017). *Jurnal Ilmiah Ibnu Sina*, 2 (2), 176-183.
- Almira, N., Arifin, S., & Rosida, L. (2019). Faktor-Faktor yang Berhubungan dengan Perilaku Kepatuhan Minum Obat Anti Diabetes pada Pasien Diabetes Melitus Tipe 2 di Puskesmas Teluk Dalam Banjarmasin. *Homeostasis*, 2(1), 9-12.
- Darsini, Fahrurrozi, & Cahyono, EA (2019). Pengetahuan; Artikel Review. *Jurnal Keperawatan*, 12(1), 97.
- Diabetes Melitus-Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia. (diakses pada hari Rabu, 5 Mei 2023 pukul 23.30 WIB) <http://pusdatin.kemkes.go.id>
- Donsu, JDT, Harmilah, & Bakri, MH (2017). Manfaat Averrhoa carambola untuk Mengurangi Hipertensi . *AASIC ke-5*, 03.
- Fahrudini. (2020). Hubungan Usia, Riwayat Keluarga dan Pola Makan dengan Kejadian Diabetes Melitus Tipe 2 di Bangsal Flamboyan RSUD Abdul Wahab Sjahranie Samarinda. 51(1), 51. https://dspace.umkt.ac.id/bitstream/handle/463.2017/899/skripsi_fahrudini_FULL.pdf
- Kementerian Kesehatan. (2016). *Profil Kesehatan*. 44, 100.
- Kementerian Kesehatan Republik Indonesia. (2020). *Infodatin 2020 Pusat Data dan Informasi Diabetes Melitus Kementerian Kesehatan Republik Indonesia*.
- Kusumaningrum, A., & Azinar, M. (2021). Higeia Jurnal Kesehatan Masyarakat . *Higeia Jurnal Penelitian dan Pengembangan Kesehatan Masyarakat*, 5(3), 227-238.
- Notoatmodjo, S. 2014. *Metodologi Penelitian Kesehatan* . Jakarta. Rineka Cipta.
- Masyarakat, P. (2023). *Bidang Ilmu: Keperawatan Medikal Bedah* .
- Meidarian, (2023). *Profil Kesehatan Puskesmas Sukadana. Dinas Kesehatan Lampung Timur*.
- Nazriati, E., Pratiwi, D., & Restuastuti, T. (2018). Pengetahuan pasien diabetes melitus tipe 2 dan hubungannya dengan kepatuhan minum obat di Puskesmas Mandau Kabupaten Bengkalis. *Jurnal Kedokteran Andalas*, 41(2), 59. <https://doi.org/10.25077/mka.v41.i2.p59-68.2018>
- Putri, AH, Setiani, LA, & Nurdin, NM (2021). Analisis Faktor-Faktor yang Mempengaruhi Kepatuhan Minum Obat pada Pasien Diabetes Melitus Tipe 2 di Rumah Sakit PMI Kota Bogor. *Prosiding Konferensi Farmasi Mulawarman*, April 2021, 41-48. <https://prosiding.farmasi.unmul.ac.id/index.php/mpc/article/view/441/424>
- Rahayu, D., & Herlina, N. (2021). Hubungan Tingkat Pengetahuan dan Kepatuhan Minum Obat dengan Kadar Gula Darah pada Pasien Diabetes Melitus Tipe 2: Tinjauan Pustaka. *Penelitian Mahasiswa Borneo*, 3(1), 341-351.
- Saibi, Y., Romadhon, R., & Nasir, N.M. (2020). Kepatuhan Berobat Pasien Diabetes Melitus Tipe 2 di Puskesmas Jakarta Timur. *Jurnal Farmasi Galenika (Galenika Journal loof Pharmacy) (e-Journal)*, 6(1), 94-103.
- Sasmita, A.M. (2021). Faktor-Faktor yang Mempengaruhi Tingkat Kepatuhan Pengobatan Pasien Diabetes Melitus. *Jurnal Medika Utama*, 02(04), 1105-1111. <https://jurnalmedikahutama.com/index.php/JMH/article/view/230/151>
- Suastika, K., Dwipayana, P., Ratna Saraswati, I.M., Kuswardhani, T., Astika, N., Putrawan, I.B., Matsumoto, K., Kajiwaru, N., & Taniguchi, H. (2011). Hubungan antara usia dan gangguan metabolik pada penduduk Bali. *Jurnal Gerontologi Klinis dan Geriatri* , 2(2), 47-52. <https://doi.org/10.1016/j.jcgg.2011.03.001>

- Suswani, & Hamid, A. (2019). Keperawatan HIV dan AIDS (Nomor Februari).
- Tarwoto, W., Taufiq, I., & Mulyati, L. (2012). Keperawatan Medikal Bedah Gangguan Sistem Endokrin . Edisi 2. Jakarta: Trans Info Media.
- Taluke, D., Lakat, R.S.M., Sembel, A., Mangrove, E., & Bahwa, M. (2019). Analisis Preferensi Masyarakat dalam Pengelolaan Ekosistem Mangrove di Pesisir Kecamatan Loloda Kabupaten Halmahera Barat. *Spasial*, 6(2), 531-540.
- Toruan, D.P.L., Karim, D. dan Woferst, R., 2013. Hubungan Motivasi Diri dengan Kepatuhan Diet pada Pasien Diabetes Melitus Tipe 2. *JOM FKp*, 5(2), pp.7129-7140
- Ubaidillah, Z., Sari, DAP, & Mashfufa, EW (2021). Faktor Determinan Kejadian Hipoglikemia pada Pasien Diabetes Melitus Tipe 2: Studi Literatur. *Jurnal Ilmiah Keperawatan*, 7(2), 289-295. <https://doi.org/10.33023/jikep.v7i2.833>
- Ulum, Z., Kusnanto, & Widyawati, Ik. Y. (2015). Kepatuhan Minum Obat Pasien Diabetes Melitus Tipe 2 Berdasarkan Teori Health Belief Model (Hbm) Di Wilayah Kerja Puskesmas Mulyorejo Surabaya. *Jurnal Keperawatan Medikal Bedah, Medikal Bedah, dan Keperawatan Medikal Bedah*, 3(1), 1-14. zahrotun.ulum@gmail.com
- Webber, S. (2013). Federasi Diabetes Internasional. Dalam *Diabetes Research and Clinical Practice* (Vol. 102, Nomor 2). <https://doi.org/10.1016/j.diabres.2013.10.013>
- Winarsunu, T. (2008). Psikologi Keselamatan Kerja .
- Organisasi Kesehatan Dunia (WHO) 2017. Laporan Global tentang Diabetes: Lembar Fakta .
Organisasi Kesehatan Dunia.