

Adherence to Anti-diabetic Medications among Diabetic Patients and Factors Affecting it in the Rural Field Practice Area of MMIMSR, Mullana, District Ambala

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Abstract

Introduction: Type 2 DM is one of the largest global health emergencies of the 21st century. Each year more number of people live with this condition. Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980.

Aims: To find adherence to antidiabetic medications and its affecting factors in diabetic patients.

Settings and Design: The cross-sectional study was conducted in rural field practice area of Department of Community Medicine of MMIMSR.

Methods and Material: A sample size of 400 local community was included. And a self-designed questionnaire was administered in the rural field practice area of our college. Time period of the study was from January 2019 to December 2019.

Statistical analysis used: Analyzed by IBM SPSS version 20 Software.

Results: Adherence to anti diabetic medications was 53.3%, non-adherence was 46.8%. Adherence to medication was more (54.1%) in males than in females (52.6%). Adherence to medication was maximum (63.2%) in the age group of (≥ 75 years). Adherence to medication was found maximum (60.0%) in people getting treatment from other non-allopathic doctors. Adherence to medication was found maximum (60.0%) in those who thought that stopping treatment could worsen their health status. Adherence was 55.0% among patients who benefited from treatment.

Conclusions: In this study, adherence to anti diabetic medications was low. The factors found to be significantly associated with adherence were education, caste, number of tablets consumed, side effects of treatment, financial support for treatment and distance of medical facility from patients' home.

Keywords: Adherence, Diabetes, Factors Affecting Diabetic Control.

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Introduction

In India diabetes prevalence is 9%¹. India had more diabetics than any other country in the world-IDF². Nearly 1 million Indians die due to diabetes every year². Every 10th Indian will suffer from either Coronary Artery Disease (CAD) or diabetes by 2030³. Effectiveness of treatment is mainly depend on the level of adherence to prescribed medications⁴. Chronically ill Patients face difficulty in adhering with their prescribed drug therapy⁵. Adherence to OHAs varies 36% - 93% among different populations⁶. Poor awareness and practices are some of the important variables influencing progression of diabetes and its complications, which are largely preventable⁷.

Objectives

1. To find the level of adherence to anti-diabetic medication in previously diagnosed diabetic patients
2. To study the association of various socio-demographic & treatment related factors with adherence to anti-diabetic medication.

Material and Method

1. Study Design: The cross-sectional study

2. Study Population: The Residents of the age 18 years and who diagnosed with type 2 Diabetes for at least 1 year above of rural field practice area of Department of Community Medicine of Maharishi Markandeshwar Institute of Medical sciences and Research, Mullana, District Ambala

3. **Sampling Method:** The Sampling was done by using pretested, self-designed, semi-structured questionnaire consisting of both open and close ended questions
4. **Including Criteria:** The Residents of the age 18 years and who diagnosed with type 2 Diabetes for at least 1 year and above of rural field practice area and who given the consent
5. **Excluding Criteria:** Age less than 18 years not a resident of field practice area and who those didn't given Consent
6. **Time Period:** From January 2019 to December 2019
7. **Ethical clearance:** Institutional Research Ethics Committee permission was obtained before conducting this study
8. **Method of Data collection:**
 - a. The subjects were identified using the records available at the rural health training center. The family folders were scrutinized for the diabetes patients sequentially starting with first folder. A list of diabetic patients was made. The subjects were visited at the place of their residence starting from the first subject in the list and explained the purpose of the study. They were then interviewed using the self-designed questionnaire for the socio-demographic and treatment related details
 - b. If a patient was not available after three visits he was deleted from the study. The process was continued till the required sample size was achieved. The Patient adherence to anti diabetic medications was measured by recall method and recording number of missed doses over 15 days prior to the date of interview
 - c. Participants sample size was calculated by using the following formula $N = Z^2 \times P(1-P)/d^2$ where: Z = Confidence level, P = Prevalence, d = Acceptable error. The expected prevalence of adherence to diabetic medication was taken as 35% and 5% absolute error. Complete enumeration of diabetics was 412. We deleted 12 subjects as they could not followed up. Therefore, our sample size was 400 diabetics.
9. **Data analysis:** The collected data was entered in Microsoft office excel software version 2007 and analyzed by IBM SPSS version 20 Software. The socio-demographic variables were expressed in percentages. Adherence to

anti diabetic medication was calculated in percentage. Chi-square test was used to test the association of various socio-demographic and treatment related factors with adherence.

10. **Consent:** An informed consent was duly signed by the participants who volunteered to participate in the study after explaining to them the procedure, purpose and confidentiality of this study.

Results

This research found 53.25% adherence to anti-diabetic drugs among diabetics in the study population, and 46.75% non-adherence.

According to Table 1 There was a significant association between increased adherence to anti-diabetic drugs and increasing age. 60% of adherence was found among diabetics with the age above 60 years. Maximum adherence (63.2%) was found among diabetics below 29 years of age. There was higher participation among females than males in the study. Adherence pattern was found to be similar in both genders, with 54.1% among males and 52.6% among females. Only 51.2% married diabetics were adherent to medications, while 71.4% of unmarried diabetics were adherent. But this association was not found to be statistically significant.

As described in Table 1, level of education was significantly associated with adherence to drugs. With better education, there was better adherence. 54.4% Illiterates were found to be maximally non-adherent. Other factors that were significantly associated with adherence were family income and caste. Religion, occupation, type of family were not associated significantly. Majority of diabetics, 94 general category of caste (23.5%) were adherent and maximum 69 (17.25%) diabetics belonging to OBCs caste stratification were non-adherent to drugs. It was found that among the lower income levels 43% of diabetics were non-adherent and similar trends were found among the highest income group whereby 69.2% of diabetics were non-adherent. But the highest income group were the least diabetics with only 13 participants. Classified as I, the lowest income group was 57% adherent, and upper-middle income group was 66.7% adherent among them. 59.6% of the lowest income diabetics adhered to drugs compared to other income groups. The lower the income, the more adherence was found among diabetics. Hindus were 54.1% adherent and Muslims were 47.1%. Other religions; 61.8% were adherent.

Table 1: Distribution of participant's Soci-demographic profile.

S.N.	Characteristics	Adherence	Non-adherence	X ² =	P (value) =
1.	Age (years)				
	< 29	12(63.2%)	7(36.8%)	6.295	0.043
	30 – 59	108(47.8%)	118(52.2%)		
	≥ 60	93(60%)	62(40%)		
2.	Sex				
	Male	93(54.1%)	79(45.9%)	0.081	0.775
	Female	120(52.6%)	108(47.4%)		
3.	Marital Status				
	Married	166(51.2%)	158(48.8%)	3.067	0.216
	Unmarried	5(71.4%)	2(28.6%)		
	Other	42(60.7%)	27(39.1%)		
4.	Education				
	> Secondary School Pass	17(68%)	8(32%)	10.346	0.006
	≤ Secondary School Pass	103(60.2%)	68(39.8%)		
	Illiterate (Can't read and can't Write)	93(45.6%)	111(54.4%)		
5.	Occupation				
	Employed	24(45.3%)	29(54.7%)	4.48	0.214
	Unemployed	133(53.8%)	114(46.2%)		
	Daily Wage	39(51.3%)	37(48.7%)		
	Others	17(70.8%)	7(29.2%)		
6.	Monthly Family Income				
	(< 9999)	127(57%)	96(43%)	8.168	0.04
	(10,000-19,999)	64(46.7%)	73(53.3%)		
	(20,000-29,999)	18(66.7%)	9(33.3%)		
	(≥ 30,000)	4(30.8%)	9(69.2%)		
7.	Type of Family				
	Joint	159(54.1%)	135(45.9%)	0.762	0.715
	Nuclear	48(50.0%)	48(50.0%)		
	Three Generation	6(40.0%)	4(40.0%)		
8.	Caste				
	General	94(59.1%)	65(40.9%)	10,691	0.014
	OBC	51(42.5%)	69(57.5%)		
	SC/ST	48(52.2%)	44(47.8%)		
	Other	20(69.0%)	9(31.0%)		
9.	Religion				
	Hindu	151(54.1%)	128(45.9%)	2.386	0.3
	Muslim	41(47.1%)	46(52.9%)		
	Others	21(61.8%)	13(38.2%)		

As shown in **Table 2**, those already getting drugs from government hospitals (73.7%), those taking metformin only (50% adherent), metformin + glimepiride (70.5% adherent) and other drugs (49% adherent) were significantly different in comparison to non-adherent diabetics in their respective groups. Maximum adherence was shown by metformin only group (52.6%) followed by other drugs (23.9%). Other factors like diabetics taking 1 tablet in a day were more likely to be adherent compared to other regimens, as 118 diabetics in number. There was 100% adherence in groups taking 3 and more tablets. 47.9% diabetics on insulin were adherent to medications among their group. The number of tablets taken was significantly associated with adherence. Also, higher cost of anti-diabetic

medication was significantly associated with adherence. Lower cost drugs caused better adherence but among the group non-adherence was higher (51.6%). Among high-cost (>Rs. 500 per month) drugs group adherence was higher (71.4%).

We also found that there was a highly significant association between adherence and means of financial support. Maximum adherence was observed among self-funders group (67.6%), followed by family (44.4%) group and then government or other sources (45.9%) group. But family group non-adherence (55.6%) was more than adherence (44.4%). Daily physical exercise had a significant negative association with adherence. Among the walking diabetics, 63.8% were non-adherent, cycling 73.9% were non adherent and

yoga and other activity; 53.8% were non adherent. 146 (51.4%) were not performing any activity but were adherent to drugs compared to 138 (48.6%) non-adherents in this group. There was no significant difference found among categories of smokers and those diabetics with varied random

blood sugars. Eating habits, distance from the health facility, preference for allopathy were also not significantly related to adherence to anti-diabetic medications especially oral hypoglycemic agents (OHAs).

Table 2: Association of factors affecting participant’s adherence with anti-diabetic medications

S.No	Characteristics	Adherence	Non-adherence	X ² =	P (value) =
1.	Getting T/t from				
	Government hosp.	70(73.7%)	25(26.3%)	20.898	0.000
	Private hosp.	143(46.9%)	162(53.1%)		
2.	Preference of T/t type				
	Allopathic	201(52.9%)	179(47.1%)	3.85	0.535
	Others	12(60.0%)	8(40.0%)		
3.	Combination of OHAs				
	Metformin	112(50.0%)	112(50.0%)	9.655	0.047
	Metformin+Glimepiride	31(70.5%)	13(29.5%)		
	Glimepiride	19(67.9%)	9(32.1%)		
	Others	51(49.0%)	53(51.0%)		
4.	Numbers of Tablets for DM per day				
	1 Tab.	118(50.4%)	116(49.6%)	11.269	0.024
	2 Tab.	52(60.5%)	34(39.5%)		
	3Tab.	6(100.0%)	0(0.0%)		
	> 3Tab.	3(100.0%)	0(0.0%)		
	Insulin	34(47.9%)	34(52.1%)		
5.	Monthly Cost of Anti-diabetic medications				
	> 500 Rs	60(71.4%)	24(28.6%)	14.115	0.0001
	< 500 Rs	153(48.4%)	163(51.6%)		
6.	Financial support from				
	Self	100(67.6%)	48(32.4%)	19.396	0.000
	Government/Other	34(45.9%)	40(54.1%)		
	Family	79(44.4%)	99(55.6%)		
7.	Distance from health facility				
	< 2kms	46(63.3%)	27(37.0%)	3.419	0.064
	> 2kms	167(51.1%)	160(48.9%)		
8.	Benefitted from pharmacological T/t				
	Yes	193(55.0%)	158(45.0%)	3.468	0.063
	No	20(40.8%)	29(59.2%)		
9.	Usually taking fried food				
	Yes	18(48.6%)	19(51.4%)	0.347	0.556
	No	195(53.7%)	168(46.3%)		
10.	Eat in B/W meals				
	Yes	29(42.6%)	39(57.4%)	0.586	0.444
	No	158(47.7%)	173(52.3%)		
11.	Daily exercise				
	Walking	51(63.8%)	29(36.3%)	9.965	0.019
	Cycling	17(73.9%)	6(26.1%)		
	Yoga OR any other	7(53.8%)	6(46.2%)		
	None	138(48.6%)	146(51.4%)		
12.	Number of Bidi/Cigarette in a day				
	≤ 10	9(39.1%)	14(60.9%)	1.467	0.48
	11 - 20	5(50.0%)	5(50.0%)		
	> 20	1(50.0%)	1(50.0%)		
	0/Non-smokers	172(47.1%)	193(52.9%)		
13.	RBS				
	≤ 140mg/dl	49(52.7%)	44(47.3%)	4.146	0.126
	141-200mg/dl	57(46.3%)	66(53.7%)		
	≥201-300mg/dl	107(58.2%)	77(41.8%)		

Discussion

Stalin et al found 50.6% diabetics adherent to anti-diabetic medications⁸. Another study conducted in Puducherry showed 49.3% adherence to drugs⁵. These studies were conducted before 2015 in India. In our study there is no drastic leap in the prevalence of adherence and compliance remains a lacuna, as the prevalence was found to be 53.25%. In contrast, a study by Swain et al (2018) found only 15% adherence to anti-diabetic medications⁹. This was a low-performing state of Odisha in terms of health indicators. Similarly, Sontakke et al in their study conducted in Nagpur found 70% of diabetics, non-adherent to prescribed drugs¹⁰. Kumar et al also found 43.5% non-adherence to anti-diabetic medications¹¹. Another study in Kolkata found 57.7% adherence to drugs but was conducted in 2013⁶. A 2018-research in Delhi found that 82.4% of diabetics were adherent to drugs¹².

According to Stalin et al, gender differences were not significant determinants for adherence to medications⁸. Neither were marital status, religion, age, income, and education. They surmised, similar to our research, that number of tablets consumed in a day was significantly associated with adherence. In contrast to our study, they found that follow-up to private settings enabled more adherence but in our research adherence was more among those who followed-up in government settings. Another factor that was similar in our study was physical exercise. In both the studies, adherence was more among people who were less physically active. The results of physical activity and adherence were significant in the two studies. Mukherjee et al also observed that those who were less physically active showed better compliance to drugs but their results were not statistically significant⁶. Stalin et al also found that adherence was better among non-smokers and drinkers of alcohol⁸. The relation was highly significant. In comparison, our study did not find any statistical difference.

Roy S and Reang T found no significant association of factors like sex, age, literacy, occupation, income and caste with adherence to prescribed treatment¹³. Religious differences were statistically significant. Our study was dissimilar, as we found factors like caste, age, education, family income, influencing adherence to be statistically significant. Religious differences were not significantly associated. Divya and Nadig found that illiteracy, finance, poor diet and physical exercise were not significantly associated with adherence¹⁴. For us monthly cost of drugs and financial support were highly significant factors leading to adherence. Food factors were not associated. Arulmozhi S and Mahalakshmy T found that family support and age above 60 years were significantly associated with adherence⁵. But gender, education were non-significant factors.

Basu et al found that odds of nuclear family, family support and insulin therapy were high (more than 2) among non-adherent diabetics¹². In comparison, we did not find statistically significant association for type of family, but financial support from family showed a significant difference. Also, there were 52.1% diabetics on insulin in our study who were non-compliant to oral drugs in our study.

Conclusion

It was seen that maximum participants (33.4%) were in the age group of 55 – 65 years. Maximum (57.0%) participants were females. Adherence was affected by literacy status, socio-economic status, gender, religion, age, married or widowed. Sikh religion, males, post-graduates were more adherent to medicines. Also, elderly and single people adhered more. Cost of drugs and the distance from the medical facility also significantly affected compliance. People who spent more than Rs 500 were more adherent. Lower castes were less adherent.

Recommendations

In this study the adherence to diabetic treatment was found to be low which can significantly impact the health of the patients. Therefore, there is a need for activities focused towards diabetics and their health in general. Financial assistance and free drugs can significantly improve adherence. Increased collaboration of government health facilities with other social welfare measures to improve economic conditions of the patients can be recommended that indirectly helps in better transportation, procurement of drugs and good health-seeking behaviour. Health education can play a significant role in reinforcement and motivation to increase self-care practices with regard to diabetes control. Mass media can be efficiently utilized for social mobilization against diabetes and improvement in treatment and lifestyle changes. It is imperative that all diabetics receive continuous counselling to continue therapy.

Limitations

There could be duplication of services for diabetes care for which no investigation was done in this study. Another drawback is human error in recording and honesty of patient responses. Re-sampling and house to house survey in the field practice area may confirm our results as an ongoing monitoring of diabetic patients for better understanding of factors related to adherence.

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References:

1. Gupta L, Khandelwal D, Lal PR, Gupta Y, Kalra S, Dutta D. Factors Determining the Success of Therapeutic Lifestyle Interventions in Diabetes – Role of Partner and Family Support. *European Endocrinology*. 2019; 15(1): 18.
2. Diabetes [Internet]. Wikipedia. Wikimedia Foundation; 2020 [cited 2020june26]. Available from: <https://en.wikipedia.org/wiki/Diabetes>
3. Rajput R, Rajput M, Singh J, Bairwa M. Prevalence of diabetes mellitus among the adult population in rural blocks of Haryana, India: a community-based study. *Metab Syndr Relat Disord*. 2012 Dec;10(6):443-6.
4. Jemal A, Abdela J. Adherence to Oral Antidiabetic Medications among Type 2 Diabetic (T2DM) Patients in Chronic Ambulatory Wards of HiwotFanaSpecialized University Hospital, Harar, Eastern Ethiopia: A Cross Sectional Study. *Journal of Diabetes & Metabolism*. 2017;08(01).
5. S A, T M. 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): UC01-3.
6. Mukherjee S. Compliance to Anti-Diabetic Drugs: Observations from the Diabetic Clinic of a Medical College in Kolkata, India. *Journal of Clinical and Diagnostic Research*. 2013; 7(4): 661-665.
7. Gimenes HT, Zanetti ML, Haas VJ. Factors related to patient adherence to antidiabetic drug therapy. *Revista Latino-Americana de Enfermagem*. 2009;17(1):46–51.
8. Stalin P, Singh Z, Purty A J, Sharma Y, Abraham S B. Study on prevalence and factors influencing patient's adherence to anti-diabetic medications in Urban Pondicherry. *Int J Diabetes Dev Ctries*. 2015; 35 (2):S128–S131.
9. Swain, S., Samal, S., Sahu, K., & Rout, S. Out-of-pocket expenditure and drug adherence of patients with diabetes in Odisha. *Journal of Family Medicine and Primary Care*, 2018;7(6): 1229.
10. Sontakke S, Jadhav M, Pimpalkhute S, Jaiswal K, Bajait C. Evaluation of Adherence to Therapy in Patients of Type 2 Diabetes Mellitus. *Journal of Young Pharmacists*. 2015; 7(4): 462-467
11. Kumar N, Unnikrishnan B, Thapar R, Mithra P, Kulkarni V, Holla R, Bhagawan D, Kumar A, Aithal S. Distress and Its Effect on Adherence to Antidiabetic Medications Among Type 2 Diabetes Patients in Coastal South India. *J Nat Sci Biol Med*. 2017 Jul-Dec;8(2):216-220.
12. Basu S, Garg S, Sharma N, Singh MM, Garg S. Adherence to self-care practices, glycemic status and influencing factors in diabetes patients in a tertiary care hospital in Delhi. *World journal of diabetes*. 2018;9(5):72-79
13. Roy S, Reang T Adherence to treatment among type 2 patients attending tertiary care hospital in Agartala City-a cross-sectional study. 2018; 7(10) :1223-1227.
14. Divya S, Nadig P. Factors contributing to non-adherence to medication among type 2 diabetes mellitus in patients attending tertiary care hospital in South India. *Asian Journal of Pharmaceutical and Clinical Research* 8(2):274-27.