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Evaluation of Medication Therapy Management (MTM) Services to Improve Adherence in Patients with Diabetes

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Abstract

Background: Treatment of diabetes mellitus aims to control blood sugar stability, prevent complications, and improve the patient's quality of life. Low adherence has been shown to increase the incidence of complications, decrease quality of life, inflate and inefficient medical costs, and even increase mortality. Medication Therapy Management (MTM) is a service or program that assists pharmaceutical services in improving adherence and quality of life. The aim is to determine the effect of medication therapy management on patient compliance with diabetes mellitus at the Banyumas Regency Health Center.

Methods: This research is experimental with a randomized control trial method and a pre-test and post-test. The variable measured was compliance of diabetes mellitus type 2 patients with pill counts before the intervention (pre-test) and one month after the MTM-based service intervention (post-test). Inclusion criteria for this research are patients diagnosed with diabetes mellitus type 2 with or without comorbidities, patients who underwent routine check-ups at least one month before the study, patients taking oral antidiabetic drugs without insulin, patients willing to be respondents, and willing to sign informed consent. Exclusion criteria for this research are patients who cannot communicate well, smoking patients, pregnant patients, patients who did not complete the questionnaire, and patients who did not undergo control during the study period. The instruments of this study are the documentation book of MTM-based pharmaceutical service treatment, namely the patient documentation book "BU MENTRY" (a book brought and filled in by the patient), "KU SIAP" (a book brought by the pharmacist), and leaflets.

Results: 180 respondents are divided into 90 in the control group and 90 in the intervention group. The mean compliance score in the control group at the pre-test is 84.6908 ± 7.68219, and at the post-test, it decreased to 83.0165 ± 9.20044 (p = 0.000). Statistically, there was a significant difference in the decline in compliance scores. While in the intervention group, the mean compliance score at the pre-test was 83.9630 ± 7.78213, and at the post-test, it increased to 88.5314 ± 7.87536 after being given MTM-based services (p = 0.000). There was a significant statistical difference in the increased compliance scores. MTM-based services significantly affect adherence in patients with diabetes mellitus, with an increased score of 4.5684 ± 5.31901 and a p-value of 0.000.

Conclusion: Medication Therapy Management (MTM)-based services impact increasing compliance of diabetes mellitus patients. So, the implementation of the MTM method carried out by pharmacists is expected to reduce the incidence of complications, improve quality of life, and save medical costs.

Keywords: *Adherence; Diabetes Mellitus; Medication Therapy Management; MTM.*

Introduction

Diabetes mellitus is a global health threat. In 2019, diabetes was the cause of death for 1.5 million people, and 48% of all deaths due to diabetes occurred before the age of 70[1]. According to the World Health Organization (WHO), the prevalence of diabetes will increase by 2030 to 21.3 million. The International Diabetes Federation (IDF) estimates that in 2019–2030, there will be an increase in the number of diabetes patients from 10.7 million to 13.7 million. Indonesia itself is ranked seventh out of the top ten countries in the world, with 10.7 million diabetes patients[2]. According to the national report on the results of Basic Health Research (*Riskesdas*) in 2018, there was an increase in the prevalence of diabetes to 8.5%, or around 20.4 million[3]. In Central Java Province, Banyumas Regency is ranked second with a prevalence of 1.70% or around 3,302 diabetes mellitus patients aged ≥ 15 years[4].

Compliance is one of the determinants of successful therapy, apart from the diagnosis, selection, and administration of appropriate drugs. Many studies report low compliance in diabetes patients. Research by Anggraini et al. (2019) showed that only 17.9% of diabetes patients have high compliance[5]. Another study by Triastuti et al. (2020) showed that 78.1% of diabetes patients have a low level of compliance[6]. Therefore, efforts are needed to increase diabetes patients' compliance with appropriate therapy services and management. One service that can be provided is Medication Therapy Management (MTM).

Medication Therapy Management (MTM) is a service or program that helps with health problems

related to treatment in patients. The main elements of MTM services include Medication Therapy Review (MTR), Personal Medication Record (PMR), Medication-related Action Plan (MAP), intervention, documentation, and follow-up[7]. MTM-based services require collaboration from pharmacists, doctors, and other professionals to ensure that patients understand their health condition, disease risks, diagnosis results, and the therapy goals they are undergoing. The patient also plays an active role in managing their health[8]. Apart from that, MTM can serve as an evaluation tool to ensure that the drug use is according to Evidence-Based Medicine (EBM), is appropriate to the patient's condition, and that treatment is running optimally. The expected results of MTM include safe and effective use of drugs, a reduced risk of drug-related and other treatment-related problems, as well as optimization of therapeutic outcomes[9]. Several previous studies showed that MTM services provided by pharmacists resulted in improvements in diabetes mellitus patients. MTM services by pharmacists affect increasing compliance with treatment and reducing the number of hospitalizations in type II diabetes mellitus patients[10].

In 2018, the Health Care and Social Security Agency (BPJS) implemented a policy to provide patient care for the Referral Program (PRB) based on MTM in First-Level Health Facilities (FKTP). This research aims to see the effect of MTM on diabetes mellitus patient compliance at Banyumas Regency Health Center.

Methods

The method in this research is a randomized control trial with a pre-test and post-test. The total sample of 180 patients with type II diabetes mellitus was divided into 90 in the control group and 90 in the intervention group. The sampling technique for dividing the control and intervention groups used a randomization application conducted before the study began. Pre-test data collection was 30 days apart from the post-test.

Adherence is measured using the pill count method. Pill counting is done by calculating the remaining medication obtained by the patient during therapy within a certain period. The measurement results of the level of fulfilment are divided into two categories, namely compliant if the calculation result of the fulfilment is ≥80% and the category of non-compliant patients if the level of fulfilment is <80%.

The differences in patient compliance scores were measured before and after receiving MTM-based services using the paired t-test for normally distributed data, and the Wilcoxon test for non-normally distributed data. The significance value used is 5% (a = 0.05); if p <a (p <0.05), it can be interpreted that the data is statistically significant. The differences in patient compliance scores and quality of life of the control and intervention groups were measured using the independent samples t-test for normally distributed data and the Mann-Whitney for non-normally distributed data.

Research Instrument

Instruments for this MTM-based service research are the book "BU MENTRY," which the patient brought and filled in, the book "KU SIAP," which the pharmacist brought, and leaflets.

Work Procedures

In this study, the intervention was MTM-based services, which included assessment, counselling, and patient education. The assessment consists of collecting information by interviewing the patient regarding personal identity (element of medication therapy review), history of drug use, habits, current conditions, and patient complaints (personal medication component record). The results are then documented in the book "BU MENTRY". After that, if there are problems related to therapy, an assessment is conducted to determine an appropriate action plan to solve the problem (medication-related action plan element). Counselling is performed according to the patient's problems and needs (intervention element) and carried out during drug delivery. Besides that, education regarding diabetes mellitus is carried out using leaflets. All follow-up actions on treatment-related problems are documented in the "KU SIAP" book as a pharmacist's record regarding the respondent's therapy (documentation element). Next, a follow-up was carried out when the respondent was doing routine control the following month by bringing "BU MENTRY". Meanwhile, in the control group, only interviews were conducted regarding self-identity and filling out informed consent, as well as pre-tests and post-tests. Respondent's compliance was measured using the pill count method, which directly calculated the remaining amount of medication during the pre-test and the post-test. After that, the level of compliance was analyzed using the paired sample t-test or the Wilcoxon test, with a confidance level of 95%.

Result

Respondents' Characteristics

In this study, the 180 respondents were grouped based on age, gender, education level,

occupation, duration since DM diagnosis, comorbidities, and number of medications. Data on respondents' characteristics are presented in Appendix Table 1.

Table 1. Respondents' characteristics

Characteristic	Control		Intervention	
	n=90	%	n=90	%
Gender				
Male	22	24.4	26	28.9
Female	68	75.6	64	71.1
Age				
<45 year	4	4.4	0	0
45-54 years	15	16.7	16	17.8
55-64 years	52	57.8	50	55.6
65-75 years	19	21.1	24	26.7
Education				
Elementary School	39	43.3	40	44.4
Junior High School	13	14.4	12	13.3
Senior High School	22	24.4	26	28.9
College	3	3.3	2	2.2
No formal education	13	14.4	10	11.1
Occupation				
Work	36	40	40	44.4
Doesn't work	54	50	50	55.6
Diseases Duration Diabetes				
1 year	3	3.3	3	3.3
2 year	10	11.1	11	22.2
3 year	26	28.9	31	34.4
4 year	27	30.0	25	27.8
5 year	24	26.7	20	22.2
Comorbidities				
Yes	48	53.3	46	51.1
No	42	46.7	44	48.9
Number of medications				
1	5	5.6	3	4.4
2	18	20.0	17	25.6
3	43	47.8	42	46.7
4	24	26.7	25	23.3

Characteristics of the total 90 respondents in both control and intervention groups. In the control group, the gender of the respondents was dominated by women as many as 68 people (75.6%), and mainly in the age range 55-64 years are 52 people (57.8%), and the least in range <45 years as many as four people (4.4%). The respondents' education profile was mainly elementary school, with 39 people (43.3%), and the least was college, with three people (3.3%). Based on the occupation, most respondents were unemployed, totaling 54 people (50%) who were housewives. The duration since diabetes mellitus diagnosis was mostly 4 years, totaling 27 people (30%), and the least was 1 year, totaling three people (3.3%). On average, 48 respondents (53.3%) had comorbid hypertension, with the highest number of drugs taken by respondents being three drugs, including 43 people (47.8%), and the lowest number of medications taken being one drug, including five people (5.6%).

In the intervention group, respondents were also dominated by females, totaling 64 people (71.1%), with the majority in the age range of 55-64 years, as many as 50 people (55.6%). The respondents' education profile was mainly elementary school, 40 people (44.4%), and the least was college, two people (2.2%). Based on the occupation, most respondents were unemployed, totaling 50 people (55.6%) who were housewives. The duration since diabetes mellitus diagnosis was mostly 3 years, totaling 31 people (34.4%) and the least duration was 1 year, totaling three people (3.3%). Respondents who had comorbidities with hypertension were more than those without comorbidities, namely 46 people (51.1%), with the number of drugs taken by the respondents the most being three drugs, 42 people (46.7%), and the number of drugs consumed the least was one drug, totaling three people (4.5%).

The Influence of MTM on Compliance

The statistical analysis results showed that the mean compliance score can be seen in Table 2. The average value of respondent compliance is obtained by calculating the remaining medication obtained divided by the number of drugs that should be taken. The mean compliance score of respondents in the control group experienced a decrease in score of Δ±SD -1.6743±3.05445. The Wilcoxon test results showed a significant difference in the score reduction value, p=0.000 (p<0.05). Meanwhile, the intervention group experienced an increase in score of Δ ± SD 4.5684 ± 5.31901. The Wilcoxon test results showed a significant difference in the increase in score, with a significance value of p = 0.000 (p < 0.05).

The Influence of Respondent Characteristics on Compliance

Many factors, such as the respondent's characteristics, can cause some barriers to treatment. In this study, the influence of respondent characteristics on compliance is presented in Table 3.

Table 2. Average respondents' compliance

Group	Pre-test (mean±SD)	Post-test (mean±SD)	Difference (mean±SD)	p-value
Control	84.6908±7.68219	83.0165±9.20044	-1.6743±3.05445	0.000
Intervention	83.9630±7.78213	88.5314±7.87536	4.5684±5.31901	0.000

Noted: Analysis used Kruskal-Wallis

Table 3. The influence of respondents' characteristics on compliance

Characterisitc	Control (n=90)			Intervention (n=90)		
	n	Difference (mean±SD)	p value	n	Difference (mean±SD)	p value
Gender						
Male	22	-2.3575±2.99815	0.230[a]	26	5.0835±6.47106	0.561[a]
Female	68	-1.4533±3.06153		64	4.3592±4.81633	
Age						
<45 year	4	-1.0847±1.81503	0.979[b]	0	0	0.915[b]
45-54 years	15	-1.5655±3.86942		16	4.9224±6.65457	
55-64 years	52	-1.7228±3.23067		50	4.6235±5.21848	
65-75 years	19	-1.7516±2.06482		24	4.2178±4.72840	
Education						
Elementary School	39	-1.7468±3.08590	0.901[b]	40	3.9173±5.34604	0.295[c]
Junior High School	13	-1.2928±3.78247		12	6.8354±6.37193	
Senior High School	22	-1.3936±3.25831		26	3.9127±4.96563	
Collage	3	-2.9330±0.40201		2	6.2275±0.88318	
No formal education	13	-2.0232±2.29774		10	5.8261±5.03745	
Occupation						
Work	35	-1.4165±3.35495	0.526[a]	40	4.5120±5.68581	0.929[a]
Doesn't work	55	-1.8384±2.86693		50	4.6136±5.06476	
Diseases Duration Diabetes						
1 year	3	1.1557±1.98588	0.115[b]	3	4.2020±2.40925	0.030[b]
2 year	10	-0.7214±2.52549		11	2.5280±3.48977	
3 year	26	-1.0673±3.45584		31	5.3255±4.78576	
4 year	27	-2.5852±2.97094		25	2.5472±5.18897	
5 year	24	-2.0580±2.70563		20	7.0988±6.31256	
Comorbidities						
Yes	48	-2.1998±2.78771	0.081[a]	46	4.4439±6.29960	0.822[a]
No	42	-1.0739±3.26360		45	4.6987±4.12225	
Number of medications						
1	5	1.5172±2.98775	0.001[b]	3	3.8127±2.00736	0.596[b]
2	18	-0.3793±2.41176		17	5.9534±4.04892	
3	43	-1.6940±3.22322		45	4.5920±5.24460	
4	24	-3.2752±2.25323		25	3.6750±6.40006	

Noted: [a] Independent t-test, [b] Anova, [c] Kruskal-Wallis

In this study, gender did not significantly affect compliance in the control and intervention groups (p>0.05). Age was also not proven to affect compliance in both the control group, with p = 0.979 (p> 0.05), and the intervention group, with p = 0.915 (p> 0.05). According to statistical analysis, education was not proven to affect the respondents' compliance in both the control group, p = 0.901 (p> 0.05), and the intervention group, p = 0.295 (p> 0.05). Respondents' occupation in both the control and intervention groups (p> 0.05) did not significantly affect medication compliance. The duration of diabetes in the control group (p> 0.05) was not proven to affect compliance. However, the results were different in the intervention group, which was proven to affect compliance, with p = 0.030 (p> 0.05). Based on comorbidities in this study, neither the control nor the intervention groups showed a significant difference in compliance (p> 0.05). Meanwhile, the number of drugs taken in the control group showed an effect between the number of medications taken on compliance, with p = 0.001 (p <0.05).

Discussion

Respondents' Characteristics

Regarding gender characteristics, it is dominated by women in both the control and intervention groups. Based on the results of the 2018 Indonesian basic health research, the prevalence of diabetes is higher in women (1.8%) than in men (1.2%)[3]. The high prevalence of diabetes mellitus in women is due to hormonal changes, which are related to an increase in fat accumulation, so that the Body Mass Index (BMI) increases due to premenstrual syndrome and post-menopause. When there is an increase in BMI, adipose tissue will affect metabolism by secreting hormones, glycerol, leptin, cytokines, adiponectin, pro-inflammatory substances, and releasing non-esterified fatty acids, which are closely related to insulin resistance[11,12].

The age of the respondents was mostly in the range of 55-64 years in both the control and intervention groups. This is in line with the 2018 Indonesian basic health research data, which shows that the highest prevalence of diabetes mellitus patients in Indonesia is in the 55-64 years age group of 6.3%[3]. Increasing age is one of the factors that

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increases the risk of diabetes. This affects changes in glucose metabolism in the body, especially changes in the function of pancreatic β cells, which will affect the work of insulin produced, so that glucose homeostasis changes[13,14].

The profile of the respondents' education level in the control and intervention groups was dominated by patients with a low level of education, namely, elementary school. The 2018 Indonesian basic health research stated that diabetes mellitus patients, based on a population survey, were more common among patients who did not have formal education or only had an education up to elementary school. Meanwhile, based on a doctor's diagnosis, those with diabetes were more often found in patients with a high school/high school education level[3]. The level of education has an influence on diabetes, where individuals with low levels of education are at risk of paying less attention to lifestyle and diet, as well as knowledge and behavior to prevent DM[15]. However, some respondents have a higher educational background but ignore their health for various reasons. One of which is related to very busy work, which results in an unhealthy and irregular lifestyle, and can cause health problems[16].

The employment status of the research results is dominated by unemployed respondents who are mostly housewives in both the control and intervention groups. The same results were obtained in the study conducted by Santi Oktavia (2022) on employment; the most respondents were unemployed, at 73.1%[17]. The type of work can affect daily physical activity, where someone who does not work will have less physical activity which causes low energy burning by the body, so that excess energy is stored in the form of lipids which poses a risk of increasing body mass index (obesity)[18], in addition, stress conditions are significantly related to increased blood glucose levels, where there is an increase in cortisol hormone levels which will stimulate glucose production in the liver, so that this can cause insulin resistance in peripheral tissues[19].

The duration of experiencing diabetes is the time that shows how long the patient has had diabetes since the initial diagnosis until the research was conducted. The duration of suffering from diabetes is related to the risk of complications, and this will have an impact on several aspects, including psychological, physical, social, and environmental aspects[20].

The comorbidities suffered by respondents in this study were mostly hypertension. This is in line with research by Pambudi et al. (2019) that the most common comorbidity experienced by DM patients was hypertension, with a total of 78.3%. In addition, research by Yulianti et al. (2012) revealed that 1.5-3 times more comorbid hypertension was found in people with diabetes mellitus than in those with other diseases[21]. Hypertension is one of the comorbidities that can contribute to insulin resistance. In DM patients, increased glucose levels cause intravascular fluid resistance, resulting in increased body fluid volume and damage to the vascular system. This is the basis for hypertension[22].

The number of drugs referred to is the total number consumed by respondents for DM treatment and other diseases. From the results in the control and intervention groups, the most dominant number of drugs taken was three drugs. The use of Oral Antidiabetic Drugs (OAD) in this study was metformin, glimepiride, a combination of metformin and glimepiride, or acarbose, a combination of metformin, glimepiride, and acarbose. In DM patients with hypertension, OAD is added with antihypertensive drugs of the ACEI, ARB, or CCB groups. According to the American Diabetes Association (2019), patients with a diagnosis of type 2 DM are given initial therapy with metformin, unless contraindicated, other drugs can be used, namely the sulfonylurea group. If DM patients with uncontrolled blood glucose levels do not reach the targeted HbA1c (<6.5%), it will be considered for combination therapy[22].

The Influence of MTM on Compliance

The results of statistical analysis in the control group, there was a significant decrease in medication adherence with a significance value of $p = 0.000$ ($p < 0.05$), while the intervention group experienced a significant increase in medication adherence with a significance value of $p = 0.000$ ($p < 0.05$). These results indicate that pharmacists' implementation of MTM-based pharmaceutical services can increase compliance in respondents.

These results align with previous research conducted by Rachmalina (2020). Measuring the level of compliance using the MMAS-8 method showed that there was an increase in DM patient compliance after receiving MTM-based services, and the significance value obtained was $p = 0.008$ ($p<0.05$)[23]. Apart from that, according to research conducted by Murali et al. (2016), after the implementation of MTM services, there was also a significant increase in compliance ($p<0.05$), namely that initially, before the implementation of MTM services, 37.5% of the number of patients increased to 59.5% who had high compliance. Patients with low compliance decreased from 35.5% to 15.3%[24].

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The Influence of Respondent Characteristics on Compliance

In this study, gender on compliance in both the control and intervention groups was proven to have no significant influence (p > 0.05). These results are in line with research conducted by Pratiwi et al. (2022), which stated that there was no significant relationship between gender and the level of medication adherence in diabetes mellitus patients, with a significant value of p = 0.809 (p > 0.05)[25]. Age was also not proven to influence compliance in either the control group (p = 0.979, p > 0.05) or the intervention group (p = 0.915, p > 0.05). These results are in line with research by Ningrum (2020), namely that there is no significant influence between the age of the patient and adherence to taking medication in type 2 DM sufferers (p = 0.329, p > 0.05)[26]. However, different results in research by Murali et al. (2016) revealed a significant decrease in the level of compliance with increasing age. This is because, as you get older, your memory decreases, and you tend to forget to take medication[24].

The latest education based on statistical analysis was not proven to influence respondent compliance in either the control group p = 0.901 (p > 0.05) or the intervention group p = 0.295 (p > 0.05). However, these results are different from the research of Pratiwi et al. (2022), which stated that there was a relationship between education and adherence to taking medication in diabetes mellitus patients and obtained a p-value of 0.000 (>0.05)[25]. In this case, formal education is essential for a person as a basis for knowledge, theory, and logic. Higher education can influence intellectual decision-making, including the decision to comply with taking medication[27]. Apart from that, the level of education can also influence a person's ability to absorb and understand knowledge about health, which can increase a person's knowledge and awareness regarding compliance with taking medication[28].

The job characteristics of respondents in both the control and intervention groups (p > 0.05) did not significantly influence adherence to medication, so working or not working was not a factor that influenced adherence to medication in diabetes mellitus patients. However, this is different from the results of research by Mokolomban et al. (2018), which showed the influence of work on medication adherence[29]. Occupation characteristics can influence medication adherence. For example, working patients may be busy and have little time to visit health facilities, thus reducing medication adherence.

The duration of experiencing diabetes in this study in the control group (p > 0.05) was not proven to affect compliance. Still, the results were different in the intervention group, which was proven to affect compliance, p = 0.030 (p > 0.05). This is aligned with research by Syatriani et al. (2023) showing that there is a correlation between the diabetes duration and compliance with taking medication, with a value of p = 0.004 (<0.05). Generally, newly diagnosed sufferers have a high level of compliance because they are still very obedient to the recommendations. However, long-term patients do not always have low compliance; this is due to awareness and good behavior to maintain health, so they do not miss taking medication[30].

Based on comorbidities in this study, the control and intervention groups did not have a significant difference in compliance (p > 0.05). These results are in line with research by Akrom (2019), who found that there is no significant relationship between comorbidities and compliance (p = 0.80, p > 0.05)[30]. Meanwhile, based on the amount of medication taken in the control group, it shows an influence between the amount of medication taken and compliance, p = 0.001 (p<0.05). Still, this result is different in the intervention group in that the amount of medication has no significant effect on compliance with taking medication. p=0.596 (p>0.05). In this case, indirectly, type 2 diabetes mellitus patients with comorbidities will consume more complex types of medication, which can trigger non-compliance. Respondents who administer medication once a day mostly have a high level of medication adherence. Meanwhile, respondents with a frequency of drug administration of more than once a day mostly have a low level of medication adherence[26, 29].

The impact of uncontrolled diabetes mellitus can increase the incidence of complications, decrease the quality of life, increase medical costs, and even increase mortality rates. This was proven in research by Ghimire et al. in 2021, which stated that type 2 diabetes mellitus contributed to an increase in the incidence of End-Stage Renal Disease (ESRD) complications by 35.6%[31]. ESRD, or kidney failure, is a catastrophic disease that requires long-term medical treatment and has high medical costs.

Other evidence based on data from the International Diabetes Federation in 2017 shows that complications resulting from uncontrolled diabetes mellitus account for 40% of nephropathy complications[32]. Therefore, pharmacists' role in increasing compliance with the application of Management Therapy Medication (MTM) methods in diabetes mellitus patients can reduce complications, including the incidence of new kidney failure. Preventing these complications can help save costs

for the treatment budget issued by the state and the patient independently. Apart from that, diabetes patients can also be healthier and more productive.

Conclusion

MTM-based services significantly influence compliance in diabetes mellitus patients, with an increase in score of 4.5684 ± 5.31901 and a p value of 0.000. So, by implementing the Medication Therapy Management (MTM) method carried out by pharmacists, it is hoped that it can reduce the incidence of complications, improve quality of life, and save on medical costs.

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Author Contribution

Study design	:	AI, BR, IH
Data acquisition	:	AI
Data analysis	:	AI
Manuscript writing	:	AI, BR, IH

Abbreviation

BMI	:	Body Mass Index
BPJS	:	*Badan Penyelenggara Jaminan Sosial*
DM	:	Diabetes Mellitus
EBM	:	Evidence-Based Medicine
ESRD	:	End-Stage Renal Disease
FKTP	:	First-Level Health Facilities
IDF	:	International Diabetes Federation
MAP	:	Medication-related Action Plan
MTM	:	Medication Therapy Management
MTR	:	Medication Therapy Review
OAD	:	Oral Antidiabetic Drugs
PMR	:	Personal Medication Record
PRB	:	*Program Rujuk Balik*
WHO	:	World Health Organization

Ethical Consideration

The Health Research Ethics Commission of Universitas Muhammadiyah Purwokerto (KEPK-UMP) has examined the related research design based on the principles of ethical research, with document number KEPK/UMP/03/XI/2022.

References

1. World health organization (WHO). Diabetes mellitus. (2021).
2. International Diabetes Federation. IDF Diabetes Atlas. 9th. ed. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(55)92135-8/fulltext (2019).
3. Kementrian Kesehatan RI. Laporan Nasional RISKESDAS. *Badan Penelitian dan Pengembangan Kesehatan* 674 Preprint at (2019).
4. Riskesdas. *Laporan Provinsi Jawa Tengah Riskesdas 2018*. *Kementerian Kesehatan RI* (2018).
5. Anggraini, T. D. & Puspasari, N. Tingkat Kepatuhan Penggunaan Obat Antidiabetik Pada Pasien Diabetes Melitus Tipe 2 Di Apotek Sehat Kabupaten Boyolali. *Indonesian Journal On Medical Science* 6, 1–8 (2019).
6. Triastuti, N., Irawati, D. N., Levani, Y. & Lestari, R. D. Faktor yang Mempengaruhi Tingkat Kepatuhan Konsumsi Obat Antidiabetes Oral pada Pasien Diabetes Melitus Tipe 2 di RSUD Kabupaten Jombang. *Medica Arteriana (Med-Art)* 2, 27 (2020).
7. Schomer, J. C. Medication Therapy Management Digest Tracking the Expansion of MTM in 2010: Exploring the Consumer Perspective. (2011).
8. Al-Tameemi, N. K. & Sarriff, A. Knowledge, attitude and practice of pharmacists on medication therapy management: a survey in Hospital Pulau Pinang, Penang, Malaysia. *Journal of Pharmaceutical Health Care and Sciences* 5, 1–9 (2019).
9. Viswanathan, M. *et al.* Medication therapy management interventions in outpatient settings: A systematic review and meta-analysis. *JAMA Internal Medicine* 175, 76–87 (2015).
10. Erku, D. A. *et al.* The impact of pharmacist-led medication therapy management on medication adherence in patients with type 2 diabetes mellitus: A randomized controlled study. *Pharmacy Practice* 15, 1–7 (2017).
11. Al-Goblan, A. S., Al-Alfi, M. A. & Khan, M. Z. Mechanism linking diabetes mellitus and obesity. *Diabetes, Metabolic Syndrome and Obesity* 7, 587–591 (2014).
12. Kautzky-Willer, A., Harreiter, J. & Pacini, G. Sex and gender differences in risk, pathophysiology and complications of type 2 diabetes mellitus. *Endocrine Reviews* 37, 278–316 (2016).
13. Widiasari, K. R., Wijaya, I. M. K. & Suputra, P. A. Diabetes Melitus Tipe 2: Faktor Risiko, Diagnosis, Dan Tatalaksana. *Ganesha Medicine* 1, 114 (2021).
14. Purnama, A. & Sari, N. Aktivitas Fisik dan Hubungannya dengan Kejadian Diabetes

Mellitus. *Window of Health : Jurnal Kesehatan* 2, 368–381 (2019).
15. Kassahun, A., Gashe, F., Mulisa, E. & Rike, W. A. Nonadherence and factors affecting adherence of diabetic patients to anti-diabetic medication in Assela General Hospital, Oromia Region, Ethiopia. *Journal of Pharmacy and Bioallied Sciences* 8, 124–129 (2016).
16. Mamangkey, I., Kapantow, N. H. . & Ratag, B. T. . Hubungan antara tingkat pendidikan dan riwayat keluarga menderita dm dengan kejadian dm tipe 2 pada pasien rawat jalan di poliklinik penyakit dalam BLU RSUP Prof. dr. r. Kandou Manado. *Fakultas Kesehatan Masyarakat Universitas Sam Ratulangi* 1–6 (2014).
17. Oktavia, S., Budiarti, E., Masra, F., Rahayu, D. & Setiaji, B. Faktor - Faktor Sosial Demografi yang berhubungan dengan Kejadian Diabetes Melitus Tipe 2. *Jurnal Ilmiah Permas: Jurnal Ilmiah STIKES Kendal* 12, 1039–1052 (2022).
18. Rahalus, R., Asrifuddin, A. & Kaunang, W. P. J. Faktor-faktor yang berhubungan dengan Kejadian Diabetes Mellitus Tipe 2 di Rumah Sakit TK. III. R. W. Mongisidi Manado. *FKM Unsrat Manado* 1–11 (2017).
19. Persaud, H. and & Williams, S. Occupational Stress and Increased Risk for Type 2-Diabetes: A Narrative Review. *Journal of Complementary Medicine & Alternative Healthcare* 2, 1–6 (2017).
20. Mulia, S. *et al.* PERBANDINGAN KUALITAS HIDUP PASIEN DIABETES MELITUS TIPE 2 BERDASARKAN LAMA MENDERITA (Comparison of Life Quality of Type 2 Diabetes Melitus Patients Based on Old). *Caring Nursing* 3, 40–51 (2019).
21. Yulianti, S. R., Mukaddas, A. & Faustine, I. Profil Pengobatan Pasien Diabetes Mellitus Tipe 2 Di Instalasi Rawat Inap Rsud Undata Palu Tahun 2021. *Jurnal of Natural Science* 3, 40–46 (2021).
22. PERKENI. Pedoman Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia. *PB PERKENI* 1–104, (2021).
23. Malina, R., Yasin, N. M. & Wiedyaningsih, C. The Effect of Based Services Medication Therapy Management on Treatment Adherence and Quality of Life of Diabetes Mellitus Patients. *JURNAL MANAJEMEN DAN PELAYANAN FARMASI (Journal of Management and Pharmacy Practice)* 10, 204 (2020).
24. Bindu Murali, A. *et al.* Medication therapy management (MTM): An innovative approach to improve medication adherence in diabetics. *Drug Metabolism and Personalized Therapy* 31, 151–155 (2016).
25. Pratiwi, A. M., Nurmainah & Andrie, M. Analisis Penggunaan Kotak Pil (Pill Box) Terhadap Kepatuhan Penggunaan Obat Pada Pasien Diabetes Melitus Tipe 2. *Journal Syifa Sciences and Clinical Research* 3, 629–36 (2022).
26. Ningrum, D. K. Higeia Journal of Public Health. *Higeia Journal of Public Health Research and Development* 1, 84–94 (2017).
27. Jasmine, N. S., Wahyuningsih, S. & Thadeus, M. S. Analisis Faktor Tingkat Kepatuhan Minum Obat Pasien Diabetes Melitus di Puskesmas Pancoran Mas Periode Maret – April 2019. *Jurnal Manajemen Kesehatan Indonesia* 8, 61–66 (2020).
28. Pramana, G. A., Dianingati, R. S. & Saputri, N. E. Faktor-Faktor yang Mempengaruhi Kepatuhan Minum Obat Pasien Hipertensi Peserta Prolanis di Puskesmas Pringapus Kabupaten Semarang. *Indonesian Journal of Pharmacy and Natural Product* 2, 52–58 (2019).
29. Mokolomban, C., Wiyono, W. I. & Mpila, D. A. Kepatuhan Minum Obat Pada Pasien Diabetes Melitus Tipe 2 Disertai Hipertensi Dengan Menggunakan Metode Mmas-8. *Pharmacon* 7, 69–78 (2018).
30. Syatriani, S., Amaliah, A. R. & Marwanti. Faktor Yang Berhubungan Dengan Kepatuhan Minum Obat Penderita Diabetes Melitus Tipe II di Puskesmas Tamamaung. *Jurnal Promotif Preventif* 6, 394–402 (2023).
31. Ghimire, M., Vaidya, S. & Upadhyay, H. P. Prevalence of newly diagnosed end-stage renal disease patients in a tertiary hospital of central Nepal, Chitwan: A descriptive cross-sectional study. *Journal of the Nepal Medical Association* 59, 61–64 (2021).
32. International Diabetes Federation. *IDF Diabetes Atlas*. *IDF Diabetes Atlas, 8th edition* (2017).