Indonesian Journal of Clinical Pharmacy, September 2020
Vol. 9 Iss. 3, pg 198–204
ISSN: 2252–6218, e-ISSN: 2337-5701
Available online at:
http://ijcp.or.id
DOI: 10.15416/ijcp.2020.9.3.198
Research Article

Glycemic Control and Its Factor in Type 2 Diabetic Patients in Jakarta

Maifitrianti, Nora Wulandari, Muthoh Haro, Sifah F. Lestari, Anisa Fitriani
Fakultas Farmasi dan Sains, Universitas Muhammadiyah Prof. DR. HAMKA,
Jakarta Timur, Indonesia

Abstract
Poor glycemic control is a primary risk factor for the progression of complications. This study aimed to determine the status of glycemic control and associated factors among type 2 Diabetes Mellitus (DM) patients at primary health care of Cakung District, Kebon Jeruk District and Rawa Bunga Village, Jakarta. This study was conducted from July to August 2019, and adopted a cross-sectional design. The respondents' data included sex, age, occupation, education, long suffered with diabetes, diagnosed chronic disease, antidiabetic and other regular drugs were obtained through a questionnaire. Measurement of glycated haemoglobin A1c level was carried out in a standardized laboratory in Jakarta. A total of 126 respondents met the inclusions and exclusion criteria, of which 70.6% were female. The mean age of patients was 61.46±9.086 years (35–85 years). HbA1c level was measured, and the results showed that 45.2% of respondents had good glycemic control (<7% of HbA1c level), while 54.8% had poor control (≥7% of HbA1c level). On the bivariate analysis, the number of antidiabetics was significantly associated with glycemic control ($p<0.05$). The poor glycemic control was significantly higher in patients with polytherapy (72.6%) antidiabetic compared to single antidiabetic (37.5%) ($p=0.01$). These findings highlighted the need for proper management of patients with polytherapy, in order to prevent the complication of type 2 DM.

Keywords: Glycemic control, Jakarta, primary health care, type 2 diabetes mellitus

Kontrol Gikemik dan Faktor yang Berhubungan pada Pasien dengan Diabetes Melitus Tipe 2 di Jakarta

Abstrak
Kontrol glikemik yang buruk merupakan faktor risiko utama terjadinya komplikasi pada pasien diabetes melitus (DM). Penelitian ini bertujuan untuk mengetahui kontrol glikemik dan faktor yang berhubungan pada pasien DM tipe 2 di Puskesmas Kecamatan Cakung, Kecamatan Kebon Jeruk dan Kelurahan Rawa Bunga, Jakarta. Penelitian dilakukan pada bulan Juli–Agustus 2019. Desain penelitian yang digunakan adalah *cross-sectional*. Data responden antara lain jenis kelamin, umur, pekerjaan, pendidikan, lama menderita penyakit DM, penyakit kronis lain yang diderita, obat DM dan obat rutin lain yang digunakan didapatkan melalui instrumen kuisioner. Pengukuran kadar HbA1c dilakukan di laboratorium yang terstandarisasi di Jakarta. Sebanyak 126 responden memenuhi kriteria inklusi dan eksklusi terlibat dalam penelitian ini, dan sebanyak 70,6% adalah berjenis kelamin perempuan. Usia rata-rata pasien adalah 61,46±9,086 tahun (35–85 tahun). Hasil penelitian menunjukkan bahwa 45,2% responden memiliki kontrol glikemik yang baik (<7 level HbA1c), sedangkan 54,8% responden memiliki kontrol glikemik yang buruk (≥7 level HbA1c). Hasil uji bivariat menunjukkan bahwa jumlah antidiabetes yang digunakan berhubungan dengan kontrol glikemik. Kontrol glikemik yang buruk secara signifikan lebih tinggi ditemukan pada pasien dengan politerapi (72,6%) dibandingkan pada pasien dengan terapi tunggal antidiabetes (37,5%) ($p=0,01$). Temuan ini menyoroti perlunya manajemen yang tepat pada pasien dengan politerapi untuk mencegah komplikasi DM tipe 2.

Kata kunci: Diabetes melitus tipe 2, Jakarta, kontrol glikemik, puskesmas

Correspondence: apt. Nora Wulandari, M.Farm., Fakultas Farmasi dan Sains, Universitas Muhammadiyah Prof. DR. HAMKA, Jakarta Timur, Daerah Khusus Ibukota Jakarta 13460, Indonesia, *email:* wulandari.nora@uhamka.ac.id
Submitted: 23th January 2020, Accepted: 13th August 2020, Published: 29th September 2020

Introduction

Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia and is associated with abnormalities in carbohydrate, fat, and protein metabolism. Diabetes can lead to chronic complications, including microvascular, macrovascular, and neuropathic disorder. There are six types of diabetes: type 1 diabetes, type 2 diabetes, a hybrid form of diabetes, unclassified diabetes, hyperglycemia first detected during pregnancy, and other specific types. Type 2 diabetes is the most prevalent type of diabetes, with a percentage of 90% of all cases of diabetes.[1]

The prevalence of diabetes is increasing. The International Diabetes Federation (IDF) estimates that in 2045, about 629 million people of the population would be living with diabetes among adults aged 20–79 years.[2] Based on the Basic Health Research data of Indonesia Ministry of Health, the prevalence of diabetes in Indonesia has increased from 6.9% in 2013 to 8.5% in 2018. In Jakarta, the prevalence of diabetes has increased from 2.5% in 2013 to 3.45% in 2018.[3]

Evidence shows that complications of diabetes can be prevented by optimal glycemic control. However, in Indonesia, the target of glycemic control has not been achieved satisfactorily; the majority of them have an HbA1c level higher than 7%.[4] Previous studies in Indonesia found that glycemic control remains unsatisfactory among type 2 DM patients.[5,6] Identification of factors associated with poor glycemic control is essential to prevent complications from DM.

Despite an increase in the prevalence of diabetes in Jakarta, data regarding glycemic control and factors associated are scant. These data are essential for the overall health care services of diabetic patients. This study aimed to assess the status of glycemic control and identify factors associated with glycemic control in type 2 DM patients at primary health care of Cakung District, Kebon Jeruk District and Rawa Bunga Village, Jakarta for the period July–August 2019, with HbA1c as an indicator of glycemic control.

Methods

Research methods and participants

This cross-sectional study was conducted at primary health care of Cakung District, Kebon Jeruk District, and Rawa Bunga Village, Jakarta from July to August 2019. The procedure of this investigation was approved by ethical review from the Ethics Committee of Faculty of Medicine-University of Indonesia no. KET-588/UN2.F1/ETIK/PPM.00.02/2019, followed by obtaining informed consent from all participants.

We included patients who were diagnosed to have type 2 diabetes with age 18 years old, taking antidiabetic(s) for at least three months and willing to do an HbA1C measurement. The patients had to register as a member of the Chronic Diseases Management Program (PROLANIS) and sign informed consent. We excluded patients with communication problems which includes hearing and speech impairment. We obtained data of respondents included sex, age, occupation, education, long suffered with diabetes, diagnosed chronic disease, antidiabetic, and other daily regular drugs through a structured questionnaire. Measurement of HbA1c levels was carried out in a standardized laboratory in Jakarta.

Statistical analysis and operational definition

The association between categorical variables and HbA1C levels was analyzed using Chi-Square tests. Variable with $p<0.25$ on bivariate analysis was then applied multivariate logistic regression analysis. Variable with $p<0.05$ were considered statistically significant, with a 95% confidence interval.

HbA1c $\leq$7% is indicated as good glycemic control, while HbA1c >7% is considered as

poor glycemic control.

Results

Patients characteristic

We studied 126 patients at primary health care of Cakung District, Kebon Jeruk District, and Rawa Bunga Village, Jakarta, from July to August 2019. More than half, 89 (70.6%), were female. The mean age of the patients was 61±9.09 years. More than three-quarter patients, 107 (84.9%), were non-college. One hundred and nine (86.5%) patients were non-employed (Table 1).

Clinical and medication characteristics

A total of 43 (34.1%) patients had been diagnosed with diabetes for five years or more. Twenty-six (20.6%) patients had two or more chronic diseases. Almost half (49.2%) of patients were taking a combination of antidiabetic therapy. Single therapy using metformin was the most common treatment given to the patients (38.2%), followed by 24.2% of patients with combination therapy of metformin and glimepiride. Sixteen (12.7%) patients had more than three daily regular drugs, which included antidiabetic and other chronic medication. The most common chronic medication used was amlodipine (Table 1).

Glycemic control and factor associated with glycemic control

HbA1C level was used to determine the level of glycemic control. More than half (54.8%) of the patients had poor glycemic control (Table 2). The mean HbA1C level was 7.6% ±2.03. The minimum and maximum HbA1C

Table 1 Demographic and Clinical Characteristic

Characteristic	n (%)
Age Mean ± SD	61±9.09
Age Group	
<60 years	51 (40.5)
≥60 years	75 (59.5)
Gender	
Male	37 (29.4)
Female	89 (70.6)
Occupation	
Employed	17 (13.5)
Non-employed	109 (86.5)
Education Status	
College	19 (15.1)
Non-college	107 (84.9)
Duration of Diabetes Mellitus	
<5 years	83 (65.9)
≥5 years	43 (34.1)
Diagnosed Chronic Disease	
<2 diseases	100 (79.4)
≥2 diseases	26 (20.6)
Number of Antidiabetics	
Single therapy	64 (50.8)
Polytherapy	62 (49.2)
Daily Regular Drugs	
≤3 drugs	110 (87.3)
>3 drugs	16 (12.7)

Table 2 Glycemic Control Among Type 2 Diabetic Patients

Glycemic Control	%
Good glycemic control	45.2
Poor glycemic control	54.8

levels were 5.2% and 15.0%, respectively. On the result of bivariate analysis, the number of antidiabetics was significantly associated with glycemic control (p<0.05). Multivariate logistic regression test showed that patients with single antidiabetic therapy likely to had good glycemic control than patients with combination therapy (p 0.01; OR: 4.742; [95% CI 1.912 to 11.757]) (Table 3).

Discussion

This study assessed glycemic control status and factors associated with glycemic control in type 2 DM patients in primary health care Jakarta. We found that most of the patients had poor glycemic control (54.8%). Only the HbA1c level was used to determine glycemic control in this study and only take a one-time measurement of the HbA1C level. HbA1C measurements are the gold standard for monitoring long term glycemic control for 2 to 3 months.[7] This study reported that the mean HbA1C level of the patients was 7.6%. This level is higher than the American Diabetes Association and Indonesian Society of Endocrinology (PERKENI) recommendation.[4,7]

Previous studies in Indonesia found that

Table 3 Multivariate Logistic Regression Analysis of Factor Associated with Glycemic Control

Variable	Glycemic Control		Adjusted Odds Ratio (95%CI)	p-value
	Good	Poor		
Age Group				
<60 years	19	32	0.393 (0.150-1.032)	Reference
≥60 years	38	37		0.058
Gender				
Male	20	17	1.884 (0.674-5.263)	Reference
Female	37	52		0.227
Occupation				
Employed	9	8	2.173 (0.522-9.039)	Reference
Non-employed	48	61		0.286
Education Status				
College	12	7	1.490 (0.397-5.587)	Reference
Non-college	45	62		0.554
Duration of Diabetes Mellitus				
<5 years	42	41	2.409 (0.952-6.097)	Reference
≥5 years	15	28		0.064
Diagnosed Chronic Disease				
<2 diseases	43	57	0.800 (0.279-2.291)	Reference
≥2 diseases	14	12		0.677
Number of Antidiabetic Drug				
Single theraphy	40	24	5.106 (2.020-12.906)	Reference
Polytherapy	17	45		0.001*
Daily Regular Drugs				
≤3 drugs	51	59	0.937(0.247-3.548)	Reference
>3 drugs	6	10		0.923

*Statistically significant

glycemic control remains unsatisfactory among type 2 DM patients. DiabCare Asia 2012 found that 68,9% of type 2 DM patients in Indonesia have poor glycemic control.[5] A study in the Public Health Center of Kebunsari, Indonesia, found that 83% of type 2 DM patients also have poor glycemic control.[6] Similarly, this study finding with other studies in Indonesia may be due to similar patient's characteristics and diabetes management practices. This finding was also comparable with study findings in Malaysia, where 85% of respondents had suboptimal glycemic control.[8] In India, 78.2% of patients had poor glycemic control.[9]

The rate of poor glycemic control in our study finding was higher than previous study findings, such as in China.[10] The percentage of patients with poorly controlled glycemia in this country was 36.3%. The differences in patient characteristics and disparities in diabetes management practices could be the reason behind this variation.

Poor glycemic control can be complicated and caused by many factors. It has been proved difficult to confirm which factors are most directly associated with poor glycemic control.[11] In our study, the number of antidiabetic was significantly associated with glycemic control. Patients used single antidiabetic likely to had a good controlled glycemic than patients used polytherapy. This finding was comparable with study in Brazil; the use of combine (2–4 antidiabetics) (OR= 5.13) was found to be a predictive factor for poor glycemic control.[12] This finding also similar to other studies by Haghighatpanah et al.[9] and Kasahun et al.[13] In contrast to our study finding, another study in Indonesia found that the number of antidiabetic therapy was not significantly associated with glycemic control.[14] However, other factors could also affect this finding. Patients who got polytherapy may indeed because the disease had progressed, which is shown with a high tendency HbA1C, so that it could not be controlled with monotherapy. Poor glycemic control possibly because of low medication adherence. It is notable that 23% of case uncontrolled A1C was associated with medication-taking behaviour ("medication adherence").[7] According to American Diabetes Association (2019) Patients' constraints in taking medication may include patient factors (financial limitations, remembering to get or take medication, fear, depression, or health beliefs), drug factors (complexity, daily dose, cost, or side effects), and system factors (inadequate follow or support). According to PERKENI (2015), glycemic control must be achieved not only with the use of drugs but also through lifestyle changes, which include improving eating patterns and physical activity. These factors were not investigated in this study but could help to explain the result found.[4]

In our study, we did not find that occupation, education, long suffered with DM, had a statistically significant association with glycemic control. This is in contrast with the previous study by Fiseha et al.[15] Badedi et al.[16] found that there was no correlation between glycemic and occupation; the same results we found in our study. We also did not find that age, marital status, diagnosed chronic disease, and other daily regular drugs had a statistically significant association with glycemic control. The same result also found in the previous study by Mamo et al.[17]

The number of respondents in this study was small. Some factors which could affect glycemic control, such as self-care activities, did not include in this study. Further research with more respondents needs to be done to acknowledge the glycemic control status and factors associated with type 2 diabetic patients in Jakarta.

Conclusions

This study found that the rate of poor glycemic

control among type 2 diabetic patients in primary health care in Jakarta was high. Combination of antidiabetic therapy was significantly associated with glycemic control. It is recommended that primary health care in Jakarta develop planning of intervention to improve glycemic control of diabetic patients.

Acknowledgement

The authors express their appreciation to patients and staff of Primary Health Cares in Jakarta, who helped in the recruitment of patients, also to the Institute of Research and Development, Universitas Muhammadiyah Prof. DR. HAMKA for the support to publish this article.

Funding

This study was funded by Institute of Research and Development, Universitas Muhammadiyah Prof. DR. HAMKA, Jakarta.

Conflict of Interest

All authors declare that there is no potential conflict of interest with research, authorship, or publication of this article.

References

1. American Diabetes Association. Pharmacologic approaches to glycemic treatment: Standards of medical care. 2018;41(1):S73–85. doi: 10.2337/dc18-S 008
2. Cho NH, Shaw JE, Karuranga S, Huang Y, da Rocha Fernandes JD, Ohlrogge AW, et al. IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes Res Clin Pract. 2018;138:271–81. doi: 10.101 6/j.diabres.2018.02.023
3. Kementerian Kesehatan Republik Indonesia. Riset Kesehatan Dasar. Jakarta: Kementerian Kesehatan Republik Indonesia; 2018.
4. Soelistijo SA, Novida H, Rudijanto A. Konsensus pengelolaan dan pencegahan diabetes melitus tipe 2 di Indonesia 2015. Jakarta; PB Perkumpulan Endokrinologi Indonesia (PERKENI); 2015.
5. Cholil AR, Lindarto D, Pemayun TGD, Wisnu W, Kumala P, Puteri. HHS. DiabCare Asia 2012: Diabetes management, control, and complications in patients with type 2 diabetes in Indonesia. Med J Indones. 2019;28(1):47–56. doi: 10.13181/mji.v28 i1.2931
6. Pamungkas RA, Hadijah ST, Mayasari A, Nusdin. Factors associated with poor glycemic control among type 2 diabetes mellitus in Indonesia. Belitung Nursing J. 2017; 3(3):272–80. doi: 10.33546/bnj.61
7. American Diabetes Association. Glycemic targets: Standards of medical care in diabetes-2019. Diabetes Care. 2019;42 (1):S61–70. doi: 10.2337/dc19-S 006
8. Syed Soffian SSS, Ahmad SB, Chan H-K, Soelar SA, Abu Hassan MR, Ismail N. Management and glycemic control of patients with type 2 diabetes mellitus at primary care level in Kedah, Malaysia: A statewide evaluation. PLoS ONE. 2019; 14(10):e0223383. doi: 10.1371/ journal. pone.0223383
9. Haghighatpanah M, Nejad ASM, Haghighatpanah M, Thunga G, Mallayasamy S. Factors that correlate with poor glycemic control in type 2 diabetes mellitus patients with complications. Osong Public Health Res Perspect. 2018;9(4):167–74. doi: 10.24171/j.phrp. 2018.9.4.05
10. Chen Y, Liu L, Gu L, Babineaux S, Colclough H, Curtis B. Glycemic control in chinese patients with type 2 diabetes mellitus receiving oral antihyperglycemic medication-only or insulin-only treatment:

A cross-sectional survey. Diabetes Ther. 2015;6(2):197–211. doi: 10. 007/s13300-015-0114-2
11. Angamo MT, Melese BH, Ayen WY. Determinants of glycemic control among insulin treated diabetic patients in Southwest Ethiopia: Hospital based cross sectional study. PLoS ONE. 2013;8(4): e61759. doi: 10.1371/journal.pone.0061759
12. Marczynski MA, Cortellazzi KL, Barberato-Filho S, Motta RHL, Vieira AEF, Quilici MTV, et al. Unsatisfactory glycemic control in type 2 diabetes mellitus patients: Predictive factors and negative clinical outcomes with the use of antidiabetic drugs. Brazilian J Pharm Sci. 2016;52(4):801–12. doi: 10.1590/s1984-82502016000400026
13. Kassahun T, Eshetie T, Gesesew H. Factors associated with glycemic control among adult patients with type 2 diabetes mellitus: A cross-sectional survey in Ethiopia. BMC Res Notes. 2016;9:78. doi: 10.1186/s13104-016-1896-7
14. Srikartika VM, Cahya AD, Hardiati RSW. Analisis faktor yang memengaruhi kepatuhan penggunaan obat pasien diabetes melitus tipe 2 the analysis of the factors affecting medication adherence in patients. J Manag Pharm Pract. 2016; 6(3):205–12. doi: 10.22146/jmpf.347
15. Fiseha T, Alemayehu, E, Kassahun, W, Adamu A, Gebreweld A. Factors associated with glycemic control among diabetic adult out-patients in Northeast Ethiopia. BMC Res Notes. 2018;11(1): 316. doi: 10.1186/s13104-018-3423-5
16. Badedi M, Solan Y, Hussain Darraj H, Sabai A, Mahfouz M, Alamodi S, Alsabaani A. Factors associated with long-term control of type 2 diabetes mellitus. J Diabetes Res. 2016;2016:2109542. doi: 10.1155/2016/2109542
17. Mamo Y, Bekele F, Nigussie T, Zewudie A. Determinants of poor glycemic control among adult patients with type 2 diabetes mellitus in Jimma University Medical Center, Jimma zone, south west Ethiopia: A case-control study. BMC Endocr Disord. 2019;19(1):91. doi: 10.1186/s12902-019-0421-0