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RESEARCH ARTICLE
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"EXPLORING THE ADHERENCE TO ORAL ANTIDIABETIC MEDICATIONS AMONG TYPE 2 DM PATIENTS IN DISTRICT GUJRAT: A CROSS-SECTIONAL STUDY"

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1. Abstract

1.1. Background

Diabetes is a chronic, non-communicable disease that mostly affects adults as Type 2 diabetes. It is caused by inadequate insulin usage, which raises blood glucose levels. With rising urbanization in developing nations, the prevalence has risen to 537 million worldwide and is expected to reach 783 million by 2045. Because Type 2 diabetes is more prone to cause microvascular and macrovascular complications, it is imperative to manage concomitant diseases and maintain rigorous glycemic control. In order to reduce morbidity and death, strict adherence to regimens that include medication, dietary changes, and glucose monitoring is essential.

For diabetic patients, family support plays a critical role in determining medication compliance and glycemic control. Care services and emotional well-being are impacted by patients' perceptions of family support. It is unknown how social support affects glycemic control. Globally, Pakistan has the highest rate of diabetes (30.8% in 2023).

1.2. Aims

Using the Morisky medication adherence scale (MMAS-8), a study conducted in Gujrat, Pakistan, aimed to evaluate medication adherence and its relationship to family support among diabetic patients.

1.3. Objective

To Unveil the relationship between family support, medication adherence and glycemic control in diabetes type II patients of district Gujrat.

1.4. Methodology

Survey was questionnaire based. Questions were related to patient's demographics, diabetic history and medication adherence using MMAS-8 scale. A total of 330 patients, who were above 18, were included in the study. Data was analyzed to investigate the connection between glycemic control and medication adherence.

1.5. Result

330 patients in total had been included in the survey. The survey revealed a relatively high prevalence of medication non-adherence, which led to poor glycemic control. Patients who were > 49 and had

complex treatment regimens were more likely to be non-adherencers. The most common reasons given by patients for their nonadherence were forgetfulness (54.58%), carelessness (47.42%), and treatment regimen complexity (52.92%).

1.6. Conclusion

Medication adherence was less owing to the complexity of medication adherence and forgetfulness. Medication non-adherence resulted in poor glycemic control.

Key words: *Diabetes type II, Medication adherence, glycemic control, patient compliance*

2. Introduction

Diabetes is a chronic, non-communicable disease that develops when the body is unable to use the insulin it does produce, either insufficiently or not at all, resulting in elevated blood glucose levels(Magliano et al., 2021). Type 2 diabetes is the most prevalent kind, typically affecting adults. It is caused by an insufficient or resistant response to insulin in the body (Organization).

It continues to be of great public health concern as the number of people living with diabetes has increased up to 537 million and is predicted to rise to 783 million by 2045(Federation, 2023). Developing countries have shown particularly more escalation referring to increased urbanization(Misra et al., 2019).

With a current global prevalence rate of 6.1%, diabetes ranks among the top 10 causes of mortality and disability(CDC, 2024). Microvascular and macrovascular complications are more likely to occur in people with type 2 diabetes(Nazimek-Siewniak et al., 2002). The major microvascular consequences caused by persistent hyperglycemia are diabetic nephropathy, neuropathy, and retinopathy. All diabetics can lower their morbidity and death rates by maintaining strict glycemic control and actively managing coexisting illnesses like obesity, hypertension, and other risk factors(Vasudevan et al., 2006).

Adherence has been identified as the most crucial element in the management of many chronic illnesses(Osterberg & Blaschke, 2005). Effective glycemic control in the treatment of diabetes mellitus depends on the long-term, appropriate use of anti-diabetic drugs and a suggested lifestyle modification (Al-Qazaz et al., 2010).

Given that the progressive nature of diabetes often results in comorbidities, many patients need complicated drug regimens to attain or maintain glycemic control(CDC, 2024).

Inadequate diabetes management is mostly the reason for the rise of complications and excessive expenses linked with diabetes (Rhee et al., 2005). According to a study, the cost of diabetes in adult patients worldwide is projected to be US$1.31 trillion, or 1.8% of the world GDP. Direct medical costs accounted for two thirds of this expense, with indirect costs like lost productivity accounting for the remaining third (Bommer et al.,

2017). Many patients' diabetes control is inadequate and they do not obtain the necessary standards of care, despite evidence from large-scale randomized controlled studies showing the advantages of comprehensive diabetes management in lowering microvascular and macro-vascular problems(Saaddine et al., 2002; Stratton et al., 2000).

One of the main factors influencing high-quality health outcomes in type 2 diabetes is patient adherence to prescribed treatment regimens. The advantages of medication therapy have been adequately shown in terms of better glycemic control (Ho et al., 2006; Lin et al., 2017) and a consequent reduction in morbidity and micro- and macro vascular problems. Better glycemic control, a lower risk of complications from diabetes, and a lower financial burden are all linked to oral anti-diabetic medication (OAD) adherence (Egede et al., 2012).

Adherence to the complex regimen of medications, exercises, a diabetic-specific diet, and self-monitoring glucose levels is crucial for maintaining appropriate glycemic control and lowering the risk of complications in type 2 diabetes (T2DM) (Gherman et al., 2011).

A recent study revealed that Pakistan has the highest diabetes rate (30.8%) as of 2023, more than any other nation (Saaddine et al., 2002). Using the 8-item Morisky medication adherence scale (MMAS-8), the study intends to gather information regarding medication adherence among diabetes patients in the district of Gujrat, Pakistan. Despite the lack of understanding regarding drug adherence, the data that is currently available points to patients' poor adherence (Abbas et al., 2015).

Aims and Objectives

Aims:

This study aims to determine the ration of medication adherence among diabetes patients of district Gujrat and its effect on their glycemic control.

Objectives

To evaluate how well DM patients in district Gujrat, Pakistan, adhere to their medication regimen.
To investigate different patient factors affecting medication adherence behavior.
To assess the therapeutic effect of medication adherence on glycemic control in those patients.

3. Literature Review

Adherence to medicine, in a study, was evaluated in 301 patients using the 4-item Morisky survey. Keeping other patient demographic and clinical characteristic-related variables constant, the correlation between HbA1c and Morisky score was assessed. Patients' corresponding HbA1c result was lower in those who scored higher on the Morisky scale. There was a 10% reduction in the overall HbA1c for those with a minimum Morisky score of 3 (Krapek et al., 2004).

A study was carried out at Hospital Pulau Penang's Diabetes Outpatients Clinic where 540 adult patients with type 2 diabetes were used as a convenience sample for a crosssectional study. The patients' medical records were examined for information on the condition, including HbA1C values. The final study comprised 505 patients, with a median HbA1C of 7.6, a mean age of 58.15 years, and 50.7% of them were male. 6.5 was the median adherence score. There were significant connections discovered between the two variables adherence and HbA1C. Patients with decreased HbA1C had significantly greater adherence scores ($P < 0.05$). Higher glycemic control and greater medication adherence were linked to patients' awareness of diabetes (Al-Qazaz et al., 2011).

A cohort research was conducted retrospectively on 2463 diabetic patients in Singapore. The patients were monitored for a period of three years to examine the effects of glycemic control, ER visits, and hospital stays. The first two years after the initial drug was prescribed were used to measure medication adherence and proportion of days covered (PDC). The relationship between medication adherence and outcomes, as well as the factors that increase the likelihood of non-adherence was observed using multivariable regression analysis. Compared to highly adherent patients, poor adherent individuals had a 0.4 increase in HbA1c over the course of two years, as well as a higher likelihood of hospitalization or ER visits (Lin et al., 2017).

Another study was conducted on Nigerians with type 2 diabetes who were ambulatory and receiving treatment at a primary care clinic. The study's objective was to ascertain the impact of family functionality on medication adherence and glycemic control. Medication adherence and family functioning were evaluated. The rates for glycemic control, medication adherence, and healthy family function were 61.7%, 72.5%, and 90.8%, respectively. Glycemic management and medication adherence within the household were substantially correlated with family functionality. A strong correlation was found between family functionality and both diabetes control and medication adherence (Iloh et al., 2018).

A cross-sectional study was carried out among outpatients with diabetes at a clinic in Indonesia to investigate the relationship between glycemic control and medication adherence. 321 patients in all took part in the investigation. The results of this study showed that two-thirds of the type 2 diabetes outpatients at the clinic under investigation met their glycemic objectives, despite the fact that the

majority of these patients did not take their medication as prescribed. The most often stated justification for non-adherence by self-reporters was forgetfulness. For the management of their diabetes, the majority of patients were prescribed combination medication, which added to their burden and made it harder for them to remember all the doses (Suprapti et al., 2023).
In southern India, a cross-sectional study was carried out in a hospital setting among individuals with type 2 diabetes who were undergoing treatment for a year at a public tertiary care center and were older than 18 years. Using the Morisky, Green, and Levine Adherence scale (MGL), medication adherence was evaluated. In a tertiary care setting public hospital, this study revealed that almost one-third of the PWDs did not take their prescriptions as prescribed, and that three-fourths had unsatisfactory glucose control, which is concerning. The factors that contributed to poor adherence were smoking, working group membership, distance to the tertiary care center, and gender of the female (Olickal et al., 2021).

4. Material and Methods

4.1. Study design

A descriptive cross-sectional study was performed among diabetes patients in district Gujrat for this study.

4.2. Sample source and time frame

Patients of Gujrat district were the sample source. The study was conducted for four months from November to February. Data of 330 patients was obtained.

4.3. Sample size

The sample size taken was 330 diabetes patients in from different hospital and clinics of district Gujrat.

4.4. Sampling technique

Snow ball sampling technique was used.

4.5. Data collection tool

A structured questionnaire was used to collect information on demographic data, patient history, and details related to medication adherence. The patient's medical records were reviewed to obtain information regarding the current medication regimen, dosages, and any reported complications. Patients were asked question related to medication administration behavior and about their lifestyle to investigate the medication adherence. The MMAS-8 and MMAS-4 questionnaire were utilized to evaluate medication adherence which comprise of eight questions and four questions respectively related to medication-taking behavior and adherence.

4.6. Data collection Scale

Evaluation of medication adherence was done using the Morisky medication adherence scale 8 (MMAS-8) and Morisky medication adherence scale 4. HbA1c level determined by blood assay were categorized as optimal for value ranging, elevated and high. Optimal category ranged from 4-6, elevated category ranged from 6-8 and high category ranged from 8-14.

4.7.Sample selection

4.7.1. Inclusion criteria

Patients above the age of 18 were included in this study.

4.7.2. Exclusion criteria

Patients who were not willing to participate in survey were excluded.

Ethical Consideration:

All the rules and regulations made by the ethical committee of the University of Lahore were followed while conducting this research and the rights of the research participants were respected.

- Written consent was obtained from the participants.
- All information and data obtained were kept confidential.
- Participants remained anonymous during the study.
- Patients were individually informed about the positive results of the study.
- Patients were individually informed about the purpose of study.

4.8.Data collection procedure

In Gujrat district, a cross-sectional study was carried out by Medical students of The University of Lahore, Gujrat Campus. Information was gathered from several hospitals and clinics during the time period of 4 months from November 2023February 2024.

Patients > 18 were included and patients reluctant to participate were excluded. The frequency of medication adherence among diabetes patients in the Gujrat area and its impact on glycemic control were examined using a questionnairebased survey.

The questionnaire entailed sociodemographic attributes, medical history relating to diabetes, and data on the adherence to anti-diabetic medications. The survey was created using a conventional adherence questionnaire and asked questions about aspects connected to drug adherence, such as "Do you ever forget to take your medication?" "Are you careless at times about taking your medication?" "When you feel better do you sometimes stop taking medicines?"

"I take medication only when my blood sugar level is high?" "Do you sometimes have problems remembering to take your medication?" "Do you ever feel troubled about sticking to your treatment plan?" "Thinking over the past 2 weeks, were there any days when you did not take your anti-diabetic drugs?" "Do you feel trouble sticking to treatment plan" and "How often do you have difficulty remembering to take all your antidiabetic medication?"

4.9. Data analysis

Data was entered in Microsoft Excel 2016 and analyzed. Frequencies and percentages were computed for categorical variables to describe patient history, adherence rates, and demographics. The association between medication adherence and patient variables were examined to understand its effect on glycemic control

5. Results

5.1. Patient demographics

The

Demographics

patient's demographics are given in the below table.

Table 5.1: Patient's demographics

Age wise distribution among patients	**n(%)**
18-29	14(4.24)
29-39	20(6.06)
39-49	61(18.48)
49-59	141(42.73)
Above 59	94(28.48)

BMI	
Underweight	6(1.82)
Healthy weight	111(33.64)
Overweight	150(45.45)
Obese	63(19.09)
Gender wise distribution among patients	
Male	147(44.55)
Female	183(55.45)
Marital status	
Single	8(2.42)
Married	285(86.36)
Divorcee	4(1.21)
Widowed	33(10)
Occupational distribution	
Health care professional	3(0.91)
Education/Professor	21(6.36)
Business man/ Entrepreneur	61(18.48)
Govt. sector employ	39(11.89)
Private sector employ	30(9.09)
House wife	162(49.09)
Others	14(4.24)

The aim of the study was to investigate the prevalence of medication adherence among diabetic patients and its effect on glycemic control among district Gujrat patients. This study revealed that majority of patients did not comply to their medicine regimen and had poor glycemic control. A total 330 participants were recruited among whom patients taking medication were selected to be included in the study to check the medication adherence effect.

5.1.1. Age wise distribution among patients

Age ranges were divided into 5 classes of which group 1 being 19-29 years old, group 2 being 29-39 years old, group 3 being 39-49 years old, group 4 being 49-59 years old and group 5 being above 59 years. A total of 330 patients of varying age participated in this survey. Out of this 14 (4.24%) patients belonged to group 1, 20 (6.06%) belonged to group 2, 61 (18.48%) belonged to group 3, 141 (42.73%) belonged to group 4 which was the highest number and 94 (28.48%) patients belonged to group 5.

5.1.2. BMI

BMI was divided into 4 classes. 6 (1.8%) patient were underweight, 111 (33.64%) patients had healthy weight, 150 (45.45%) were overweight and 63(19.09%) patients were obese.

5.1.3. Gender wise distribution among patients

Female participants were higher in number as they made 183 (55.45%) of total patient population. Male participants were 147 (44.55%).

5.1.4. Marital status

Among 330 patients 8 (2.42%) participants were single, 285(86.36%) participants were married, 4(1.21%) were divorced and 33 (10%) were widowed.

5.1.5. Occupational distribution

Among 330 patients 3 (0.91%) participants belonged to health care profession, 21 (6.36%) belonged to education, 61(18.48%) belonged to business, 39 (11.89%) were Government sector employee, 30 (9.09%) were private sector employee, 162 (49.09) were housewives, 14 (4.24%) belonged to various other profession.

5.2. Last reported HbA1C result

Ratio of patient's last HbA1C result is given in the below table and graph.

Table 5.1: Last reported HbA1C result (%)

Last reported HbA1C	Percentage	n
4.0-6.0	27.08	65
6.0-8.0	43.75	105
8.0-14.0	29.17	70

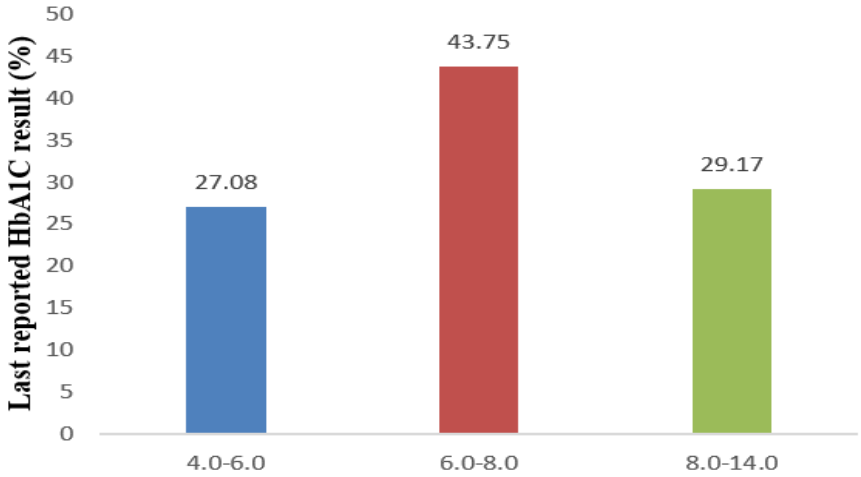

Figure 5.2: Last reported HbA1C result

In the last reported HbA1C result of participants 65(27.08%) participants had HbA1C value ranging from 4-6 categorized as optimal, 105 (43.75%) participants had value ranging from 6-8 categorized as elevated and 70(29.17%) participants had value ranging from 8-14 categorized as high. Most of the patients had elevated level of HbA1C concluding poor glycemic control.

An institutional-based multicenter cross-sectional study was carried out among T2DM patients with comorbidity at the selected hospitals in Northwest Ethiopia. A total of 403 samples were included in the final study.

The results of the study indicated that a significant majority (74.7%) of participants had poor levels of glycemic control, and patients with high medication adherence were found to be less likely to have poor glycemic control than patients with low medication adherence (Sendekie et al., 2022).

5.3. Last reported BSR result

Ratio of patient's last blood glucose level is given in the below table and graph.

Table 5.2: Last reported BSR result (%)

Last reported BSR	Percentage	n
<150	20.83	50
<200	35.83	86
>200	43.33	104

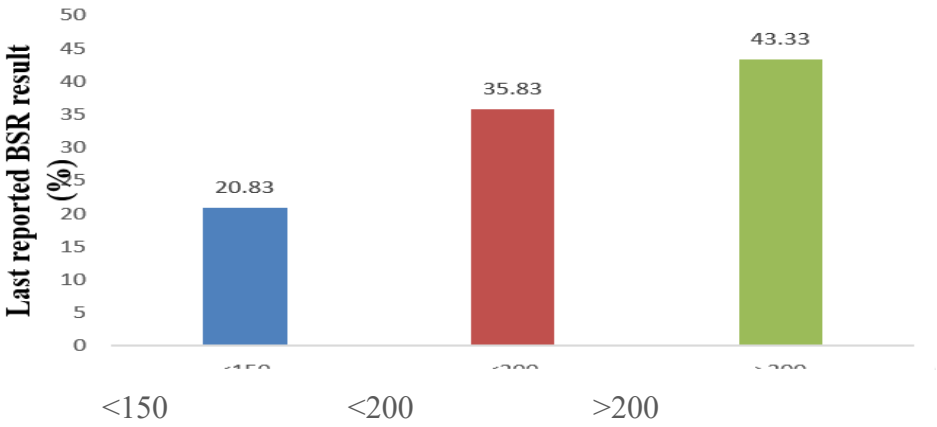

Figure 5.3: last reported BSR result

In the last reported BSR result of participants 50(20.83%) participants had BSR value <150, 86 (35.83%) participants had value <200 and 104(43.33%) participants had value >200. Most of the patients has a higher value of BSR indicating poor glycemic control.

5.4. Type of antidiabetic medication

Different types of medications used by diabetes patients are given in the below table and graph.

Table 5.4: Type of anti-diabetic machine (%)

Type of anti-diabetic medication	Percentage	n
Oral anti-diabetic medication	60	198
Oral ADM + insulin	12.73	42
insulin only	27.27	90

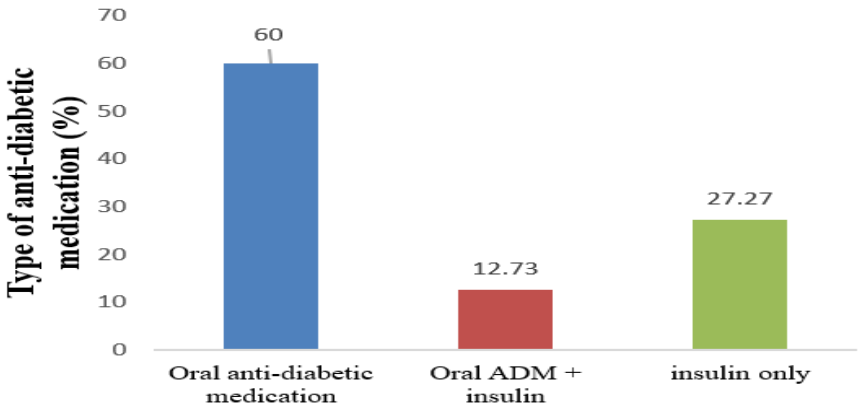

Figure 5.4: Types of anti-diabetic medication

Among 330 patients 198 (60%) patients were prescribed OADM alone while 42(12.73%) patients were prescribed OADM in combination with insulin. While the remaining 90 (27.27%) patients were prescribed insulin alone. Among these patients taking medication were selected.

5.5. Number of medication frequency

Medication frequency among diabetic patients is given in the below table and graph.

Table 5.3: Number of medication frequency (%)

Number of Medication Frequency	Percentage	n
OD	42.08	101
BD	46.25	111
TD	11.67	28

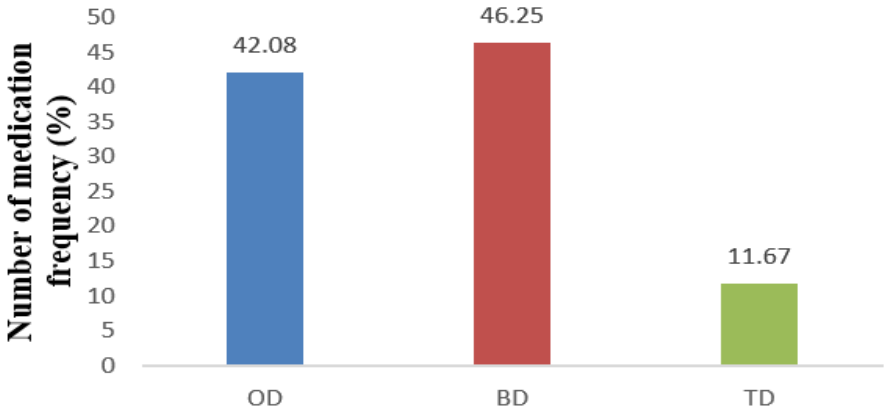

Figure 5.5: Number of medication frequency

Among 240 patients 101 (42.38%) patients were taking OD medication, 111 (46.25%) patients were taking BD medication, 28 (11.67%) patients were taking TD medication for DM.

5.6. Frequency of medication among patients

Frequency of diabetic medication among patients is given in the below table and graph.

Table 5.4: Frequency of medication among patients (%)

Frequency of medication among patients	Percentage	n
Patients using sole medication	63.75	153
Patients using medication in combination with metformin	36.25	87

Frequency of medication among patients (%)*metformin*

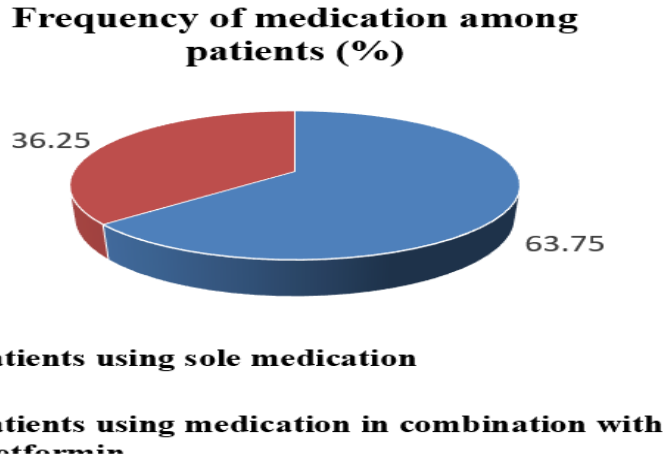

Figure 5.6: Frequency of medication among patients

Among 240 patients 153(63.75%) patients were prescribed sole medication without any combination for DM whereas 87(36.25%) patients were prescribed medication in combination with metformin.

Table 5.6: medication frequency among patients (%)

Medication frequency among patients	
Frequency of sole anti-diabetic medications among patients	**n (%)**
Metformin	103 (42.92)
Sitagliptin	17(7.08)
Glimepride	25(10.42)
Empagliflozen	5(2.08)
Glibenclamide	3 (1.25)
Frequncy of medications in combination	
Sitagliptin + Metformin HCl	32 (13.33)
Vildagliptin + Metformin HCl	30 (12.5)
Glibenclamide + Metformin HCl	8 (3.33)
Glimepride + Metformin	11 (4.58)
Empagliflozen + Linagliptin	6 (2.5)

5.6.1. Frequency of sole medication among patients

Among 240 patients 103 (42.92%) patients were taking Metformin for diabetes control, 17(7.08%)patients were prescribed Sitagliptin, 25 (10.42%) patients were prescribed Glimepride, 5(2.08%) were prescribed Empagliflozen, and 3(1.25%) were prescribed with Glibenclamide.

5.6.2. Frequency of medication in combination

Among 240 patients 32 (13.33%) participants were prescribed with combination of Metformin HCl and Sitagliptin, 30 (12.5%) were prescribed with combination of Metformin HCl with Vildagliptin, 8(3.33%) patients were prescribed a combination of Glibenclamide and Metformin, 11(4.58%) patient were prescribes combination of
Glimepride and Metformin and 6(2.5%) patient were prescribed Empagliflozen and Linagliptin in combination.

5.7. Patients who forgot to take their medication

Ratio of patients who forgot to take their medication is given in the below table and graph.

Table 5.7: Patient forgot to take medication (%)

Patient forgot to take their medication	**Percentage**	**n**
Yes	54.58	131
No	45.42	109

Patient forgot to take their medication

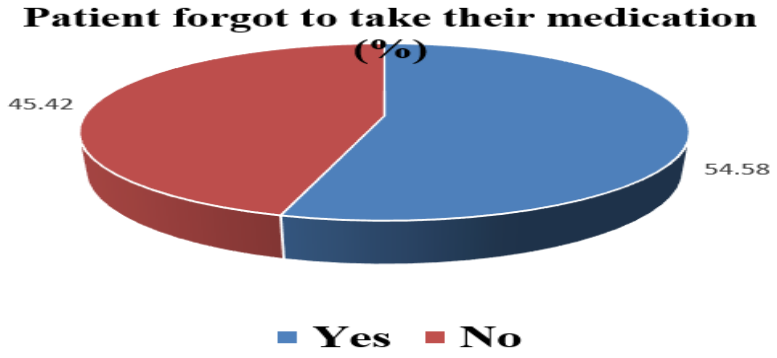

Figure 5.7: patient forgot to take medication (%)

Using the validated MMAS, this study assessed medication adherence in diabetic patients. The research participants' poor levels of adherence were shown by their median MMAS scores.
Among 240 patients 131 (54.58%) chose yes as the answer to if they forgot to take their medicines whereas 109 (45.42%) didn't forget to take their diabetic medicine.

5.8. Patients who were careless about taking medication

Ratio of patients who were careless about taking their medication is given in the below table and graph.

Table 5.8: Patient were careless about taking medication (%)

Patient was careless about taking medication	Percentage	n
Yes	40.42	97
No	59.58	143

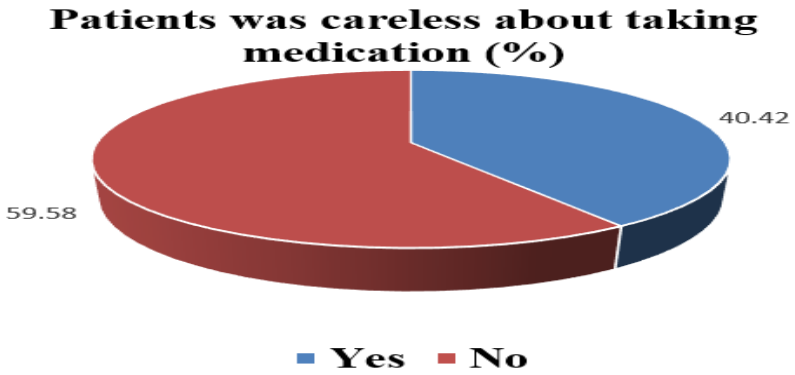

Figure 5.8: patient was careless about taking medication

Among 240 patients 97(47.42%) patients were careless about taking their medication while 143(59.58%) patients were not careless about taking their medication.

In a cross-sectional review from two territorial clinics of Cameroon, not up to half of the patients joining in diabetic facilities were disciple to their prescription.

This unfortunate adherence to antidiabetic prescriptions was to a great extent driven by more youthful age, position on insulin treatment and liquor utilization.

Carelessness, absence of funds, vanishing of side effects and being too occupied were the most continuous reasons given by members as reasons for their non-adherence to prescription (Aminde et al., 2019).

5.9. Patients who stop taking medication when feel better

Ratio of patients who stopped taking medication when they felt better is given in the below table and graph.

Table 5.9: Patients who stop taking medication when feeling better (%)

Patients who stop taking medication when feel better	Percentage	n
Yes	36.25	87
No	63.75	153

Patients stop taking their medication when they feel better (%)

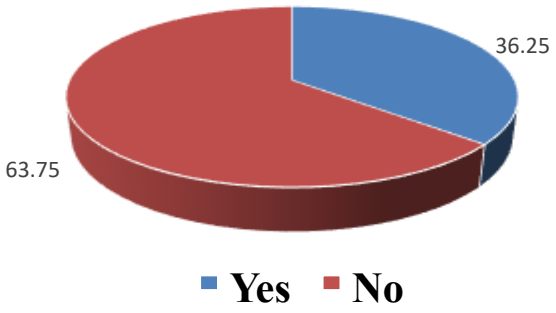

Figure 5.9: Patient stops taking their medication when they feel better (%)

Among 240 patients 87 (36.25%) participants stopped taking their medication when they felt better and 143 (59.53%) participants continued taking medication even if they felt better.

5.10. Patients who have problem in remembering to take medication

Ratio of patients who had problem in remembering to take medication is given in the below table and graph.

Table 5.10: Patients who have problem in remembering to take their medication (%)

Patients who have problem in remembering to take medicine	Percentage	n
Yes	50.42	121
No	49.58	119

Patients have problem remembering to take medication (%)

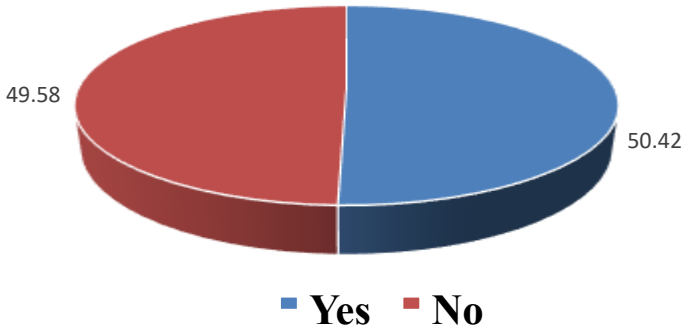

Figure 5.10: Patient who have problem in remembering to take medication (%)

Among 240 patients 121 (50.42%) patients had a problem remembering to take their medication and 119 (49.58%) remembered to take their medication.

5.11. Patient who take medication only when their blood glucose level is high Ratio of patients who only take their diabetes medication when blood glucose level is high is given in the below table and graph.

Table 5.5: patient who only take medication when blood glucose level is high (%)

Patients who take medication only when BSR is high	Percentage	n
Yes	52.92	127
No	47.08	113

Patient takes medication when their BSR is high (%)

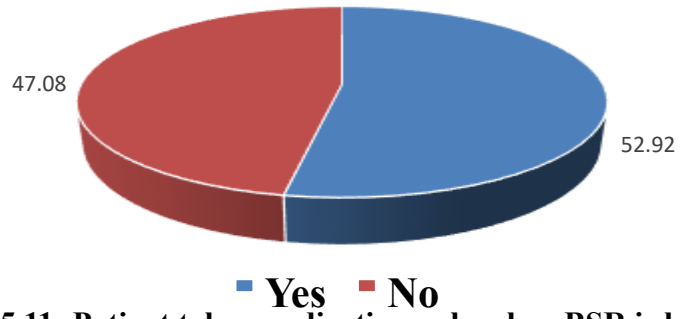

Figure 5.11: Patient takes medication only when BSR is high (%)

Among 240 patients 127 (52.92%) patients took medications only when they had high blood glucose level value while 113(47.08%) regularly took medication.

5.12. Patients who missed any diabetic medicines in last 2 week

Ratio of patients who missed any diabetic medication in the last two weeks is given in the below table and graph.

Table 5.12: Patients who missed any anti-diabetic medicines in last two weeks (%)

Patients who missed any anti-diabetic medicines in last two weeks	Percentage	N
Yes	41.67	100
No	58.33	140

Patients who missed ADM in last two weeks (%)

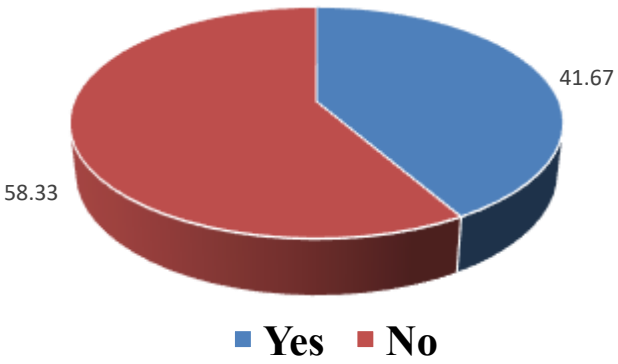

Figure 5.1: Patient who missed ADM dose in last two weeks

Among 240 patients 100 (41.67%) patients missed their antidiabetic medication dose in 2 weeks prior to survey whereas 140 (58.33%) patients didn't miss any dose in the last two weeks.

Of the 321 participants in the research conducted in Malaysia, 268 (83.5%) did not take their medications as prescribed. Patients who did not routinely exercise were more likely to take their

medications as prescribed. 106 patients, or 33.0%, had poor glycemic control (A1C: >7%) (Suprapti et al., 2023).

5.13. Patients have trouble sticking to plan

Ratio of patients facing trouble in sticking to treatment regimen is given in the below table and graph.

Table 5.13: Patients who feel troubled sticking to treatment plan (%)

Patients who feel troubled sticking to treatment plan	Percentage	N
Yes	52.92	127
No	47.08	113

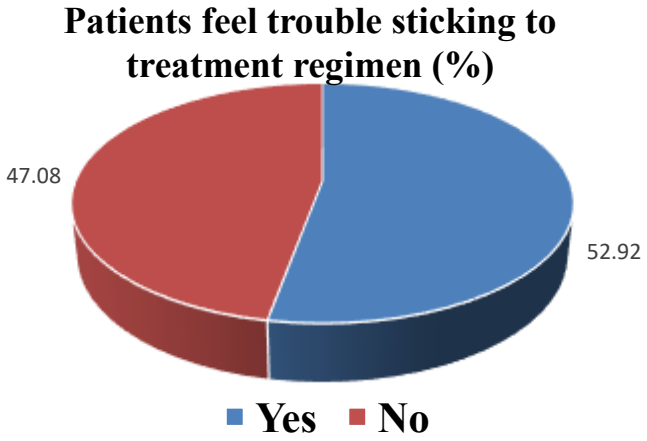

Figure 5.2: Patient feels trouble sticking to treatment plan

Among 240 patients 127 (52.92%) patients had trouble sticking to the regimen whereas 113(47.08%) patients had no trouble sticking to treatment regimen.

According to systematic reviews on diabetes medication adherence, many patients in prospective trials did not follow their oral diabetic regimens as prescribed; the range of 67 to 85% was the overall adherence rate across patients (Bezie et al., 2006).

5.14. How often patients have difficulty to remember to take medicines

Ratio of how often patients forget to take medication is given in the below table and graph.

Table 4.6: How often does patient have difficulty in remembering to take medication (%)

How often patient have difficulty to remember to take medicine	Percentage	N
All time	5	12
Sometimes	46.25	111
Rarely	30.42	73
Never	18.33	44

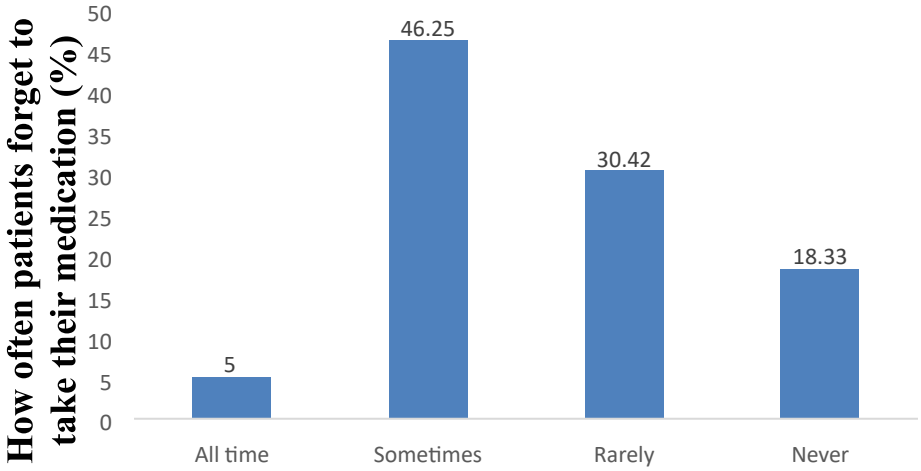

Figure 4.3: How often patient forget to take their medication (%)

Among 240 patients 12 (5%) patients had trouble all the time to remember to take their medicine, 111 (46.25%) patients had sometimes difficulty in remembering to take medication, 73 (30.42%) patients rarely had trouble remembering to take medicines and 44 (18.33%) participants never had difficulty remembering to take their medicines.

6. Summary, Conclusion, Recommendations and Limitations

Summary

The purpose of this study was to ascertain the rate of medication adherence in diabetic patients and to investigate the impact of medication adherence on glycemic control. The adherence prevalence among district Gujrat patients was ascertained using data from a total sample of 330 patients. A survey using a questionnaire was conducted, and questions on medication adherence behavior, patient history, and demographics were asked. Results were ascertained after data interpretation. The patients had poor glycemic control and a low level of adherence.

Conclusions

According to the study's results over half of the patients didn't take their medications as prescribed. It was discovered that complicated drug regimens, old age, forgetfulness, negligence, and socioeconomic conditions were linked to non-adherence. Age group, complicated medicine regimen, socioeconomic situation, and forgetfulness were found to be the main contributing factors.

For the achievement of adequate glycemic control by medication, extensive counseling and health education should be provided. Population interventions aimed at behavioral risk factors should be introduced and/or strengthened for primary prevention in the broader population, even if governments should think about providing cost subsidies to make treatment generally accessible and cheap.

Recommendations

Data was gathered from a single area; further research required data to be gathered from a larger population at the provincial or national levels. Further studies are needed to assess effect of life style along with medication compliance on glycemic control of patients and its overall positive outcomes in diabetes management. Patients should be encouraged to comply to medication regimen for achieving better glycemic control.

Limitations

Our research has some limitations as it was conducted on a small population in a single district so our population sample excluded people other than the district Gujrat.

Our study did not include the investigation of effect of lifestyle modification on glycemic control.

Reference

1. Abbas, A., Kachela, B., Arif, J. M., & Tahir, K. B. (2015). Assessment of medication adherence and knowledge regarding the disease among ambulatory patients with diabetes mellitus DM in Karachi, Pakistan. *Journal of Young pharmacists*, *7*(4), 328.
2. Al-Qazaz, H. K., Hassali, M. A., Shafie, A. A., Sulaiman, S. A., Sundram, S., & Morisky, D. E. (2010). The eight-item Morisky Medication Adherence Scale MMAS: translation and validation of the Malaysian version. *Diabetes research and clinical practice*, *90*(2), 216221.
3. Al-Qazaz, H. K., Sulaiman, S. A., Hassali, M. A., Shafie, A. A., Sundram, S., Al-Nuri, R., & Saleem, F. (2011). Diabetes knowledge, medication adherence and glycemic control among patients with type 2 diabetes. *International journal of clinical pharmacy*, *33*, 1028-1035.
4. Aminde, L. N., Tindong, M., Ngwasiri, C. A., Aminde, J. A., Njim, T., Fondong, A. A., & Takah, N. F. (2019). Adherence to antidiabetic medication and factors associated with non-adherence among patients with type-2 diabetes mellitus in two regional hospitals in Cameroon. *BMC endocrine disorders*, *19*, 1-9.
5. Bezie, Y., Molina, M., Hernandez, N., Batista, R., Niang, S., & Huet, D. (2006). Therapeutic compliance: a prospective analysis of various factors involved in the adherence rate in type 2 diabetes. *Diabetes & metabolism*, *32*(6), 611-616.
6. Bommer, C., Heesemann, E., Sagalova, V., Manne-Goehler, J., Atun, R., Bärnighausen, T., & Vollmer, S. (2017). The global economic burden of diabetes in adults aged 20–79 years: a cost-of-illness study. *The lancet Diabetes & endocrinology*, *5*(6), 423-430.
7. CDC. (2024). *National Diabetes Statistics Report*. https://www.cdc.gov/diabetes/php/dataresearch/?CDC_AAref_Val=https://www.cdc.gov/diabetes/data/statisticsreport/index.html
8. Egede, L. E., Gebregziabher, M., Dismuke, C. E., Lynch, C. P., Axon, R. N., Zhao, Y., & Mauldin, P. D. (2012). Medication nonadherence in diabetes: longitudinal effects on costs and potential cost savings from improvement. *Diabetes care*, *35*(12), 2533-2539.
9. Federation, I. D. (2023). *Diabetes Facts and Figures*. https://idf.org/about-diabetes/diabetesfacts-figures/
10. Gherman, A., Schnur, J., Montgomery, G., Sassu, R., Veresiu, I., & David, D. (2011). How are adherent people more likely to think? A meta-analysis of health beliefs and diabetes selfcare. *The Diabetes Educator*, *37*(3), 392-408.
11. Ho, P. M., Rumsfeld, J. S., Masoudi, F. A., McClure, D. L., Plomondon, M. E., Steiner, J. F., & Magid, D. J. (2006). Effect of medication nonadherence on hospitalization and mortality among patients with diabetes mellitus. *Archives of internal medicine*, *166*(17), 18361841.
12. Iloh, G., Collins, P. I., & Amadi, A. N. (2018). Family functionality, medication adherence, and blood glucose control among ambulatory type 2 diabetic patients in a primary care clinic in Nigeria. *Int J Health Allied Sci*, *7*(1), 23-30.
13. Krapek, K., King, K., Warren, S. S., George, K. G., Caputo, D. A., Mihelich, K., Holst, E. M., Nichol, M. B., Shi, S. G., & Livengood, K. B. (2004). Medication adherence and associated hemoglobin A1c in type 2 diabetes. *Annals of Pharmacotherapy*, *38*(9), 13571362.
14. Lin, L.-K., Sun, Y., Heng, B. H., Chew, D. E. K., & Chong, P.-N. (2017). Medication adherence and glycemic control among newly diagnosed diabetes patients. *BMJ Open Diabetes Research and Care*, *5*(1), e000429.
15. Magliano, D. J., Boyko, E. J., & Atlas, I. D. (2021). What is diabetes? In *IDF DIABETES ATLAS [Internet]. 10th edition*. International Diabetes Federation.
16. Misra, A., Gopalan, H., Jayawardena, R., Hills, A. P., Soares, M., Reza-Albarrán, A. A., & Ramaiya, K. L. (2019). Diabetes in developing countries. *Journal of diabetes*, *11*(7), 522539.
17. Nazimek-Siewniak, B., Moczulski, D., & Grzeszczak, W. (2002). Risk of macrovascular and microvascular complications in Type 2 diabetes: results of longitudinal study design. *Journal of Diabetes and its Complications*, *16*(4), 271-276.

18. Olickal, J. J., Chinnakali, P., Suryanarayana, B., Saya, G. K., Ganapathy, K., & Subrahmanyam, D. (2021). Medication adherence and glycemic control status among people with diabetes seeking care from a tertiary care teaching hospital, south India. *Clinical Epidemiology and Global Health*, *11*, 100742.
19. Organization, W. H. *Diabetes*. https://www.who.int/health-topics/diabetes#tab=tab_1
20. Osterberg, L., & Blaschke, T. (2005). Adherence to medication. *New England journal of medicine*, *353*(5), 487-497.
21. Rhee, M. K., Slocum, W., Ziemer, D. C., Culler, S. D., Cook, C. B., El-Kebbi, I. M., Gallina, D. L., Barnes, C., & Phillips, L. S. (2005). Patient adherence improves glycemic control. *The Diabetes Educator*, *31*(2), 240-250.
22. Saaddine, J. B., Engelgau, M. M., Beckles, G. L., Gregg, E. W., Thompson, T. J., & Narayan, K. V. (2002). A diabetes report card for the United States: quality of care in the 1990s. *Annals of internal medicine*, *136*(8), 565-574.
23. Sendekie, A. K., Netere, A. K., Kasahun, A. E., & Belachew, E. A. (2022). Medication adherence and its impact on glycemic control in type 2 diabetes mellitus patients with comorbidity: A multicenter cross-sectional study in Northwest Ethiopia. *Plos one*, *17*(9), e0274971.
24. Stratton, I. M., Adler, A. I., Neil, H. A. W., Matthews, D. R., Manley, S. E., Cull, C. A., Hadden, D., Turner, R. C., & Holman, R. R. (2000). Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *Bmj*, *321*(7258), 405-412.
25. Suprapti, B., Izzah, Z., Anjani, A. G., Andarsari, M. R., Nilamsari, W. P., & Nugroho, C. W. (2023). Prevalence of medication adherence and glycemic control among patients with type 2 diabetes and influencing factors: A cross-sectional study. *Global Epidemiology*, *5*, 100113.
26. Vasudevan, A. R., Burns, A., & Fonseca, V. A. (2006). The effectiveness of intensive glycemic control for the prevention of vascular complications in diabetes mellitus. *Treatments in endocrinology*, *5*, 273-286.