ORIGINAL ARTICLE

Clinical Inertia on Glycemic Control in Patients with Type 2 Diabetes Mellitus: A Study in Primary Healthcare Facilities

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ABSTRACT

The prevalence of type 2 diabetes mellitus (T2DM) in Indonesia continues to rise, with projections estimating 28.6 million cases by 2045. This increase poses significant health and economic burdens, especially due to complications resulting from poor glycemic control. This study aimed to evaluate the proportion of T2DM patients achieving optimal glycemic control (HbA1c ≤7%) and to identify factors related to clinical inertia in primary healthcare facilities in Malang, Indonesia. A cross-sectional study design was used, incorporating secondary data from 2256 PROLANIS patients' medical records (2020) and primary data from 580 questionnaires administered to doctors, healthcare providers, and patients. Only 32% of patients achieved HbA1c ≤7%, with higher levels of HbA1c observed among male patients and those with abnormal lipid profiles and microalbuminuria. Metformin alone was associated with the highest rate of glycemic control, while combination regimens such as metformin + sulfonylurea were linked to lower control. Logistic regression identified age, sex, lipid profile, and microalbuminuria as significant factors affecting glycemic control. From the provider side, good clinical practices were associated with adherence to guidelines, moderate workloads, and sufficient patient education. However, variability in guideline availability and lack of standardized protocols in Prolanis facilities posed barriers. Patient knowledge did not correlate significantly with treatment adherence, although most patients had moderate understanding of their condition. These findings underscore the need for standardized care guidelines and targeted interventions at the patient, provider, and system levels to improve glycemic outcomes and reduce diabetes-related complications in primary care settings.

Keywords: Type 2 diabetes mellitus, glycemic control, HbA1c, clinical inertia, primary healthcare

INTRODUCTION

Type 2 diabetes mellitus (T2DM) patients are increasing from year to year globally. Data from the International Diabetes Federation (IDF) 2021 the number of people with diabetes in the world reaches 537 million people.[1] In Southeast Asia alone, people with diabetes reach 75 million people.[2] While in Indonesia in 2021, there will be 19.5 million people with diabetes, and it is predicted that in 2045 there will be an increasing number of patients around 28.6 million people with diabetes in Indonesia. The high number of people with diabetes in Indonesia can have an impact on the economic sector[1,2] The National Healthcare BPJS database involving 812,204 diabetes patients in Indonesia shows that the average annual direct medical cost is $708/person (US ±$1247/person). People with complications (US $ 930/person/year ± US $1480/person/year) incur higher costs than those without complications (US $ 421/person/year ± US $ 745/person/year). The total cost of treating T2DM and its complications was US$576 million in 2016, with 74% of the cost being spent on the management of patients with diabetes-related complications.[3]

The risk of diabetic complications in T2DM patients is strongly related to the blood glycemic level. Tighter glycemic control has been shown to reduce the risk of microvascular and macrovascular complications of diabetes.[4] Glycated hemoglobin A1c (HbA1c) has been used by physicians as the gold standard for measuring patients' glycemic control for the previous 2-3 months.[5] This makes it possible to make treatment decisions to achieve favorable diabetes control with the aim of reducing or avoiding complications associated with hyperglycemia.

The achievement of HbA1C in the population is also an obstacle in the management of T2DM. Diabcare 2012 research data involving 1967 participants, showed an average HbA1C of 8.3% in the population and only 30.8% of participants achieved HbA1C <7%.[6] Another similar study conducted by Soetedjo et al.,(2018) on 785 participants also found the same result with an average HbA1C of 8.3% with subjects who achieved HbA1C <7% as much as 29.2%.[7] In a community context, optimal glycemic control is difficult to achieve because long-term blood glucose monitoring is required for diabetic patients. In addition, the complexity of the problem among patients becomes one of the obstacles, followed by patient and healthcare provider factors related to difficulties in achieving optimal glycemic control. As a result, primary healthcare facilities in Indonesia reported that most type 2 DM patients developed poor glycemic control. There are many factors that can affect the achievement of optimal glycemic control. Factors from patients, doctors, and the healthcare system in primary healthcare facilities can also be the cause.[8] Clinical inertia defined as a discrepancy between clinical guidelines and the reality of a clinical practice that occurs in the management of T2DM.[9] In clinical inertia, there is also a failure to initiate and intensify therapy according to indications in T2DM patients.[10]

From the statement above, we want to know how the proportion of patients who achieve optimal blood glycemic control, especially in Malang and which clinical inertia affects the achievement of HbA1C in the patient population in primary healthcare facilities. The results of this study are expected to be a reference for other researchers to see the prevalence of successful T2DM therapy, especially in the context of health services at the primary level and can be used as a basis for evaluation of the next program.

MATERIALS AND METHODS

This cross-sectional observational study uses medical record data as a secondary source of data obtained from BPJS/ Badan Penyelenggara Jaminan Sosial (Social Insurance Administration Organization) Malang City and primary data from questionnaires given to doctors, patients, and the health care system. The data taken includes PROLANIS patient data at primary health facilities in Malang City in January-December 2020. This study was declared ethically feasible based on the ethical license number

136/EC/KEPK/05/2022 approved by the Ethical Committee of the Faculty of Medicine, Universitas Brawijaya. Participants who joined the study were patients with type 2 DM with data that included patient profile data (age and gender), HbA1c, lipid profile, creatinine, microalbuminuria, urea, and drug regimen. shows the electronic medical record data by BPJS and the number of participants is 2256 patients.

The primary endpoint in this study was the proportion of patients who succeeded in achieving blood glycemic control, characterized by HbA1c <7%. Secondary endpoints in this study included demographic data (age and gender), lipid profile, creatinine, urea, microalbuminuria, and the drug regimen given to the patient. In addition, to determine the most dominant factor in clinical inertia that affects the achievement of glycemic control in T2DM patients.

Statistical analysis of the data that has been collected will be carried out with descriptive analysis and bivariate analysis. Missing data will be immediately excluded from the data pool. Descriptive analysis will be displayed in the form of mean and standard deviation for numerical data, and frequency for categorical data. Then for the bivariate test, a chi-square test will be carried out on non-parametric data. Meanwhile, the parametric data will be tested by independent T-test.

RESULTS

Table 1. Patient Characteristics of Primary Healthcare Facilities in Malang

Characteristic	Public health center (n=774)	Private clinic (n=982)	Independent practicing doctor (n=500)	Total (n = 2256)	*p-value*
Age (mean ± SD)	61,03 ± 9,37	60,25 ± 9,60	62,56 ± 9,33	61,03 ± 7,82	0,00*
Gender					
• Male	235 (30%)	397 (40%)	199 (40%)	831 (37%)	0,00*
• Female	539 (70%)	585 (60%)	301 (60%)	1425 (63%)	
HbA1c (mean ± SD)	7,91 ± 2,27	7,75 ± 2,19	7,81 ± 2,08	7,82 ± 2,19	-
Therapeutic Target (HbA1c)					
• Achieved (HbA1c ≤ 7,0)	253 (33%)	301 (31%)	157 (31%)	711 (32%)	-
• Not achieved (HbA1c > 7,0)	521 (67%)	681 (69%)	343 (69%)	1545 (68%)	
Lipid profile (mean ± SD)					
• Total	211,27 ± 47,56	208,43 ± 46,89	208,87 ± 44,80	209,50 ± 46,66	0,00*
• TG	190,11±118,57	172,87±118,33	182,12±126,90	180,83±120,55	0,00*
• HDL	51,66 ± 13,45	48,99 ± 12,19	51,11 ± 13,27	50,37 ± 12,93	0,00*
• LDL	132,68 ± 43,22	132,42 ± 42,29	133,44 ± 42,88	132,76 ± 42,73	0,00*
Creatinine (mean ± SD)	1,23 ± 2,92	1,32 ± 5,27	1,18 ± 0,55	1,26 ± 3,88	0,74
Microalbuminuria(mean ± SD)	98,73 ± 145,28	84,08 ± 131,97	93,13 ± 144,16	91,10 ± 139,46	0,00*
Ureum (mean ± SD)	32,48 ± 23,81	32,52 ± 18,78	33,56 ± 15,54	32,74 ± 20,03	0,41

In this analysis, we looked at several parameters including age, gender, HbA1c, HbA1c target achievement, lipid profile, creatinine, microalbuminuria, and urea which will be divided into the population of public health center, private clinics, private practice doctors, and the total of the three health facilities. The total population reached 2256 patients consist of 774 patients from public health center, 982 patients from private clinics, and 500 patients from private practice doctors. Each population of health facilities have the

same characteristics, where the average age of participant is over 60 years. The older population was found in the private practice doctors, while the younger population was found in the private clinics. The proportion of sexes in each health facility has the same characteristics, but at the public health center it has a higher proportion of women.

Based on the total proportion, only 32% of patients achieved the optimal HbA1c target. The highest proportion of non-optimal achievement of the HbA1c target was in the private clinics and private practice doctors. The lipid profile was good in the entire population and each health facility also has similar characteristics with values that are not far apart. The highest total cholesterol, HDL, and TG were found in the public health center population. Meanwhile, LDL cholesterol was slightly higher in the private practice doctors population. Related to kidney function where the highest creatinine is found in the private clinics population, high microalbuminuria in the public health center population, and the highest urea in the private practice doctors population. However, each population has the same statistical result and does not differ much in value. It was found that the bivariate test on all parameters had a significant difference in the achievement of glycemic control in T2DM patients except for the urea and creatinine parameters ($p<0.05$).

Tabel 2. Distribution of Drug Regimen

Regimen	Total	Optimal target	Non optimal target
Metformin	205 (9,6%)	112 (54,6%)	93 (45,4%)
Sulfonilurea + Metformin	1245 (58,3%)	356 (28,6%)	889(71,4%)
Sulfonilurea + Acarbose	130 (6,1%)	38 (29,2%)	92 (70,8%)
Acarbose	61 (2,9%)	20 (32,8%)	41 (67,2%)
Sulfonilurea	113 (5,3%)	37 (32,7%)	76 (67,3%)
Metformin + TZD	1 (0,05%)	0 (0%)	1 (100%)
Metformin + Acarbose	7 (0,3%)	3 (42,9%)	4 (57,1%)
Metformin + Sulfonilurea + TZD	2 (0,1%)	0 (0%)	2 (100%)
Metformin + Sulfonilurea + Acarbose	239 (11,2%)	68 (28,5%)	171(71,5%)
Insulin/ Insulin + OAD	132 (6,2%)	20 (15,2%)	112(84,8%)

*Optimal target : HbA1C $\leq$ 7%, Non Optimal target : HbA1C > 7%

The most frequently used drug regimens in primary healthcare facilities are sulfonylnurea + metformin, metformin + sulfonylurea + Acarbose, and metformin alone. Metformin drug regimen has the highest percentage of achieving blood glycemic control compared to other regimens. The sulfonylurea + metformin regimen had the highest percentage of unattainable blood glycemic control compared to other regimens.

Table 3. Logistic Regression of Factors Affecting the Failure of Glycemic Control in Patients with Type 2 DM

Parameter	Odds Ratio	CI 95%	p-value
Age	0,977	0,967-0,987	0,00*
Sex			
• Female	Ref	Ref	Ref
• Male	1,369	1,121-1,672	0,002*
Primary healthcare facilities			
• Public health center	Ref	Ref	Ref
• Private clinics	0,834	0,648 – 1,073	0,158
• Independent practicing doctors	1,015	0,796 – 1,295	0,903
Total Cholesterol	1,000	0,996 - 1,004	0,887
HDL	0,988	0,979 – 0,996	0,004*
LDL	1,004	1,000 – 1,008	0,030*
Trigliserida	1,003	1,002 – 1,005	0,00*
Creatinine	1,002	0,980 – 1,025	0,836
Microalbuminuria	1,002	1,002 – 1,003	0,00*
Ureum	0,998	0,992 – 1,004	0,469

After the bivariate test has been carried out, the secondary data will then be processed using multivariate analysis in the form of a binomial logistic regression test to determine the factors that influence the inability to achieve glycemic control. The reference value used lies in the first data, so the interpretation of the odds ratio refers to the factors that cause glycemic control not to be achieved. There are several factors that influence the failure to achieve optimal blood glycemic control in T2DM patients including age, gender, total cholesterol, HDL, LDL, TG, and microalbuminuria.

Participant Characteristic of Primary Data

This data consists of 3 population groups, consist of doctors, the health care system (BPJS), and patients. Each of these groups will be analyzed using a questionnaire that will determine the merits of practice, knowledge, and compliance. The number of samples of doctors reached 123 participants, the healthcare system reached 99 participants, and patients were 358 participants. The sampled doctors were general practitioners working at each primary health facility. The health service system referred to the existence of clinical practice guidelines, availability of drugs and laboratory tests at each primary healthcare facility. Patients indicators are the level of knowledge and patient compliance in diabetes treatment.

Analysis of Factors Affecting Clinical Inertia at Primary Healthcare Facilities in Malang

This analysis is a test conducted to assess the factors that influence the occurrence of clinical inertia in primary healthcare facilities in Malang which focuses on 3 populations, namely doctors, systems, and patients. In the population of doctors, there are 3 factors that we examine including the use of guidelines, workload as a doctor, and education to patients. Here are the results we got in the doctor population.

Table 4. Frequency of Guideline Utilization Score, Workload, Patient Education, and Doctor's Total Clinical Practice Score Based on Primary Healthcare Facilities Types

Parameter		Primary Healthcare Facilities Types			
		Public Health Center (%)	Private Clinic (%)	Independent Practicing Doctor (%)	Total (%)
Guideline Utilization	Good	96,9	95.6	82.6	93
	Bad	3,1	4.4	17.4	6.5
Workload	Heavy	25	33.8	21.7	29.3
	Moderate	50	44.1	39.1	44.7
	Mild	25	22.1	39.1	26
Education to patient	Good	87.5	97.1	87	92.7
	Bad	12.5	2.9	13	7.3
Total Score	Good	87.5	86.8	78.3	85.4
	Bad	12.5%	13.2	21.7	14.6

Table 5. Parameter Description

Parameter		Scoring from Questionnaire
Guideline Utilization	Good	6-11
	Bad	12-18
Workload	Heavy	4-7.33
	Moderate	7.33-10.66
	Mild	10.66-14
Education to patient	Good	6-8
	Bad	3-5
Total Score	Good	26.6-40
	Bad	13-26.5

Table 6. Logistics Regression of Unattainable Doctor's Clinical Practice

Characteristic	Odds Ratio	CI 95%	p-value
Guideline Utilization			
Bad	Ref	Ref	Ref
Good	0,04	0,00-0,62	0,02*
Workload			
Heavy	Ref	Ref	Ref
Moderate	0,001	0,00-0,21	0,01*
Mild	0,09	0,01-5,91	0,34
Education to Patient			
Bad	Ref	Ref	Ref
Good	0,15	0,00-0,32	0,01*

It was found that the use of good guidelines had the highest percentage in public health centers and the lowest in independent practicing doctors. Then for heavy workloads, the highest number of workloads was obtained at Primary Clinics and the most light workloads were independent practicing doctors. Among the three types of primary healthcare facilities, the

most are moderate workloads. For education scores to patients, the most good scores were obtained at the Primary Clinic. The use of a good guideline for type 2 DM has a 96% probability of achieving good clinical practice in the management of DM. A moderate workload has a 99% probability of achieving good clinical practice in the management of DM. Good patient education has a 98% probability of achieving a good doctor's clinical practice in the management of DM.

Table 7. Frequency of Healthcare System Score Based on Primary Healthcare Facilities Types

Parameter	Primary Healthcare Facilities Types			
	Public Health Center	Private Clinic	Independent Practicing Doctor	Total
Guideline procurement				
- **Yes**	12 (54,5%)	40 (66,7%)	15 (88,2%)	67 (67,7%)
- **No**	10 (45,5%)	20 (33,3%)	2 (11,8%)	32 (32,3%)
Durg Availability				
- **Good**	18 (81,8%)	49 (81,7%)	15 (88,2%)	82 (82,8%)
- **Bad**	4 (18,2%)	11 (18,3%)	2 (11,8%)	17 (17,2%)
Laboratory Examination				
- **Good**	12 (54,5%)	58 (96,7%)	17 (100%)	87 (87,9%)
- **Bad**	10 (45,5%)	2 (3,3%)	0 (0%)	12 (12,1%)
Total Score				
- **Good**	19 (86,4%)	57 (95%)	17 (100%)	93 (93,9%)
- **Bad**	3 (13,6%)	3 (5%)	0 (0%)	6 (6,1%)

Table 8. Logistics Regression of Unattainable Healthcare System Score

Characteristic	Odds Ratio	CI 95%	p-value
Guideline Procurement			
No	Ref	Ref	Ref
Yes	0,22	0,04-1,25	0,09
Drug Availability			
Bad	Ref	Ref	Ref
Good	0,00	0,00-1,00	0,45
Laboratory Examination			
Bad	Ref	Ref	Ref
Good	0,02	0,001-0,300	0,00*

For the healthcare system, we assess 3 parameters which include procurement guidelines, drug availability, and laboratory tests. The total of respondents who got a good PROLANIS system achievement reached 93.9% of the 99 respondents. Independent practicing doctors have the highest proportion in achieving a good PROLANIS system (100%), followed by private clinics (95%), then public health centres(86.4%). A good laboratory examination has a 98% probability of achieving a good PROLANIS system. The use of type 2 DM guidelines and drug availability are not dominant factors in achieving a good PROLANIS system.

Table 9. Frequency of Patient Knowledge and Treatment Adherence Based on Primary Healthcare Facilities Types

Parameter	Primary Healthcare Facilities Types			
	Public Health Center	Private Clinic	Independent Practicing Doctor	Total
Knowledge				
Low	4 (6,3%)	13 (5,5%)	2 (3,3%)	19 (5,3%)
Moderate	54 (85,7%)	163 (69,4%)	44 (73,3%)	261(72,9%)
High	5 (7,9%)	59 (25,1%)	14 (23,3%)	78 (21,8%)
Treatment Adherence				
Good	44 (69,8%)	190 (80,9%)	46 (76,7%)	280(78,2%)
Bad	19 (30,2%)	45 (19,1%)	14 (23,3%)	78 (21,8%)

Table 9. Spearman Correlation Test of Knowledge Score & Patient Treatment Adherence Score

		Knowledge Score	Adherence Score
Knowledge Score	Coefficient		0,18
	p-value		0,00
Adherence Score	Coefficient	0,18	
	p-value	0,00	

The highest percentage of knowledge scores was obtained in patients at the Private Clinic and the lowest knowledge score was the highest percentage at the public health center. Then, for treatment adherence, the most routine medication adherence was found in the private clinic group and the least obedient in the public health center group. The data shows a significant weak positive correlation on the knowledge score on the compliance score. The knowledge score is interpreted if the higher the score, the patient will have a good tendency. In contrast to the adherence score, where the higher the score, the patient will tend to be disobedient in treatment. So it can be concluded that the higher the knowledge score, the patient has a tendency to be disobedient in treatment.

DISCUSSION

The mean value of HbA1C (%) in all type 2 DM patients was 7.82 ± 2.19. Where the higher HbA1C value was obtained at the public health care, namely 7.91 ± 2.27 and the lower average value was obtained at the private clinics, namely 7.75 ± 2.19. Overall, out of 2256 subjects only about 32% of patients achieved the HbA1C target (≤7%). This data is not much different from the research in primary health care in Indonesia conducted by Cholil et al (2012), where the achievement of HbA1C control in the range of 30.8% of the type 2 DM population.[6] Research conducted by Soetedjo et al., (2018), the achievement of HbA1C (<7%) in 783 patients in Indonesia is only 29.2% of the population.[7] What distinguishes this study is that although both were unable to achieve HbA1C control, the average HbA1C in the population of Prolanis type 2 DM patients in Malang was better than Soetedjo's study, which was 8.3%, this is possible because Prolanis patients have received long-term disease management. and good monitoring, while Soetedjo's study used a population sample of diabetic patients with varied glycemic control management and monitoring.

This result is slightly better than the data in America and Japan. Data from the National Health and Nutrition Examination Survey shows that in America only 50% of type 2 DM patients can achieve control of HbA1C <7% and that number has been decreasing since 2003-2006 and 2011-2014.[11] The achievement of HbA1C control in Japan is also not much different from the data from America. In a study involving 9956 subjects with type 2 DM at primary health

facilities, there were 52.9% subjects who achieved HbA1C <7%.[12]

There are several things related to not achieving optimal blood glycemic control in type 2 DM patients which include age, sex, total cholesterol, HDL, LDL, TG, and microalbuminuria. With increasing age, patients had better glycemic control (HbA1C 7%) by 3%. This is the same as research Cambra., et al. (2016) who stated that type 2 DM patients with age < 65 had an average HbA1C of > 10. Male sex had a 1.36-fold probability of not achieving glycemic control compared to women. This is different from the results of research by Cambra., et al. (2016) which stated that more males (61.2%) achieved HbA1C 7% compared to females (58.8%).[13] Research conducted by G Duarte F, et al (2019) also states that women have the possibility of worse glycemic control than men. Possible factors that cause poorer glycemic control in women include differences in glucose homeostasis, response to therapy and psychological factors.[14] In addition, hormonal factors, differences in the distribution of body fat and obesity levels, which are more prone to occur in women, may be factors that influence the achievement of glycemic control. From the fat profile data, it is known that the mean total cholesterol of type 2 DM patients is 209.5 ± 46.6 (mg/dl). Meanwhile, the mean LDL level was 132.76 ± 42.73 (mg/dl). This mean LDL is higher than the study in Spain by Cambra et al. (2016), the mean LDL in type 2 DM patients was lower at 109.1 mg/dl where about 40% of patients had LDL levels < 100 mg/dl.

There are 3 things that are evaluated from the doctor's perspective, including the use of type 2 DM guidelines, workload and education provided by doctors to patients. From the data, it was found that the use of type 2 DM guidelines has the possibility of achieving good clinical practice of doctors by 96% with a confidence level of p = 0.02. If it is associated with the achievement of HbA1C values in all subjects, the use of type 2 DM guidelines by doctors has been carried out so that statistically it is not a factor that affects the failure to achieve HbA1C in type 2 DM patients. According to Tunceli et al (2015), the implementation of the use of diabetes clinical guidelines will improve diabetes care. In addition, the use of the American Diabetes Association guidelines will increase the understanding of primary care providers for diabetes management, reduce the number of treatments due to diabetes emergencies, reduce diabetes care costs and improve glycemic control. Baptista et al (2016) and Al Harbi et al (2015) also concluded that the use of diabetes clinical guidelines will improve several problems in diabetes management and improve glycemic control.

Regarding the doctor's workload on primary healthcare facilities, it was found that mostly the participant had a moderate workload. From the statistical test a moderate workload will support good clinical practice, so it is not a factor that affects the failure to achieve HbA1C control in type 2 DM patients. According to Guan et al (2020) a doctor in outpatient services should ideally only work a maximum of 4 hours continuously. continuously. It was also stated that the longer the doctor worked, the less the clinical service provided to the patient would be, which in turn could have an impact on the failure to achieve HbA1C in type 2 DM patients.

Education from doctors to patients is needed in the management of type 2 DM. Understanding the patient about his condition will increase awareness in the management of type 2 DM which will be carried out in the long term. From the data obtained, good education will have an 85% effect on good clinical practice, so it is not a factor that affects the failure to achieve HbA1C control in type 2 DM patients. Research conducted by Sharaf (2013), with educational interventions given to patients with diabetes mellitus. primary care patients in Saudi Arabia, there was an improvement in HbA1C from the previous 8.1% to 7.4% within 4 months, and improved glycemic control in the population from the previous 40% HbA1C uncontrolled, down to 30% HbA1C uncontrolled in 365 subjects. From the doctor's point of view, it can be seen that doctors who work in primary healthcare facilities have carried out ideal clinical practices. Judging from several

indicators, namely doctors who have used guidelines in the care of type 2 DM patients, besides that, they have also done quite good education to patients. The workload, which is mostly light and moderate, also supports the achievement of good clinical practice by doctors at primary healthcare facilities.

There are 3 factors analyzed in this study, namely the use of guidelines, drug procurement and laboratory tests. From the data on the use of the type 2 DM guideline, it was found that the distribution of the use of the type 2 DM guideline varied. A total of 32.3% of the subjects stated that there was no guideline used for patient care. A total of 16.2% stated that there was a guideline in the form of an official letter, 25.3% in the form of a soft file guide, and 26.3% in the form of a guidebook. From the distribution of these data, it can be concluded that currently there is no standard guideline used in the service of type 2 DM patients at the primary healthcare facilities BPJS Kesehatan Malang City.

In multivariate statistical analysis, it was found that the use and application of guidelines in patient care will support 89.9% of good clinical practice, which indirectly affects the achievement of Hba1c in type 2 dm patients. clinic, but because there is no standard guideline from the Prolanis service provider in primary healthcare facilities, this becomes a problem that can lead to non-standard clinical practice in all types of primary healthcare facilities managers of Prolanis BPJS.

The availability of good drugs and laboratory support in the Prolanis service system will support good clinical practice. The ideal availability of drugs is when there is a standard guideline in which there is a choice of drugs according to the condition of each patient and indications for treatment. From the system factor, it can be seen the fact that clinical practice services have been running well in terms of medicines and laboratory support, but because there is no standard guideline issued by Prolanis service providers, good clinical practice cannot be implemented because there are no standard standards in management of type 2 DM patients at primary healthcare facilities BPJS Malang City.

We analyzed the patient population from 2 different aspects consisting of patient knowledge and patient treatment adherence. A total of 72.9% with moderate knowledge, 21.8% with high knowledge, and 5.3% with low knowledge. A total of 78.2% of subjects were adherent to treatment and 21.8% did not adhere to treatment.

From the relationship of knowledge and compliance, there was no significant correlation between the two. So, from statistical data, it can be concluded that the high score of knowledge has no effect on patient compliance in treatment. This is different from the research conducted by Boyoh et al (2015), which concluded that there is a relationship between knowledge and compliance. The difference in the results is possible from the number of research samples which are only 58 respondents, besides the operational definition of knowledge is not explained in detail in the study.

The limitations of our study are limited to data and sample size. The HbA1c data that we got from the database did not contain specific information regarding each health facility. Then, research that includes primary data only takes a few representative samples where a total sampling needs to be carried out on a daily basis with data related to secondary data, so that there is a direct relationship between the two.

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