ORIGINAL ARTICLE

Assessment of Medication Adherence in Type II Diabetic Patients: A Cross-sectional Study

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ABSTRACT

Introduction: Diabetes is a chronic disorder and requires long-term therapy. Lack of adherence to antidiabetic medication causes suboptimal glycemic control and can lead to treatment failures, development of complications, and increased mortality.

Aim: To study the medication adherence among type II diabetic patients at a tertiary care hospital in Navi Mumbai, Maharashtra, India.

Materials and methods: A cross-sectional, observational study was conducted for a period of 1 year in the Diabetology Clinic in a tertiary care hospital. A total of 100 type II diabetic patients, who were on antidiabetic drug therapy for at least 6 months, were enrolled. Blood glucose was measured and details of drug therapy were noted. Medication adherence was assessed using Morisky Medication Adherence Scale and adherence scores were calculated.

Results: Only 1% had high medication adherence, while 34% had moderate and 65% had low medication adherence. Medication adherence issues identified in type II diabetics were that they forgot to take/bring their medication when traveling, stoppage of medication once glycemic control is achieved, and difficulty in adhering to medication plan. Only 19% were having optimally controlled glycemic levels, whereas 81% were having uncontrolled glycemic levels. Medication adherence scores were lower (reflecting lower adherence) in type II patients with uncontrolled glycemic levels than those having optimally controlled glycemic levels, but this difference was not statistically significant.

Conclusion: Overall, the medication adherence was low in type II diabetic patients. The study shows that to improve medication adherence, better counseling and health education of patients are required.

Keywords: Medication adherence, Morisky Medication Adherence Scale, Type II diabetes.

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INTRODUCTION

Diabetes mellitus is one of the most common chronic diseases across the world, and the number of diabetic patient is on the rise. In 2011, there were 366 million people with diabetes globally, and this is expected to rise to 552 million by 2030.[1] It has been shown unequivocally that good glycemic control helps to prevent diabetic complications.[2,3] In recent years, newer antidiabetic drugs have been introduced to optimally control diabetes, which have increased the complexity of diabetes treatment algorithms leading to multiple second-line and third-line options.[4-7] Nonadherence to medication declines the efficacy of the medication and, in turn, the glycemic control.[8]

Adherence is referred as active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behavior to produce a therapeutic result.[9-12] Adherence to antidiabetic medications has been shown to improve glycemic control, and predicts good long-term prognosis of the disease.[13,14] Medication adherence to antidiabetic agents has also been shown to be more cost-effective, as it may reduce hospitalization frequency and costs associated with complications.[15,16] Worldwide, studies on medication adherence among diabetic patients have shown a wide variation.[17-24] In India, as per the Indian Council of Medical Research – INdia DIABetes national study report, there are 62.4 million people with type II diabetes and 77 million people with prediabetes. It is expected that these projected figures will increase to 101 million by the year 2030.[1,25] Studies have documented that more than 50% of people with diabetes have poor glycemic control.[25-27]

Limited studies from Southern and Northern regions of India have documented wide variation in the medication adherence and have addressed the issues of nonadherence in diabetic patients.[21,28-33]

AIM

Therefore, this study was conducted to assess the medication adherence among type II diabetic patients attending a tertiary care hospital in Navi Mumbai, India.

MATERIALS AND METHODS

A cross-sectional, observational study was conducted in the Outpatient Diabetology Clinic, MGM Hospital, Navi Mumbai, Maharashtra, India, from October 2014

to September 2015. Ethical clearance was obtained from the Institutional Ethics Committee.

Adult patients diagnosed with type II diabetes taking antidiabetic drug therapy for more than 6 months attending Diabetology Clinic were included and interviewed. After taking informed consent, patients were interviewed in the adjacent room. Their demographic data along with details of duration of treatment, current antidiabetic drug therapy, and medication adherence were recorded. Fasting and post-prandial blood glucose was measured by Accu-Chek Active Glucometer. The study excluded type I diabetics, newly diagnosed type II diabetic patients on antidiabetic drug treatment for less than 6 months, and diabetics not willing for informed consent and/or blood glucose measurement. Participants were further categorized as having optimal controlled glycemic level based on the blood glucose level (fasting <130 mg/dL and/or postprandial <180 mg/dL).

To assess the medication adherence, 8-item Morisky Medication Adherence Scale (MMAS-8) was used after seeking permission from the concerned authorities in UCLA School of Public Health, Los Angeles, USA. (Use of the MMASc is protected by US copyright laws. Permission for use is required. A license agreement is available from: Donald E. Morisky, ScD, ScM, MSPH, Professor, Department of Community Health Sciences, UCLA School of Public Health, 650 Charles E. Young Drive South, Los Angeles, CA 90095-1772). The scale is designed to facilitate identification of barriers to and behaviors associated with adherence to medication. It is a self-report questionnaire with eight questions (items) having good validity and internal reliability. Response categories are yes/no for each item with a dichotomous response and a 5-point Likert response for the last item. Based upon the responses, each item is scored and a total score is calculated. Scores on the MMAS were categorized as: 0 to 6 = low, 6 = medium, and 7 to 8 = high.[34-36]

Statistical Analysis

Data recorded were entered in Microsoft Excel version 2007. Statistical analysis was done using Statistical Package for the Social Sciences version 20. Data were expressed in actual number, mean ± standard deviation (SD), and percentage; t-test was used to compare the mean between the two groups. Probability p-value of less than 0.05 was considered as statistically significant.

RESULTS

A total of 100 type II diabetic patients were included and analyzed. The mean age of the sample was 54 (±10.3) years and male:female ratio was 65:35 (Table 1). Responses of the study participants to individual items of MMAS-8 are summarized in Table 2.

Table 1: Characteristics of type II diabetic patients enrolled in the study

Patient characteristics		Value
Patients with type II diabetics		100
Age in years (mean)		54 ± 10.3
Gender	Male	65 (65%)
	Female	35 (35%)
Duration of treatment in years (mean)		6.9 ± 4.4
Number of medications (mean)		2.05 ± 0.7
Mean blood glucose (mg/dL)	Fasting	176 ± 35
	Postprandial	214 ± 46
Glycemic status	Controlled level	19 (19%)
	Uncontrolled level	81 (81%)

Table 2: Responses of the participants to individual items of MMAS-8

Questions	Yes (%)	No (%)
1 Do you sometimes forget to take your antidiabetic pills?	50	50
2 People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past 2 weeks, were there any days when you did not take your antidiabetic medicine?	32	68
3 Have you ever cut back or stopped taking your antidiabetic medication without telling your doctor, because you felt worse when you took it?	21	79
4 When you travel or leave home, do you sometimes forget to bring along your antidiabetic medication?	83	17
5 Did you take your antidiabetic medicine yesterday?	51	49
6 When you feel like your diabetes is under control, do you sometimes stop taking your medicine?	61	39
7 Taking antidiabetic medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your antidiabetic treatment plan?	69	31
8 How often do you have difficulty remembering to take all your antidiabetic medications?		
Never/rarely	35%	
Once in a while	21%	
Sometimes	30%	
Usually	14%	
All the time	0%	

Responses of patients were analyzed; 83% said they forgot to take medicines when away from home and/or traveling; 69% complained of inconvenience and difficulty in adhering to medication plan; 50% said they just forget to take medicines. In this study, based upon the total MMAS score, only 1% had perfect/high medication adherence, while 34% had moderate and 65% had low medication adherence (Table 3). Type II diabetic patients were further analyzed based upon glycemic status.

Table 3: Level of medication adherence among type II diabetic patients

Medication adherence level (as per MMAS)	Percentage
Low adherence (score <6)	65
Moderate adherence (score 6 to <8)	34
Perfect adherence (score 8)	1

Table 4: Comparison of medication adherence score between diabetic patients with controlled and uncontrolled glycemic levels

Variable	Glycemic status		p-value*
	Controlled	Uncontrolled	
MMAS total score (mean ± SD)	5.07 ± 2.1	4.37 ± 2.05	0.49

*p-value between group comparisons by independent t-test

We found that only 19% were having controlled blood glucose, whereas 81% were having uncontrolled blood glucose despite being on drug therapy. On subgroup analysis, MMAS score was higher in controlled group in comparison with uncontrolled group, but this difference was not statistically significant (Table 4).

DISCUSSION

The findings of the study suggest that the medication adherence was low and addresses the issue of nonadherence among type II diabetic patients. Worldwide studies using various research assessment instruments and systematic reviews have addressed issues of poor medication adherence among diabetes patients.[17-22,37]

In this study, medication adherence was assessed using MMAS-8. It is a reliable and validated scale. The scale is designed to facilitate identification of barriers to and behaviors associated with adherence to medication.[34-36] Only 1% had high while 34% had moderate and 65% had low medication adherence. It was observed that many patients forgot to take medicines with them while traveling. Some of them stopped taking medicines on their own because they believed that their diabetes was under control. Others felt it was difficult to stick to a prescribed treatment plan and so stopped medication.

The findings are comparable to several Indian studies documenting poor medication adherence in diabetic patients.[21,28,29,38] Sharma et al[21] documented that only 16.6% of the patients were adhering to the prescribed antidiabetic drugs, and majority often forgot to take antidiabetic medications. Nonadherence was high and significantly (p < 0.001) associated with frequent dosing and multiple drugs in the prescription, especially attributed to the "forgetfulness" in the older/occupationally retired age groups. Patients would deliberately take drug holidays without the knowledge of their physician. More than half of the patients desired a decrease in the number and the frequency of medications. More than 50% of patients were not aware of the consequences of missing the drugs; 13.3% of patients experienced a number of side effects contributing to medication nonadherence (p < 0.05). Study conducted by Shaimol et al[28] (Kerala) reported that only 21.8% of patients showed high adherence, 43.3% moderate adherence, and 35.3% low adherence toward the therapy. The study concluded that among educated patients, medication adherence is higher. Study described

that low-income patients were less adherent to the prescribed therapy than high-income patients. The patients with onset of diabetes at younger age showed more adherence to treatment than older patients. Study conducted by Khan et al[29] also documented that only 9.8% diabetic had high adherence. Majority of the diabetic patients were on three-drug combination and showed poor glycemic control with poor compliance to drug therapy.

However, some studies have documented better medication adherence than our study.[30-33] Priyanka et al[30] documented that majority (60%) had high medication adherence, and this high medication adherence rates were regardless of number of medicines prescribed. Majority of diabetics had positive beliefs about the necessity of their medication and this may have resulted in high adherence. Similarly Baishnab et al[31] recorded that the adherence levels were 64.90% (high adherence), 29.80% (medium adherence), and 5.29% (poor adherence). The most common reasons for nonadherence were the patient feeling better, cost of medications being expensive, and high quantity of medications. Similarly, the study undertaken by Sajith et al[32] (in Maharashtra) found that the adherence levels were high (40.95%), medium (37.14%), and poor (21.90%) among diabetic patients. Arulmozhi and Mahalakshmy[33] chronicled that 49.8% were high, 24.7% moderate, and 26% low adherent. This better medication adherence probably could be explained by increased awareness about diabetes mellitus and its complications among the population. They substantiated that poor family support was a significant factor associated with low medication adherence and emphasized to assess patients regularly for medication adherence and also include their families in counseling sessions.

Secondary analysis revealed that only 19% type II diabetics were having glycemic level optimally controlled, whereas 81% were having uncontrolled glycemic levels. Indian studies have shown that more than 50% of people with diabetes have poor glycemic control, and this is a growing concern. In this study, the medication adherence scores were comparatively lower in type II patients with uncontrolled glycemic levels than those having optimally controlled glycemic levels, reflecting lower medication adherence in type II diabetics with uncontrolled levels, but this difference was not statistically significant. Glycemic control can be influenced by multiple factors, namely dietary adherence, regular

physical activity, and appropriate drug therapy, of which antidiabetic drug therapy plays an important role. As adherence to medication declines, efficacy and glycemic control also decrease.[8] Therefore, adherence to medication is an essential component in diabetic care management.

Adherence could be affected by patient-centric, physician-dependent, or health care establishment factors. Physicians can play a major role in improving medication adherence by increasing interaction with patients. The physician–patient relationship plays a major role in keeping the patient well informed about the medications they consume. Patients' adherence, when the treatment regimen is simple, seems effective. If they believe the benefits exceed the costs and that their environment supports regimen-related behaviors, their medication adherence improves.[39] Diabetes is a chronic disorder which requires lifelong compliance with treatment regime. Efforts should be made by the physicians to identify the reasons for nonadherence and initiate steps to improve it. They need to educate and counsel the patients on the importance of medication adherence and self-care activities in order to achieve optimal glycemic control.

LIMITATIONS

The study sample size was limited. As it was conducted at a single tertiary care hospital, the findings cannot be generalized to the community. Glycosylated hemoglobin is the gold standard but due to financial restraint, only blood glucose measurements by glucometer were used. Dietary, lifestyle modifications, and physical activity-related factors were not addressed. Further multicentric hospital and community-based studies with larger sample size are warranted. Medication adherence was assessed using MMAS-8, a self-reported scale likely to be affected by recall bias and error in self-observation.

CONCLUSION

Overall, the medication adherence was low in type II diabetic patients. There is a need to address the issue of nonadherence to medication. Efforts should be made by physicians to identify the reasons for nonadherence and initiate steps to improve it. Counseling and health education of the patients related to medication adherence need to be improved.

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REFERENCES

1. Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract 2011 Dec;94(3):311-321.
2. Kohner EM, Aldington SJ, Stratton IM, Manley SE, Holman RR, Matthews DR, Turner RC. United Kingdom Prospective Diabetes Study, 30: diabetic retinopathy at diagnosis of non-insulin-dependent diabetes mellitus and associated risk factors. Arch Ophthalmol 1998 Mar;116(3):297-303.
3. The Diabetes Control and Complications Trial Research Group. Clustering of long-term complications in families with diabetes in the diabetes control and complications trial. Diabetes 1997 Nov;46(11):1829-1839.
4. Inzucchi SE, Bergenstal RM, Buse JB, Diamant M, Ferrannini E, Nauck M, Peters AL, Tsapas A, Wender R, Matthews DR. Management of hyperglycemia in type 2 diabetes: a patient-centered approach: position statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetes Care 2012 Jun;35(6):1364-1379.
5. Bailey TS, Grunberger G, Bode BW, Handelsman Y, Hirsch IB, Jovanovi L, Roberts VL, Rodbard D, Tamborlane WV, Walsh J. American Association of Clinical Endocrinologists and American College of Endocrinology 2016 outpatient glucose monitoring consensus statement. Endocr Pract 2016 Feb;22(2):231-261.
6. India Diabetes Management Algorithm Proposal Group. A proposed India-specific algorithm for management of type 2 diabetes. Diabetes Technol Ther 2016 Jun;18(6):346-350.
7. Kalra S, Bajaj S, Das AK. Indian Research Society for the Study of Diabetes in India (RSSDI) recommendations for diabetes management: a psychosocial commentary. J Soc Health Diabetes 2016 Feb;4(1):1-2.
8. Martínez YV, Prado-Aguilar CA, Rascón-Pacheco RA, Valdivia-Martínez JJ. Quality of life associated with treatment adherence in patients with type 2 diabetes: a cross-sectional study. BMC Health Serv Res 2008 Jul;8:164.
9. Delamater AM. Improving patient adherence. Clinical Diabetes 2006 Apr;24(2):71-77.
10. Meichenbaum, D.; Turk, DC. Facilitating treatment adherence: a practitioner's guidebook. New York: Plenum Press; 1987.
11. Ho PM, Bryson CL, Rumsfeld JS. Medication adherence: its importance in cardiovascular outcomes. Circulation 2009 Jun;119(23):3028-3035.
12. Cramer JA, Roy A, Burrell A, Fairchild CJ, Fuldeore MJ, Ollendorf DA, Wong PK. Medication compliance and persistence: terminology and definitions. Value Health 2008 Jan-Feb;11(1):44-47.
13. Yu AP, Yu YF, Nichol MB. Estimating the effect of medication adherence on health outcomes among patients with type 2 diabetes – an application of marginal structural models. Value Health 2010 Dec;13(8):1038-1045.
14. DiBonaventura M, Wintfeld N, Huang J, Goren A. The association between nonadherence and glycated hemoglobin among type 2 diabetes patients using basal insulin analogs. Patient Prefer Adherence 2014 Jun;8:873-882.

15. Breitscheidel L, Stamenitis S, Dippel FW, Schöffski O. Economic impact of compliance to treatment with antidiabetes medication in type 2 diabetes mellitus: a review paper. J Med Econ 2010 Mar;13(1):8-15.

16. Wild H. The economic rationale for adherence in the treatment of type 2 diabetes mellitus. Am J Manag Care 2012 Apr;18 (Suppl 3):S43-S48.

17. Bagonza J, Rutebemberwa E, Bazeyo W. Adherence to anti diabetic medication among patients with diabetes in eastern Uganda; a cross sectional study. BMC Health Serv Res 2015 Apr;15:168.

18. Awodele O, Osuolale JA. Medication adherence in type 2 diabetes patients: study of patients in Alimosho General Hospital, Igando, Lagos, Nigeria. Afr Health Sci 2015 Jun;15(2):513-522.

19. García-Pérez LE, Alvarez M, Dilla T, Gil-Guillén V, Orozco-Beltrán D. Adherence to therapies in patients with type 2 diabetes. Diabetes Ther 2013 Dec;4(2):175-194.

20. Rwegerera GM. Adherence to anti-diabetic drugs among patients with Type 2 diabetes mellitus at Muhimbili National Hospital, Dar es Salaam, Tanzania – a cross-sectional study. Pan Afr Med J 2014 Apr;17:252.

21. Sharma T, Kalra J, Dhasmana DC, Baser H. Poor adherence to treatment: a major challenge in diabetes. JIACM 2014 Jan;15(1):26-29.

22. Fadare J, Olamoyegun M, Gbadegesin BA. Medication adherence and direct treatment cost among diabetes patients attending a tertiary healthcare facility in Ogbomosho, Nigeria. Malawi Med J 2015 Jun;27(2):65-70.

23. Ahmad NS, Ramli A, Islahudin F, Paraidathathu T. Medication adherence in patients with type 2 diabetes mellitus treated at primary health clinics in Malaysia. Patient Prefer Adherence 2013 Jun;7:525-530.

24. Tiv M, Viel JF, Mauny F, Eschwège E, Weill A, Fournier C, Fagot-Campagna A, Penfornis A. Medication adherence in type 2 diabetes: the ENTRED study 2007, a French Population-Based Study. PLoS One 2012 Mar;7(3):e32412.

25. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, Bhansali A, Joshi SR, Joshi PP, Yajnik CS, et al. Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: phase I results of the Indian Council of Medical Research-INdia DIABetes (ICMR-INDIAB) study. Diabetologia 2011 Dec;54(12):3022-3027.

26. Raheja BS, Kapur A, Bhoraskar A, Sathe SR, Jorgensen LN, Moorthi SR, Pendsey S, Sahay BK. DiabCare Asia-India Study: diabetes care in India-current status. J Assoc Physicians India 2001 Jul;49:717-722.

27. Agarwal AA, Jadhav PR, Deshmukh YA. Prescribing pattern and efficacy of anti-diabetic drugs in maintaining optimal glycemic levels in diabetic patients. J Basic Clin Pharm 2014 Jun;5(3):79-83.

28. Shaimol T, Biju CR, Anilasree BP, Jayakrishnan SS, Babu G. Medication adherence to oral hypoglycemic agents in type 2 diabetic patients. JPRCP 2014 Apr-Jun;4(2):8-12.

29. Khan GH, Aqil M, Pillai KK, Ahmad A, Kapur P, Ain R, AlGhamdi SS, Shahzad N. Therapeutic adherence: A prospective drug utilization study of oral hypoglycemic in patients with type 2 diabetes mellitus. Asian Pac J Trop Dis 2014 Feb;4(1):S347-S352.

30. Priyanka T, Lekhanth A, Revanth A, Gopinath C, Babu SC. Effect of polypharmacy on medication adherence in patients with type 2 diabetes mellitus. Ind J Pharm Pract 2015 Jul;8(3): 126-132.

31. Baishnab S, Basavarajappa AP, Sushilkumar PL, Morla S, Patel YA, Kukadiya AG, Chaitanya Kumar T, Muneerudeen J. A study to assess medication adherence towards anti-diabetic therapy in patients diagnosed with type 2 diabetes mellitus of Davangere, Karnataka. Indo Am J Pharm Res 2015 Jul;5(7):2634-2639.

32. Sajith M, Pankaj M, Pawar A, Modi A, Sumariya R. Medication adherence to antidiabetic therapy in patients with type 2 diabetes mellitus. Int J Pharm Pharm Sci 2014 Feb;6(2):564-570.

33. Arulmozhi S, Mahalakshmy T. Self care and medication adherence among type 2 diabetics in Puducherry, southern India: a hospital based study. J Clin Diagn Res 2014 Apr;8(4):UC01-UC03.

34. Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. J Clin Hypertens (Greenwich) 2008 May;10(5):348-354.

35. Krousel-Wood M, Islam T, Webber LS, Re RN, Morisky DE, Muntner P. New medication adherence scale versus pharmacy fill rates in seniors with hypertension. Am J Manag Care 2009 Jan;15(1):59-66.

36. Morisky DE, DiMatteo MR. Improving the measurement of self-reported medication nonadherence: response to authors. J Clin Epidemiol 2011 Mar;64(3):255-257.

37. Cramer JA. A systematic review of adherence with medications for diabetes. Diabetes Care 2004 May;27(5):1218-1224.

38. Mukherjee S, Sharmasarkar B, Das KK, Bhattacharyya A, Deb A. Compliance to anti-diabetic drugs: observations from the diabetic clinic of a medical college in Kolkata, India. J Clin Diagn Res 2013 Apr;7(4):661-665.

39. Jansiraninatarajan. Diabetic compliance: a qualitative study from the patient's perspective in developing countries. IOSR-JNHS 2013 May-Jun;1(4):29-38.