

## Evaluation of patient compliance with the use of type II diabetes mellitus medication at Clinic X Padang City

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### ABSTRACT

Diabetes Mellitus (DM) is a metabolic disease characterized by hyperglycemia due to defects in insulin secretion, insulin action, or both. Patient compliance is necessary to successfully treat non-communicable diseases (diabetes mellitus, hypertension, asthma, cancer, etc.), mental disorders, HIV/AIDS infectious diseases, and tuberculosis. This study aims to describe the level of adherence of patients taking DM type II medication. This cross-sectional study involved 90 patients who met inclusion and exclusion criteria. The level of patient adherence was measured using the MMAS-8 questionnaire sheet, translated into Indonesian as a research instrument. Data were analyzed using univariate and bivariate analysis to describe the frequency distribution of patient characteristics and the level of adherence. Relationship between patient characteristics and the level of adherence was tested with the chi-square test using SPSS version 23. It was found that 77 respondents (85.6%) were included in the adherent category, and 13 respondents (14.4%) were non-adherent. The low compliance rate was 13 respondents (14.4%), the moderate compliance level was 50 respondents (55.6%), and the high compliance level was 27 respondents (30%). The results of this study indicate that patient adherence to the use of DM type II drugs at Clinic X Padang City is high. Variables that affect patient adherence to taking medication for DM type II at Clinic X Padang City are age, gender, education, employment, and income because it gets significant Value. Meanwhile, the long duration of the drug does not affect adherence to taking medication because it gets an insignificant value.

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## INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disease characterized by hyperglycemia due to defects in insulin secretion, insulin action, or both (American Diabetes Association, 2010). DM diagnosis criteria according to the 2011 American Diabetes Association (ADA) guidelines and the 2011 Indonesian Endocrinology Association (PERKENI) consensus, fasting plasma glucose  $\geq 126$  mg/dl with

accompanying classic symptoms. Clinically Diabetes Mellitus (DM) is divided into two types, namely DM type 1 (Insulin Dependent Diabetes Mellitus / IDDM), which is caused by an absolute lack of insulin due to an autoimmune process. Type 2 DM (Non-Insulin-Dependent Diabetes Mellitus/NIDDM) is the most common case in the community (about 90% to 95% of all diabetes cases worldwide)(Soelistijo et al, 2021).

Diabetes mellitus(DM) is a disease whose prevalence continues to increase globally, both in developed and developing countries. A report from the Health Research and Development Agency, Ministry of Health in 2018 stated that there was an increase in the prevalence of DM sufferers based on a doctor's diagnosis or symptoms in 2018 to 2%, with the highest prevalence diagnosed by a doctor in the DKI Jakarta area (3.4%) and the lowest in the East Nusa Tenggara (0.9%)(Ministry of Health of the Republic of Indonesia, 2019). In Indonesia in 2020, during the Covid-19 pandemic, the prevalence of patients with DM reached 6.2%, with a global prevalence reaching 9.3%. In 2021, based on dataIDF recorded 537 million adults (aged 20-79 years) or 1 in 10 people living with DM around the world. DM also causes 6.7 million deaths, or one every 5 seconds, where the prevalence of DM sufferers in Indonesia reaches 10.6%(Pranita et al., 2022).

Patient compliance is necessary to successfully treat non-communicable diseases (diabetes mellitus, hypertension, asthma, cancer, etc.), mental disorders, HIV/AIDS infectious diseases, and tuberculosis. Patient non-compliance with disease therapy can cause negative effects such as can result in an increased risk of treatment costs, increased complications, hospitalization, and even death. Identifying non-adherent patients in outpatient treatment is important to carry out therapy effectively (Miyusliani & Yunita, 2011). Considering that the therapy used in patients with diabetes mellitus is carried out long-term, adherence also contributes to the therapy carried out. Therefore, adherence measures represent a comparison between two sets of events, i.e., how the drug was taken and how the drug should have been taken as prescribed. (Düsing et al., 2001).

Low adherence to treatment can result in an increased risk of treatment costs, complications, hospitalization, and even death. Identifying non-adherent patients in outpatient treatment is important to carry out therapy effectively. However, health practitioners rarely ask about problems that are at risk of causing low patient compliance. Various approaches can be used to describe patient compliance, namely direct and indirect methods. Includes direct observation of patient therapy, measurement of drug metabolism in the body, and measurement of biological aspects in the body as well as patient self-reports or questionnaires, calculating the number of pills, re-taking drugs, electronic drug monitoring, and patient self-assessment of response(Gimenes et al., 2009).In the direct method, measurement tools such as the MMAS-8 Questionnaire can be used. MMAS-8 can capture the obstacles or difficulties experienced by respondents in adherence to drug use. MMAS can be used to measure compliance because it has points that match the compliance criteria used by WHO(Vika et al., 2016). In the indirect method, it can be seen from the patient's medical record data(Otolowo et al., 2021).

Based on data from Medical Records, Diabetes Mellitus Patients at Clinic X Padang City who came for treatment were 375 patients with Type II Diabetes Mellitus with a fasting blood glucose range of 150 - 300 mg/dl. Patients come once a month for blood glucose control, doctor consultation, and taking monthly medication. Most patients often rarely consult a doctor and take medication every month because they feel bored or bored taking medication. And some Type 2 DM patients feel afraid of drugs because of the side effects of chemical drugs.

## RESEARCH METHOD

### Research Design

This research is a quantitative observational (analytic) study with a cross-sectional approach. This research was conducted at Clinic X Padang City from November 2021 to June 2022, with the data sources used primary and secondary data. Primary data was obtained from questionnaire respondent's personal data/ respondent demographic data, which contains

demographic data (age, gender, occupation, education, income level, length/duration of taking diabetes medication). Secondary data was obtained from written information from medical records, and the required data were in the form of medical record numbers, control dates, age, gender, length/duration of taking diabetes medication, and use of drugs other than diabetes mellitus therapy as well as answers directly obtained from respondents who had filled out the Questionnaire. The sampling technique used in this study is purposive Sampling. The sample size calculated by the sample size formula for an infinite population is:

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}}\right)^2 \cdot P \cdot (1 - P)}{d^2} \quad (1)$$

Where :

$n$  = sample size

$\left(Z_{1-\frac{\alpha}{2}}\right)^2$  = Value of the standard normal distribution (Table Z) at a certain  $\alpha$

$P$  = Price proportion in the population

$d$  = Error (absolut) tolerable (0,1)

Research sample:

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}}\right)^2 \cdot P \cdot (1 - P)}{d^2} \quad (2)$$

$$n = \frac{(1,96)^2(0,375)(1 - 0,375)}{(0,1)^2} = 90,03 \quad (3)$$

$= 90\text{patient}$

The inclusion criteria in this study were as follows:

1. Diagnosed patients *diabetes mellitus*(DM) type 2, received OHO therapy(Oral Hypoglycemic Drugs)/insulin
2. The patient has had at least one control in a month
3. Willing to be a respondent and willing to complete a questionnaireMMAS-8 in full.
4. Respondents were in place at the time of data collection.
5. Patients can read, write and communicate

The exclusion criteria in this study were as follows:

1. Patients who did not agree to cooperate in this study.
2. Respondents who did not answer the questionnaire MMAS-8 completely
3. Patients who cannot answer the Questionnaire independently because they have a senile disease.
4. Patients with hearing and/or vision problems
5. Patients with data on the date of taking the drug and the type of drug that is incomplete

### Research Instruments

The research instruments used in data collection are:

1. Questionnairesrespondent's data contains demographic data (age, gender, occupation, education, income level, and duration of taking medication).
2. Written information from medical records, data in the form of medical record number, date of control, type of drug, amount of drug, frequency of drug administration, age, gender,

- length/duration of suffering from type II DM (length/duration of taking diabetes medication) and use of drugs other than therapy diabetes mellitus.
3. MMAS-8 Questionnaire, which has been validated. MMAS-8 Questionnaire. Questionnaires are used as a method to measure the patient's level of adherence to the treatment he is currently undergoing. The Questionnaire contains questions related to the patient's treatment while undergoing treatment that the patient must answer. The Questionnaire used in this study was MMAS-8. A value of 1 was given if the question was answered "yes," whereas if the answer to the question was "no," it was given a value of 0. The cumulative score of all questions is categorized into three categories of compliance levels as follows: low compliance level if the total score is  $< 6$ , moderate compliance level if the total score is  $6 - < 8$ , and if the total score is 8, then the level of compliance is in the high category

### Data analysis technique

Data analysis was carried out using univariate analysis, bivariate analysis, and multivariate analysis using the SPSS 23 program.

### Univariate analysis

Univariate analysis is an analysis performed for one variable or each variable. The aim is to see how big the proportion of the variables studied and presented in tabular form is. Univariate analysis was carried out to describe or explain each of the variables studied in the frequency distribution of each research variable.

### Bivariate Analysis

Bivariate analysis was performed to determine the relationship between the independent and dependent variables, using the Chi-Square test, with a degree of confidence/CI of 90% and  $\alpha=0.05$ . The basis for taking the research hypothesis is based on the significant level (p-value), namely:

1.  $H_0$  is rejected if the Value of P. Value  $< 0.05$  ( $\alpha$ ) means that there is a relationship between the variables studied.
2.  $H_a$  is accepted if the P.Value is  $> 0.05$  ( $\alpha$ ), meaning there is no relationship between the studied variables.
3. 95% confidence interval with  $\mu=0.05$

Bivariate analysis is an analysis involving an independent variable and a dependent variable. Because the data is in the form of categorization, to find out the relationship between the independent and dependent variables, the statistical analysis uses the Chi-square test using an alpha value of 0.05. If cells have an expectation of less than 5, then Continuity Correction is used (Heryana, 2020; Mulyati et al., 2022 ; Fika, 2020).

A computer was used to analyze the Chi-square test to obtain a meaningful relationship with the research variables. Rules that apply to the Chi-square Test:

1. If, in the 2x2 table, it is found that the expected Value is less than 5, then the fisher exact test is used.
2. If the table is 2x2 and there is no expected value (expectation) greater than 5, then the test that is used otherwise is continuity correction.
3. If the table is more than 2x2, for example, 2x3, 3x3, and so on, then the Pearson Chi-square test is used. (Heryana, 2020 ; Mulyati et al., 2022 ; Fika, 2017)

### Multivariate Analysis

This analysis determines the most dominant variable affecting DM patient adherence with multiple logistic regression tests (Multiple Logistic Regression). This was done by simultaneously entering the independent variables (age of the respondent, gender, occupation and education,

length/duration of taking medication) according to certain statistical significance criteria ( $p < 0.25$ ). The independent variables will be withdrawn gradually (Backward Selection) until no more independent variables have a  $p > 0.05$ .

## RESULTS AND DISCUSSIONS

### Research Result

#### Univariate analysis

##### Patient Characteristics

Based on the number of respondents as many as 90 people, the characteristics of the respondents are shown in Table 1:

**Table 1.** Respondent demographic data at clinic X, Padang City

No	Characteristics	classification	Number of Respondents	Total Respondents	Percentage (%)
1.	Age	41 - 60 years	47	90	52,2
		61 - 80 years	43		47,8
2.	Gender	Woman	48	90	53,3
		Man	42		46,7
3.	Education	Low (Elementary, Middle, High School)	59	90	65,6
		Tall (D3,S1,S2)	31		34,4
4.	Work	Self-employed	36	90	40
		IRT	27		30
		civil servant	27		30
5.	Income	$\geq$ UMK	35	90	38,9
		$<$ UMK	55		61,1
6.	Duration of Taking Medication	Short (1-5 years)	57	90	63,3
		Currently (6-10) years	22		24,4
		Long ( $>$ 10) years	11		12,2
7.	Obedience	obey	77	90	85,6
		Not obey	13		14,4
8.	Blood Sugar Levels	Controlled	50	90	55,6
		Not Controlled	40		44,4

#### Bivariate Analysis

The results of the study were analyzed by bivariate analysis, shown in Table 2:

**Table 2.** Results of bivariate analysis of medication compliance in type II Diabetes Mellitus Patients at Clinic X, Padang City

No	Variable	Classification	Obedience		P. Value	Odds Ratio (OR)
			Obey	Not Obey		
1.	Age	41 - 60 years	44 (57.1%)	3 (23.1%)	0.023	4,444
		61 - 80 years	33 (42.9%)	10 (76.9%)		
2.	Gender	Woman	45	3	0.018	4,688

No	Variable	Classification	Obedience		P. Value	Odds Ratio (OR)
			Obey	Not Obey		
			(58.4%)	(23.1%)		
		Man	32 (41.6%)	10 (76.9%)		
		Low (Elementary, Middle, High School)	54 (70.1%)	5 (38.5%)	0.026	3,757
		Tall (D3,S1,S2)	23 (29.9%)	8 (61.5%)		
		Self-employed	26 (33.8%)	10 (76.9%)		
4	Work	IRT	25 (32.7%)	2 (15.4%)	0.012	-
		civil servant	26 (33.8%)	1 (7.7%)		
		≥UMK	34 (44.2%)	1 (7.7%)	0.013	9,488
		<UMK	43 (55.8%)	12 (92.3%)		
		Short (1-5 years)	51 (66.2%)	6 (46.2%)		
6.	Duration of Taking Medication	Currently	17 (22.1%)	5 (38.5%)	0.358	-
		Long (> 10) years	9 (11.7%)	2 (15.4%)		

## Discussions

Respondents in this study amounted to 90 people who met the inclusion criteria, with a category of 77 respondents who obeyed or equal to 85.6% and 13 respondents who did not comply or equal to 14.4%. The level of compliance is low if the total score < 6 is 13 respondents or 14.4%, the level of compliance is medium if the total score is 6 - < 8 as many as 50 respondents or 55.6%, and if the total value is 8, the level of compliance is high as many as 27 respondents or by 30%.

Variables that affect patient adherence to taking medication for Type 2 DM at Clinic X Padang City are age (P. 0.023) so, (P. <0.05) with OR 4.444, gender (P. 0.018) so (P. < 0.05) with OR 4.688, education (P. 0.026) so (P. <0.05) with OR 3.757, work (P. 0.012) so (P. <0.05) and income (P. 0.013), so (P. <0.05) with OR 9.488, because it gets a significant value. Meanwhile, what did not affect adherence to taking medication was the long duration of the drug (P.0.358), so (P. > 0.05) because it got an insignificant value.

From table 2, it can be seen from the research results that the researchers found that most of the respondents were aged 41 - 60 years. This is because, after the age of 30 years, there are changes in the anatomy, physiology, and biochemistry of the body; according to WHO, after the age of 30 years, blood glucose levels will rise 1-2 mg/dl/year during fasting and will increase 5.6-13 mg/dl at 2 hours after eating (Sudoyo, et al, 2006). Therefore, the susceptibility of the body at that age to chronic diseases such as DM will increase. Patients with type 2 diabetes increase at a young age, mainly due to lifestyle changes, namely lack of activity and obesity. Obesity causes the body's cells to become insensitive to insulin and can eventually cause DM. Based on this study, low educational-level patients judged that health was more important. Adherently taking medication will help improve health.

In this study, there were more women than men. Early adult men have a tendency to be disobedient because of their productive age activities. In contrast, older men show low compliance due to decreased memory function or degenerative diseases they experience. In contrast, older

women have a lower level of compliance compared to young women because of the link between decreased function memory and degenerative disorders (Jelantik & Haryati, 2017).

The results of this study indicate that education has a significant relationship with medication adherence in DM patients; this is because type 2 DM patients understand more about the information on medication therapy provided by doctors. The study's results found that most respondents who visited Clinic X Padang City had low education. According to the theory, the higher the level of education, the lower the risk of developing diabetes mellitus, and the lower the level of education, the higher the risk of developing diabetes mellitus. People with high levels of education usually have a lot of health knowledge, and people with low levels of education lack knowledge. With this knowledge, people will be aware of maintaining health (Mokolomban et al., 2018).

The study's results found that the work factor has a significant value. This is due to the presence of a work schedule that is too busy, especially for working patients, making medication taking or drug therapy control forgotten, resulting in a schedule for taking medication that is not following the doctor's rules. (Hartono & Kusumastuti, 2019). The results showed that respondents' income (economic status) influenced a person's self-care management in undergoing DM treatment. The link between economic status and medication adherence theoretically can be explained by the inability to pay for treatment.

The duration of taking medication does not significantly affect patient adherence to taking medication for Type 2 DM. Based on the literature, the level of adherence to treatment is generally higher in newly diagnosed patients. The level of compliance with the duration of taking medication has a negative relationship. The longer the patient suffers from DM, the less likely it is to become adherent to treatment (Hartono & Kusumastuti, et al, 2019).

### **Patient Compliance Overview**

Based on the results of this study, it was found that in the majority of patients with DM at Clinic X, Padang City, 77 respondents had obedient behavior in taking medication or 85.6%, and 13 respondents were disobedient, or 14.4%. The level of compliance is low if the total score < 6 is 13 respondents or 14.4%, the level of compliance is medium if the total score is 6 - < 8 as many as 50 respondents or 55.6%, and if the total value is 8, the level of compliance is high as many as 27 respondents or by 30%.

This compliance occurred because Clinic X Padang City provided health education related to DM disease, which the clinic and other health workers carried out. This has been effective but not optimal because there were still as many as 13 non-compliant respondents; this is a problem that must be studied by the clinic, especially in administering drugs in a comprehensive manner. The clinic carries many factors, such as exercising for the elderly and conducting Hba1 c.

The distance patients travel to health facilities is the main reason patients are reluctant to visit the clinic. So that the knowledge possessed by DM patients is felt to be lacking, and the transportation costs required to go to the clinic are another reason patients use it to make it difficult to visit the clinic (Fika & Setiawan, 2018). Ways to support patient adherence to taking medication for Type 2 DM include education, accommodation, modification of environmental and social factors, changes in therapy models, and increasing the interaction of health professionals with patients. One of the reasons why the respondent is not compliant with taking the drug is the respondent's lifestyle.

### **Drug Therapy**

Single therapy is the first-line therapy for treating type 2 DM (American Diabetes Association, 2010). The drugs most commonly used are metformin, glimepiride 1 mg, glimepiride 2 mg, glimepiride 3 mg, glimepiride 4 mg, and vitamin b-complex. Patients take the drug once a month. Each time the patient takes the drug, they must check their blood sugar to keep it under control. Metformin is the drug of choice for monotherapy recommended for treating DM (Osterberg,

& Blaschke, 2005). Metformin is a biguanide that has an activity that reduces gluconeogenesis and increases peripheral glucose utilization. In another study, it was stated that DM patients who received monotherapy were more adherent to taking medication compared to patients who received combination therapy (Wells. et al, 2009).

## CONCLUSION

Characteristics Based on the results of research on factors that influence patient adherence to taking medication for Type 2 DM for the period November 2021 to June 2022 at Clinic X Padang City, they are aged 41-60 years (57.1%), with (P. 0.023), female sex (58.4%) with (P. 0.018), low education (70.1%) with (P. 0.026), self-employed and civil servant jobs (33.8%) with (P. 0.012) and income <UMK (55, 8%) with (P. 0.013) because it gets a significant value P. <0.05 on adherence to taking medication for Type 2 DM. The level of adherence of patients taking medication at Clinic X in Padang City was 77 respondents (85.6%) who adhered, and 13 respondents (14.4%) did not comply. The low compliance rate was 13 respondents (14.4%), the moderate compliance level was 50 respondents (55.6)%, and the high compliance level was 27 respondents (30%).

## References

- Aru W Sudoyo, Bambang Setiyohadi, Idrus Alwi, Marcellus Simadibrata, S. S. (2006). *Buku Ajar Ilmu Penyakit Dalam*. Fakultas Kedokteran Universitas Indonesia.
- ASSOCIATION, A. D. (2010). Diagnosis and classification of diabetes mellitus. *Diabetes Journals*, 33(SUPPL. 1), 62-69. <https://doi.org/10.2337/dc10-S062>
- DiPiro., Barbara G. Wells. Joseph T. Terry L. Schwinghammer. Cecily V. DiPiro, P. (2009). *Pharmacotherapy Handbook*. 2nd Edition. In 7 (Ed.), *Mc Graw Hill Medical*. The McGraw-Hill Companies. <https://doi.org/10.1345/aph.10237>
- Düsing, R., Lottermoser, K., & Mengden, T. (2001). Compliance with drug therapy - New answers to an old question. *Nephrology Dialysis Transplantation*, 16(7), 1317-1321. <https://doi.org/10.1093/ndt/16.7.1317>
- Fika, R. Setiawan, B. (2018). *Jurnal Pharma Sainatika (JPS)* ISSN : 2580-684X *Jurnal Pharma Sainatika (JPS)* ISSN : 2580-684X. *Jurnal Pharma Sainatika*, 1(1), 1-9.
- Fika, R. (2017). Increase In Activity And Learning Outcomes In Pharmacy Mathematics With Jigsaw Cooperative Learning Model At Pharmacy Academy Of Dwi Farma. *FUTURE of MEDICAL EDUCATION JOURNAL*, 7(4), 36-46.
- Fika, R. (2020). The effectiveness of Jigsaw and STAD (student teams achievement division) cooperative learning model on pharmaceutical mathematics. *Journal of Advanced Pharmacy Education & Research*, Vol 10(Issue 2), 147-158. <https://japer.in/storage/models/article/vesxdrdSjAN0QUIfzzM2iZVLDDeSFFJb66215D50SjAjwcosnPD7k316OcSw/the-effectiveness-of-jigsaw-and-stad-student-teams-achievement-division-cooperative-learning-model.pdf>
- Gimenes, H. T., Zanetti, M. L., & Haas, V. J. (2009). Factors related to patient adherence to antidiabetic drug therapy. *Revista Latino-Americana de Enfermagem*, 17(1), 46-51. <https://doi.org/10.1590/s0104-11692009000100008>
- Hartono, H., & Kusumastuti, L. A. (2019). Tingkat Kepatuhan Penggunaan Ramuan Jamu Sainatifik Hiperglikemia pada Pasien Diabetes Melitus di Rumah Riset Jamu Hortus Medicus B2P2TOOT Tawangmangu. *Jurnal Farmasi (Journal of Pharmacy)*, 8(1, Oktober), 29-37. <https://doi.org/10.37013/jf.v1i8.77>
- Heryana, A. (2020). Analisis Data Penelitian Kuantitatif. *Penerbit Erlangga, Jakarta, June*, 1-11. <https://doi.org/10.13140/RG.2.2.31268.91529>
- Jelantik, G. M. G., & Haryati, E. (2017). Hubungan Faktor Risiko Umur, Jenis Kelamin, Kegemukan Dan Hipertensi Dengan Kejadian Diabetes Mellitus Tipe II Di Wilayah Kerja Puskesmas Mataram. *Journal of Chemical Information and Modeling*, 53(9), 21-25. <http://www.elsevier.com/locate/scp>
- Kementerian Kesehatan Republik Indonesia. (2019). *Laporan Risesdas 2018 Nasional.pdf* (p. 674).
- Lars Osterberg, M.D., and Terrence Blaschke, M. D. (2005). Adherence to medication. *The New England Journal of Medicine*, 353(5), 487-497. <https://doi.org/10.1056/nejmra050100>
- Miyusliani, S., & Yunita, J. (2011). Faktor Resiko yang Berpengaruh Terhadap Kepatuhan Diet Hipertensi. *Jurnal*



- Kesehatan Komunitas*, 1(3), 163-169. <https://doi.org/10.25311/jkk.vol1.iss3.21>
- Mokolomban, C., Wiyono, W. I., & Mpila, D. A. (2018). Kepatuhan Minum Obat Pada Pasien Diabetes Melitus Tipe 2 Disertai Hipertensi Dengan Menggunakan Metode Mmas-8. *Pharmacon*, 7(4), 69-78.
- Mulyati, D. A., Fika, M. M. R., & Pd, M. (n.d.). *Ragam penelitian dengan spss*.
- Otolowo, D. T., Akinola, S. A., Bello, M., Alaba, J. O., & Ajejomoni, D. (2021). *Croatian Journal of Food Science and Technology potential treatment for diarrhoea*. 13(1), 68-79.
- Pranita, E., Artikel ini telah tayang di Kompas.com dengan judul "Indonesia Peringkat ke-5 Negara dengan Penderita Diabetes Terbesar di Dunia," K. untuk baca: <https://www.kompas.com/sains/read/2022/04/10/090300623/indonesia-peringkat-k-5-negara-dengan-penderita-diabetes-terbesar-di?page=all>, Pranita, P. : E., Dewi, E. : B. K., Cepat, D. aplikasi K. co. untuk akses berita lebih mudah dan, <https://bit.ly/3g85pkA>, A., & <https://apple.co/3hXWJ0L>, I. (2022, April). Indonesia Peringkat ke-5 Negara dengan Penderita Diabetes Terbesar di Dunia. *KOMPAS.Com*. <https://www.kompas.com/sains/read/2022/04/10/090300623/indonesia-peringkat-ke-5-negara-dengan-penderita-diabetes-terbesar-di?page=all>
- Soelistijo, S. A., & Ketut Suastika, Dharma Lindarto, Eva Decroli, Hikmat Permana, Krishna W Sucipto, Yulianto Kusnadi, Budiman, M. Robikhul Ikhsan, Laksmi Sasirini, Himawan Sanusi, K. Heri Nugroho HS, H. S. (2021). *PEDOMAN PENGELOLAAN DAN PENCEGAHAN DIABETES MELITUS TIPE 2 DEWASA DI INDONESIA 2021*. PB. PERKENI PEDOMAN.
- Vika, V., Siagian, M., & Wangge, G. (2016). Validity and reliability of Morisky Medication Adherence Scale 8 Bahasa version to measure statin adherence among military pilots. *Health Science Journal of Indonesia*, 7(2), 129-133. <https://doi.org/10.22435/hsji.v7i2.5343.129-133>