



Impact of Medication Adherence on Glycated Hemoglobin (HbA1C) Levels in Type -2 Diabetes Mellitus Patients in Tertiary Care Teaching Hospital

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ABSTRACT

Introduction: Medication adherence is the extent to which a patient's medication-taking behaviour coincides with intention of the physician. This study aims at the impact of medication adherence on glycated haemoglobin (HbA1C) levels in type -2 diabetes mellitus patients in tertiary care teaching hospitals. The main objective of the study is to assess medication adherence by a Morisky questionnaire and identify factors linked with poor adherence in patients with type 2 DM. To improve the clinical outcomes in diabetes patients who are visiting the hospital by patient medication counselling.

Methods: A 6 months prospective observational study was conducted at Rajeev Gandhi institute of medical sciences Hospital (tertiary care) with 110 Diabetic patients to assess the adherence to medication. Adherence was measured by using an 8-items Morisky Medication Adherence Questionnaire consisting of 8 questions. Other data such as patient demographics, family history, duration of DM, smoking & alcoholic, comorbidities, complications and treatment were also collected from patient medical records.

Results: A total of 110 patients were recruited in the study, out of that 10 patients are not attending regular follow up. They were assessed for their adherence rate in Follow up. Approximately 74 of patients in the study were medium adherent in follow up and 9 Patients in the study where low adherent in 17 patients are in high adherence level is observed.

Conclusion: Adherence to medication in T2DM patients in the tertiary care hospital was found to be medium. The major barriers identified in our study like forgetfulness, inadequate knowledge regarding drug therapy, the nature of a busy schedule, lack of knowledge about the disease can be overcome by continuous follow-up and patient education by the pharmacist. Pharmacist-patient participation has significantly improved adherence and glycaemic control.

Keywords: Type 2 diabetes mellitus, adherence, glycemic control.

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INTRODUCTION

Medication adherence is defined by the World Health Organization as "the degree to which the person's behaviour corresponds to the agreed recommendations from a health care provider."²⁰ Drugs and lifestyle changes to control type 2 diabetes and associated conditions can only be effective through adherence to the overall prescribed regimen. The World Health Organization (WHO) has shown that adherence to long-term therapy for chronic illnesses in developed countries averages only around 50 %. Adherence rates are usually reduced for patients with chronic conditions than those with acute conditions; this is associated with the long-term nature of chronic diseases because the decline in adherence is most rapid after the first 6 months of therapy. Such reduced adherence not only results in poor health outcomes but

also has a significant impact on healthcare costs. Thus, the overall management of type 2 diabetes should address adherence as well as appropriate medications.²¹ Adherence is a multidimensional phenomenon determined by the interaction of five sets of factors, termed "dimensions" by the WHO. These dimensions are social and economic, educational, relationship with health care providers, disease status, therapy-related and patient-related factors.²² Over the past decade, diabetes prevalence has risen faster in low- and middle-income countries than in high-income countries.² The prevalence among adults aged 20-70 years is expected to rise from 285 million in 2010 to 438 million by the year 2030. While Type 2 Diabetes poses a huge economic burden to all nations, developing countries bear the highest-burden than 80% of cases occurs in middle and low-income countries. Prevalence estimates of diabetes and impaired glucose tolerance (IGT) are high for all Asian countries and are expected to increase further in the next two decades.³ It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India. India currently faces an uncertain future in about the potential burden that diabetes may impose upon the country.⁴



Aim of the study

To evaluate the impact of medication adherence on Glycated haemoglobin (Hba1c) levels in type-2 diabetes mellitus patients.

Objectives of the study

The key objectives of the study include:

- To assess medication adherence by a Morisky questionnaire.
- To identify factors linked with poor adherence in patients with type 2 DM.
- To improve the clinical outcomes in diabetes patients who are visiting the hospital by patient medication counselling.

Methodology**Study design and study period:**

- A prospective observational study to be conducted in the department of general medicine in RIMS HOSPITAL KADAPA.
- Study was conducted for a period of six months.

Source of Data:

- Demographic characteristics of the patients from the case sheets.
- Data would be collected from treatment charts, prescriptions and case sheets, questioner forms, participants included in the study.

Sample Size:

- All the patients were recruited from the Outpatient department of general medicine diagnosed with type 2 diabetes and the sample size is 100 patients.

Inclusion Criteria:

The study includes if the subjects satisfy the following criteria:

- Patients of age >18 years of both sexes were included in the study.
- Patients who are attending their regular follow-ups.
- Patients who are willing to give their informed consent.

Exclusion Criteria:

The study excludes the following people:

1. Pregnant women, lactating women, and paediatrics
2. Patients who are with iron deficiency anaemia and using drugs like glucocorticoids.
3. Patients with recent blood loss, sickle cell anaemia, thalassemia.
4. Patients were not willing to participate in the study.

Method of Collection of Data

Prospective Data collection was done by using:

Informed consent forms would be obtained to study participants after explaining study details.

- Annexure-1 (Demographical characteristics of the patient)
- Annexure-2 (Medication adherence by Morisky 8-item medication adherence questionnaire)
- Annexure-3 (Factors affecting rate of medication adherence in type 2 diabetic patients)

Statistical Analysis

Results were summarized using EXCEL form and data analysis was carried out by differentiating based on age, gender, duration of diabetes, the habit of smoking & alcohol, educational status, diabetes with comorbidities & complications and calculating the adherence rate and glycaemic control. Data were expressed in percentage.

Chi-square test was applied to find the level of significance, $P < 0.005$ was fixed as statistically significant. Graph pad prism 7.05 was used to assess the level of significance.

RESULTS

The total sample size of the present study for six months was 110. The total no of patients willing to participate was 100 and 10 patients are not attended for their regular follow up

Percentage Distribution Based on Gender and age:

Among the 100 patients, the majority of patients were recorded in the age group of 48-57 are 40 (40%) in those males are 21, females are 19. Later it is followed by the age group of 58-67 are 24(24%) in those males are 11, females are 13. The remaining age groups are 38-47 is 18(18%), >67 is 16(16%), 28-37 is 2(2%). The majority of the patients were males (55%) compared to females (45%) in the 100-sample size. (Shown in figure 1)

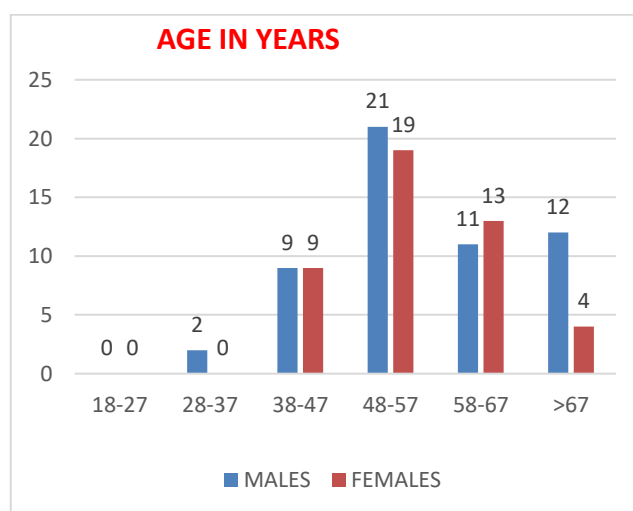


Figure: 1: Graphical representation of percentage distribution based on gender and age

Distribution of Gender-Based on Education:

Illiterate (65%) are more when compared to the literates (35%).

Table 1: Distribution based on Education

S.No.	Educational status	No. of Patients	Percentage
1	Literate	35	35%
2	Illiterate	65	65%

Patients Based on social history:

The no of patients who are associated with Alcohol and smoking (both) are 17(17%). Among the total sample, alcoholic patients are 15(15%), Smoking 1(1%).

Table 2: Percentage distribution of patients based on social history

S.No.	Social history	No. of Patients	Percentage
1	Smoking	1	1%
2	Alcohol	15	15%
3	Both	17	17%
4	None	67	67%
	Total no. of patients	100	100%

Percentage Distribution Based on Co-Morbidities

Among the 100 patients, the Majority of the patients in the total sample are having hypertension 50 (50%) when compared to the other comorbidities which are followed by Hypertension & Dyslipidemia is 11(11%), Hypertension & CVA is 8(8%), Hypertension + CVA + Dyslipidemia is 4(4%), Hypertension + CVA + CKD is 2(2%). other comorbidities include COPD, alcoholic liver disease, CHF, CAD is 7(7%).

Table 3: Percentage distribution based on co-morbidities

S. No.	Comorbidities	No. of Patients	Percentage
1	Hypertension	50	50%
2	Hypertension+ Dyslipidemia	11	11%
3	Hypertension +CVA	8	8%
4	Hypertension+ CVA+ Dyslipidemia	4	4%
5	Hypertension+ CVA+ CKD	2	2%
6	Others	7	7%
7	None	18	18%
	Total no of patients	100	100%

Percentage Distribution Based on the duration of diabetes:

The participants were differentiated into groups depending on the number of years they had been suffering from diabetes. The majority of the study sample had been diagnosed with diabetes for the past 5-10 years is 49(49%) with the second-highest representation being in the 1-5 years is 33(33%) category, remaining no of patients are categorized under the duration of >10 years is 18 (18%). (Shown in figure 2)

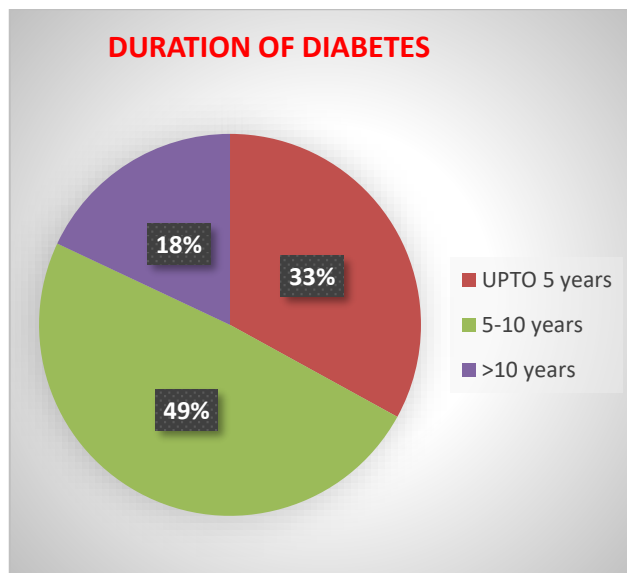


Figure 2: Graphical representation of percentage distribution based on the duration of diabetes

Distribution of Patients Based on Medication regimen:

Among the total 100 sample size, the majority of the patients are treated with the medications such as oral hypoglycemic agents are 86(86%), which are followed by the patients who are using the insulin are 8(8%), patients who are having both (insulin and OHA agents) is 6(6%).

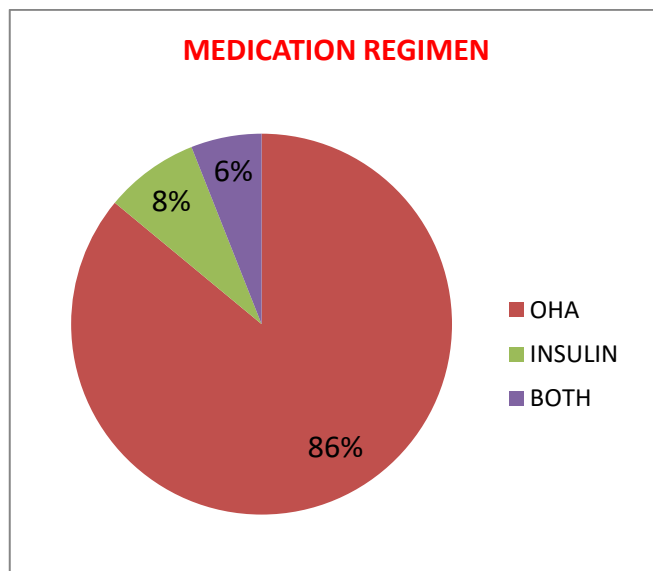


Figure 3: Graphical representation of percentage distribution based on the medication regimen

Distribution of patients based on glycaemic control:

By measuring the Glycated haemoglobin levels (HbA1C) of the patients to check their blood glucose levels. Among the 100 patients of the total sample size, the majority of the patients are recorded in the Mild group (6.5%-7.0%) after the follow-up, 81 patients are having control of HbA1C levels when compared to the baseline. Under the moderate group (7.0%-7.5%) 18 patients are having control of HbA1C levels after the follow-up, which is followed by a severe (>7.5%) group, 1 patient has shown that control of HbA1C levels after the follow-up. The p-value is said to be significant for the patients with baseline and follow up of the HbA1c levels, where the value is 0.0027 (shown in table-4).

Distribution of Patients Based on Medication Adherence:

Our study results show that the majority of patients are in the medium adherence by providing medication

counselling to those patients’ adherence level increased from baseline (42 patients) to follow up (74 patients). Higher adherence patients are increased from baseline (7 patients) to follow up (17 patients). In the low adherence number of patients are decreased from baseline (51 patients) to follow up (9 patients). The p-value is said to be significant for the patients with baseline and follow up of the medication adherence, where the value is 0.0001.

Distribution of patients based on factors affecting rate of medication adherence:

These are the factors identified in patients linked with poor adherence. The majority of the patients are having forgetfulness (46), which are followed by a lack of knowledge about the disease (21), forgetfulness along with the inadequate knowledge regarding therapy is (16), a number of medications along with the frequency of dosing are (12), Decision to omit is (10), Nature/busy schedule of work along with Travel a lot is (19).

Table 4: Distribution of patients based on Glycaemic Control

S.No	HBA1C	Baseline	1 ST Follow Up	P-value
1	Mild (6.5%-7.0%)	59	81	Significant: YES P-value:<0.0027
2	Moderate (7.1%-7.5%)	37	18	
3	Severe (>7.5%)	4	1	
	Total no. of patients	100	100	

Table 5: Distribution of patients based on medication adherence

S.No.	Medication Adherence score	Baseline	1 st follow up	P-value
1	Low	51	9	Significant: YES P-VALUE:<0.0001
2	Medium	42	74	
3	High	7	17	
	Total no of patients	100	100	

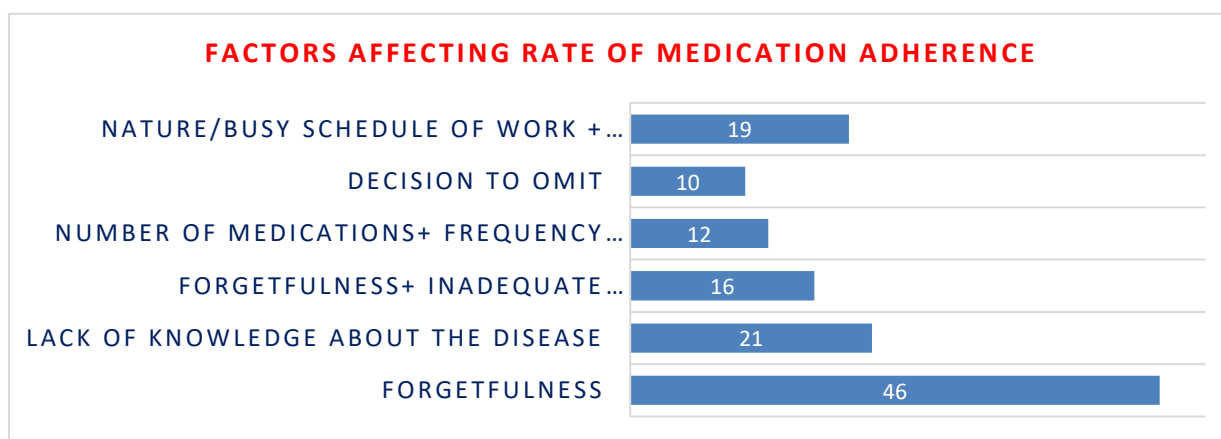


Figure 5: Graphical representation by Distribution of Patients Based on Factors Affecting Rate of Medication Adherence

DISCUSSION

In this present study, most of the patients had medium adherence (74%), patients with higher adherence are 17% and lower adherence are 9% after the follow up by providing counselling regarding drug therapy.

Our study results were compared with Divya.S et.al, Illiteracy can interfere with understanding of disease and medication to some extent. Studies show that adherence is low in patients who cannot understand medication therapy and lack knowledge about disease.⁷



In this study majority of the patients were recorded in the age group of (48-57) are 40%, which follows the age group of (58-67) is 24%. The majority of them are males (56%) compared with females (44%)

Our study results were similar to **D. Sunanda et.al** T2DM patients with comorbidities generally have more drugs of different pharmacological classes such as hypertensive drugs, lipid-lowering agents, and antiplatelet drugs. This complex treatment regimen could be a factor that contributes to non-adherence.⁸

Our study results were compared **V. Karthikeyan et.al** Treatment of co-morbid diseases is really a challenging factor in the therapeutic management of type-2DM diabetes. Among the study population, 20.00 % of patients were having hypertension along with diabetes (DM+HTN) then followed by DM +HTN+ CAD (12.17 %). The majority of patients (291 patients; 84.34%) were prescribed with OHA alone followed by 33 patients (9.56%) with (insulin + OHA) and 21 patients (6.08%) were prescribed with only insulin. Among patient-related barriers, forgetfulness was reported by 36.52% of patients followed by low literacy (19.13%), Stopped medications on being well (6.95%), clinical waiting for longer periods (5.12%) and frequent travelling by 2.60% of patients.⁹ In our study most of the patients are having hypertension along with diabetes is (50%) when compared with other comorbidities and the majority of the patients are treated with the oral hypoglycaemic agents are (86%) and insulin using patients are (8%) and both are (6%). most of the patients have forgetfulness (46%), lack of knowledge regarding disease along with the forgetfulness (21%), nature or busy schedule of work along with travel a lot (19%), forgetfulness with the inadequate knowledge regarding therapy (16%), no of medications along with the frequency of dosing (12%), decision to omit is (10%), these are the major factors are identified in the diabetic patients for non-adherence.

Our study results were similar to **Phei Ching Lim et.al**. The UKPDS study has proved that every 1% reduction of mean HbA1c is associated with 21% risk reduction for any endpoint related to diabetes and 37% risk reduction for microvascular complications. Patients with extra DMTAC program had a mean HbA1c reduction of 0.9% that is indirectly associated with 19% risk reduction for any endpoint related to diabetes and 33% risk reduction for microvascular complications like retinopathy and nephropathy. As the result, this has indirectly improved the quality of life of patients.¹⁰

In our study, the results showed that control of glycated haemoglobin levels from baseline to the follow-up. In the

mild group, more no of patients having controlled hba1c levels from baseline (59 patients) to follow up (81 patients) likely in the moderate and severe groups. The p-value is said to be significant (value is <0.0027) from the baseline to the follow up of hba1c values for the type 2 diabetic patients.

There was a significant relationship between the adherence level of the patients from baseline to the follow up (whereas the p-value is <0.0001). More patients are recorded in the low adherence before the baseline (51 patients). More number of patients are in the medium adherence level after the follow up (74 patients).

This indicates that patients who strictly adhere to medication therapy and awareness of their disease condition have satisfactory adherence levels.

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