



Review Article

Barriers To Medication Adherence In Type 2 Diabetic Patients On Oral Hypoglycemic Drugs: A Comprehensive Review

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ABSTRACT

Type 2 diabetes mellitus is a chronic and progressive metabolic disorder that requires lifelong management. In order to achieve ideal glycemic control and avoid problems, medication adherence is crucial. However, several obstacles prevent type 2 diabetes patients who are administered with oral hypoglycemic medicines from adhering to their prescription regimens. The many different reasons that contribute to non-adherence in this group are explored and analyzed in-depth in this thorough review. Specific barriers to medication adherence in T2D, especially those that are potentially modifiable, need to be more clearly identified; strategies that target poor adherence should focus on reducing medication burden and addressing negative medication beliefs of patients. Solutions to these problems would require behavioral innovations as well as new methods and modes of drug delivery. Patients' limited understanding of their condition and medications can hinder their ability to make informed decisions about treatment. Furthermore, psychosocial factors, including mental health, stigma, and cultural beliefs, play a significant role in influencing medication adherence. Forgetfulness emerges as another critical barrier, often exacerbated by complex medication regimens. Access to healthcare services, including affordability and transportation challenges, can further limit patients' ability to obtain and adhere to their medications. Financial constraints and high medication costs are explored as formidable barriers. The review underscores the challenges posed by complex medication regimens, particularly in the context of polypharmacy. The intricacies of managing multiple medications, combined with concerns about interactions and side effects, can overwhelm patients. Complex regimens can lead to medication errors and contribute to non-adherence. Effective communication between healthcare providers and patients is identified as a pivotal factor in addressing these barriers. Ineffective communication can result in misunderstandings about treatment plans, contributing to non-adherence.

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A patient-centered and collaborative approach, tailored to individual needs and preferences, is essential for mitigating these barriers and achieving better glycemic control and long-term health outcomes in type 2 diabetic patients. Reducing these barriers not only benefits individual patients but also alleviates the burden of diabetes-related complications on healthcare systems and society as a whole.

INTRODUCTION

Poor glucose blood level control is a hallmark of the metabolic disorder known as diabetes mellitus (DM). There are other subgroups within it, including type 1, type 2, maturity-onset diabetes of the young (MODY), gestational diabetes, neonatal diabetes, and steroid-induced diabetes. Complex treatment plans and lifestyle modifications are necessary for diabetes management to ensure patient compliance.^[1,2] Oral hypoglycemic agents (OHAs) are highly effective in managing Type 2 diabetes if taken appropriately. Adherence is defined by the World Health Organization (WHO) as “the extent to which a person's behavior—taking medication, following diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider”.^[3] In order to achieve adequate diabetes control and reduce mortality and morbidity, taking diabetic medicines as prescribed is crucial. Most diabetic patients need to follow complicated medication, food, and exercise regimes to manage their ailment effectively, which may cause problems with medication adherence. Only 60% of those with type 2 diabetes who take insulin report medication adherence, with one in three patients reporting missing at least one dosage of oral hypoglycemic medicine each month. Costs associated with T2D healthcare might be greatly lowered with better drug adherence. The likelihood of hospitalisation or ER visits was 13% lower in T2D patients who showed signs of improved medication adherence, whereas a 15% rise in hospitalisation and ER visits was linked to poor adherence over time.^[4] Adherence behaviors in patients with type-2 diabetes include five categories: adherence to

medication, dietary recommendations, increased physical activity, self-control of blood glucose, and proper care of legs.^[5] There are various methods to assess medication adherence, of which, the Morisky Medication Adherence Scale (MMAS-8) is a widely used self-administered validated tool.^[6] Glycemic control is challenging to accomplish in type 2 DM patients since medication non-adherence is widespread. Long-term inadequate glycemic management raises the risk of disease-related complications, which can cause patients to suffer physically, emotionally, and financially.^[7]

Medical professionals are often challenged by lack of patient compliance with pharmaceutical treatments. Research has shown that patients with diabetes have one of the lowest medication adherence rates at 65% to 85%. Key demographic characteristics linked with inadequate compliance with medication in type 2 diabetes mellitus have been found via studies based on large claim databases, including younger age, lower education level, and lower income.^[8] It has been noted that the characteristics of the clinical context have an impact on patients' adherence to therapy, thus it is also important to comprehend the issues unique to that setting.^[9] This article aims to provide an in-depth review of the barriers to medication adherence in type 2 diabetic patients on oral hypoglycemic drugs.

BARRIERS TO MEDICATION ADHERENCE:

1. Patient-Related Factors:

- a. Lack of Knowledge: Many type 2 diabetic patients lack a sufficient understanding of their condition and the importance of medication.
 - Diabetes Misunderstanding: Patients who know little about the disease may not completely realize its chronic nature and its associated consequences. As a result, individuals can undervalue the role that



medicine plays in controlling their diabetes.^[10]

- **Lack of Knowledge of prescription Oral Hypoglycemic Drug Benefits:** Patients who are unaware of the advantages that their prescription oral hypoglycemic pills provide may not recognize these benefits. They might not be aware of how these medications assist regulate blood sugar, lower the risk of problems, and enhance overall quality of life.^[11] Health care professional can play a major role in creating awareness amongst patients which can help to a great extent in improving adherence to medication.^[7]
- **Doubt about Medication Efficacy:** When patients are unaware of how oral hypoglycemic drugs work, they may doubt their effectiveness. This skepticism can lead to non-adherence as patients may feel that taking the medication is unnecessary or ineffective.^[12]
- **Inadequate Dosage Understanding:** Patients might not fully comprehend the significance of taking their medications as directed, including the recommended dosage, frequency, and time. The efficacy of the medication may be impacted by missing doses or inappropriate administration as a result.^[13]
- **Lack of Awareness about Side Effects:** Some patients may not be adequately informed about potential side effects or adverse reactions associated with their medication. As a result, when they experience side effects, they may discontinue the medication without seeking guidance from healthcare providers.^[14]
- **Limited understanding of lifestyle changes:** Patients may not be aware that lifestyle changes, including as dietary

adjustments and exercise, are equally essential for managing diabetes. Patients who rely entirely on medicine may overlook other parts of self-care as a result of their lack of understanding, which can cause non-adherence.^[15] Patients should receive detailed information about their prescribed medications, including how they work, benefits, potential side effects, and proper administration techniques.

- **Language and Health Literacy Barriers:** It may make it difficult for patients to comprehend the directions for taking their medications, which makes it difficult for them to follow their treatment plan.^[16] Healthcare providers should employ strategies to improve health literacy, such as using plain language, visual aids, and involving family members or caregivers when necessary.
- b. **Psychosocial Factors:** In type 2 diabetes patients taking oral hypoglycemic medications, psychosocial variables can significantly contribute to hurdles to medication adherence. These facets of a patient's life, which span a variety of emotional and social spheres, might have a significant influence on their capacity to adhere to their recommended drug schedule.
 - **Depression and Anxiety:** It might be challenging for patients who are depressed or anxious to adequately manage their diabetes because they may have reduced motivation, diminished energy, and feelings of pessimism. Due to mental turmoil, people could be less inclined to stick to their prescription schedule.^[17]
 - **Stress:** Cortisol levels can rise under prolonged stress, which can cause insulin resistance and make it harder to control blood sugar levels. Patients may



be distracted from their drug regimens by stressful life events or everyday concerns, which can lead to missed doses.^[18]

- **Psychological Resistance:** Some patients may experience psychological resistance to the diagnosis of type 2 diabetes. Denial, anger, or fear can lead to non-acceptance of the condition, which can manifest as non-adherence to medication.^[17]
 - **Lack of Social Support:** Patients who lack a strong support system may face additional challenges in managing their diabetes. They may not have encouragement or assistance with medication reminders or coping with side effects.^[19] Stigmatization associated with diabetes can lead to social isolation and reluctance to engage with healthcare providers. Isolated individuals may not seek support or information about their medication, leading to non-adherence.
 - **Cultural Beliefs and Norms:** Cultural beliefs and norms can influence how individuals perceive illness and treatment. Some cultures may hold beliefs that clash with the use of medication. Patients may be less likely to adhere to medication if it conflicts with their cultural beliefs.^[20]
- c. **Forgetfulness:** forgetfulness can be a significant barrier to medication adherence in type 2 diabetic patients on oral hypoglycemic drugs.
- **Missed Doses:** Missing dosages of prescription medicine is the direct result of forgetfulness. Patients may simply forget to take their medications at the appointed times, which might result in irregular blood sugar management. Recommending the use of pill organizers or automated medication dispensers with alarms can help patients remember to take their medications as scheduled.
 - **Inconsistent Timing:** Even if patients remember to take their medication, they might do so at irregular intervals. This inconsistency can result in fluctuations in blood glucose levels, making it harder to manage diabetes effectively. Suggesting the use of smartphone apps, alarms, or calendar reminders can be an effective way to prompt patients to take their medication at the right times.
 - **Multiple Medications:** Patients with multiple medications for various health conditions may find it challenging to keep track of all their prescriptions. This can increase the likelihood of forgetting to take specific medications, including oral hypoglycemic drugs.
 - **Complex Regimens:** Some medications require specific instructions regarding timing, dietary restrictions, or concurrent use with other drugs. Patients may forget or become overwhelmed by the complexity of their medication regimen.
 - **Lack of Routine:** Forgetfulness may be more pronounced in patients who do not have a consistent daily routine. Variability in daily activities can make it difficult to establish a medication-taking habit. Whenever possible, healthcare providers can help patients align their medication schedules with daily routines or other medications they are taking to simplify the regimen.^[21]
- 2. Healthcare System Issues:**
- a. **Access to Healthcare:** Limited access to healthcare can pose a significant barrier to medication adherence in type 2 diabetic patients on oral hypoglycemic drugs.



- Lack of Regular Checkups: Patients without access to healthcare may miss out on checkups or appointments for managing their diabetes. Without these visits, individuals might not get critical prescription modifications or condition monitoring.^[13]
 - Refills on prescriptions: Having access to healthcare is necessary in order to get refills on prescriptions. Patients may run out of medicine and have treatment disruptions if they are unable to conveniently reach medical professionals or pharmacies.^[22]
 - Limited Education: Access to healthcare is essential for receiving comprehensive diabetes education. Patients may not receive information about their condition, the importance of medication, or potential side effects, leading to misconceptions and non-adherence.^[23]
 - Financial Constraints: Oral hypoglycemic drugs, especially newer and branded medications, can be expensive. Patients with limited financial resources may struggle to afford their prescribed medications, leading to rationing or discontinuation.^[24] In addition to medication costs, managing diabetes often involves regular doctor's visits, laboratory tests, and monitoring supplies like glucose meters and test strips. These expenses can accumulate, putting a strain on patients' budgets. Financial constraints can result from unemployment, underemployment, or reduced income due to health-related issues. These situations can make it difficult for patients to afford their medications. Patients with inadequate health insurance coverage or high deductibles may find that their out-of-pocket expenses for medications are prohibitively high. High copayments or deductibles can discourage patients from refilling prescriptions.^[25]
- Transportation Challenges: Patients who do not have access to reliable transportation may find it difficult to attend their primary care physician, endocrinologist, or diabetes educator appointments, which may end up in neglected chances for treatment adjustments, learning, and surveillance.^[26] Patients who rely on public transportation or face long travel distances to pharmacies may experience delays in obtaining their prescribed medications. This can lead to medication gaps and non-adherence. The cost of transportation, including public transit or fuel for private vehicles, can be a financial burden for patients. Promote the use of telehealth and virtual healthcare visits as an alternative to in-person appointments, reducing the need for transportation.^[27]
- b. Complex Regimen: Complicated dosing schedules and frequent medication changes can confuse patients.
 - Increased Cognitive Load: Patients on complicated regimens may have to take a number of drugs during the course of the day. Patients may find it more difficult to remember when and how to take each prescription as a result, especially those who have cognitive impairments or are elderly.^[28] Avoid the “prescribing cascade.” If a patient develops new symptoms after starting a medication (e.g., pedal edema after starting a calcium channel blocker), try changing the

medication before adding another one to treat the symptoms.^[29]

- Confusion and medication mistakes: Complicated regimens may need for various doses, pill sizes, and administration guidelines. Errors in dose and timing may occur as a result of patients becoming confused about which drug to take when. Patients may confuse one medication with another, leading to taking the wrong medication at the wrong time or in the wrong dosage. This can potentially result in ineffective treatment or adverse effects. Due to uncertainty about which medication to take, when, or how, patients might skip doses altogether to avoid making mistakes. This can lead to inadequate blood sugar control.^[30] Confusion can create inconsistencies in medication use, with patients taking medications sporadically or inconsistently, making it difficult to achieve stable blood glucose levels. Whenever possible, simplify medication regimens by consolidating medications or prescribing combination therapies to reduce the number of pills or doses required. Encouraging the use of pill organizers with compartments for each day of the week or time of day to help patients keep track of their medications.
- Interaction Concerns: Patients on multiple medications may worry about drug interactions. These concerns can lead to hesitation in taking all prescribed medications concurrently, affecting adherence to one or more drugs.^[31] If a patient is given several medications, they might be concerned whether consuming these all at once could result in potentially hazardous drug interactions. As a result, they could be reluctant to take their

prescriptions simultaneously, resulting in missed doses or erratic adherence.^[32]

Some patients may turn to the internet to research potential drug interactions. While seeking information is essential, not all online sources provide accurate or context-specific information, leading to misinformation and unfounded concerns. Patients may delay taking certain medications to ensure that there is no overlap with other drugs they are taking. This can result in suboptimal blood glucose control and reduced medication effectiveness. Conduct regular medication reconciliation to review all of a patient's medications and assess the likelihood of interactions. Adjust the treatment plan if necessary. Provide clear and comprehensive education to patients about the potential for drug interactions and the importance of open communication with their healthcare provider.^[33]

- c. Cost of Medications: The high cost of oral hypoglycemic drugs can be a significant barrier, even for patients with insurance.
 - Prioritization of Expenses: Patients with limited financial resources may be forced to prioritize essential expenses such as housing, food, and utilities over medication costs. As a result, they may cut back on medication use or skip doses to make ends meet.^[34] Inform patients about pharmaceutical company patient assistance programs, discount cards, and coupons that can reduce the cost of medications.
 - Medication Rationing: To make their medications last longer or reduce costs, some patients may ration their medications by taking smaller doses or stretching the prescribed regimen. This



can lead to inadequate blood sugar control.^[35] Encourage the use of generic versions of medications whenever possible, as they are typically more affordable than brand-name drugs and may provide similar therapeutic benefits. Employ social workers or patient advocates who can help patients navigate medication assistance programs and explore options for reducing medication expenses.

- d. **Communication:** Ineffective communication between healthcare providers and patients can lead to misunderstandings about treatment plans. A major obstacle to type 2 diabetes patients taking their medications as prescribed is inadequate interaction between physicians and patients. Treatment strategy misconceptions can have a negative impact on patient adherence and overall diabetes control.^[36] Some patients may have limited health literacy, making it challenging to understand medical terminology and complex treatment plans. They may be hesitant to ask questions for fear of appearing uninformed. Patients may not receive clear information about potential side effects of their medications. When side effects occur unexpectedly, patients may discontinue or modify their medication without consulting their healthcare provider. By fostering self-efficacy and reducing the detrimental impacts of financial obstacles to adherence, patient-centered communication behaviours are essential tactics used by physicians to build patient trust, which improves patient adherence.^[37] A patient's declaration of non-adherence may be facilitated by skilled doctors, allowing for problem-solving such as altering regimens that are producing adverse effects or involving patients' significant others.^[38]

3. **Medication-related Challenges:** Medication-related challenges can create significant barriers to medication adherence in type 2 diabetic patients. These challenges encompass a range of issues related to the medications themselves, including polypharmacy, pill burden, side effects, complex regimen etc.

- a. **Polypharmacy:** Polypharmacy, defined as the use of multiple medications, increases with age. Multiple medications are commonly prescribed for older adults, who may also contribute to complicated regimens by purchasing over-the-counter medications and dietary supplements with or without their providers' knowledge. For physicians, especially those caring for complicated older persons, striking a balance between over-, under-, and adequate prescription can be difficult. The more medications a patient takes, the greater the risk of confusion. Patients may struggle to remember which medication to take when, increasing the likelihood of missed doses or taking incorrect doses.^[40] Previous study findings indicate that a significant proportion of patients with comorbidity fail to achieve the expected adherence level of medications. This might be because patients may discontinue medications due to other medications for additional diseases and or it might be difficult to remember medications due to medication regimen complexity.^[41] A study conducted in an Ethiopian general hospital by Asnakew Achaw Ayele et al., revealed that The prevalence of high MRC medication regimen complexity index is high among patients with T2DM. Patients with low and moderate regimen complexity had improved



adherence. Simplification of a complex medication regimen for patients with diabetes should be sought by physicians and pharmacists to improve medication adherence and subsequent improvement in glycemic control. In another study it was found that of the total 2920 subjects identified, adequate adherence ($\geq 90\%$) was found in 31% of those prescribed sulphonylureas alone ($n = 1329$, median adherence = 300 days per year), and in 34% of those prescribed metformin alone ($n = 528$, median = 302 days per year). There were significant linear trends of poorer adherence with each increase in the daily number of tablets taken ($p = 0.001$) and increase in co-medication ($p = 0.0001$) for sulphonylureas alone after adjustment for other factors.^[42]

- b. Pill Burden: Pill load, which is the term for the total amount of tablets and drugs that a patient must take each day, can in fact be a major impediment to medication compliance in people with type 2 diabetes mellitus.^[43] Type 2 diabetes patients' subjective perceptions of their illness condition are influenced by how many medications they take daily. There was a direct correlation between the number of prescribed medications and the severity of illness perceived by patients with type 2 diabetes and cardiovascular disease, according to a previous study. Patients' perceptions that taking a lot of pills made them feel sicker were consistent with the results of the survey known as the Brief Illness Perception Questionnaire.^[44] Studies have shown that a large number of tablets taken on a daily basis is perceived as a burden by a majority of

patients regardless of age, but it is evident that older patients (≥ 65 years of age) are affected more than younger patients (< 65 years of age) by the consequences of pill burden. Pharmacological therapy should not unnecessarily entail a large number of tablets to be taken because this has an adverse effect on patients' therapeutic adherence, pill burden, and quality of life.^[45] The more medications a patient is prescribed, the greater the risk of feeling overwhelmed and confused about when and how to take each one. Patients may struggle to keep track of multiple medications with different dosing schedules. Type 2 diabetes management often involves multiple medications taken at different times of the day, with or without food. Coordinating these medications with daily routines can be complex and may lead to missed doses. Over time, some patients may experience "pill fatigue," a feeling of exhaustion or frustration from having to take multiple pills daily. This can result in reduced motivation to adhere to the prescribed regimen.^[46]

CONCLUSION

Type 2 diabetes patients using oral hypoglycemic medications confront a variety of challenges that can have a big influence on how well they manage their chronic illness. Many important factors that contribute to non-adherence have been highlighted in this thorough review, including a lack of knowledge, psychosocial factors, forgetfulness, restricted access to healthcare, financial constraints, transportation difficulties, complex regimens, medication-related difficulties, and ineffective patient-provider communication. For type 2 diabetes patients to adhere to their medications better and have better overall health



outcomes, it is crucial to recognize and remove these obstacles. Patient education streamlined treatment plans, psychological support, reminder systems, financial aid programmes, and increased patient-provider communication are all effective ways to get through these obstacles. A patient-centered, team-based approach that takes into account distinct requirements and preferences is also essential. Healthcare professionals, governments, and patients themselves may significantly improve medication adherence and, ultimately, achieve improved glycemic control and long-term health for people with type 2 diabetes by being aware of and actively trying to alleviate these hurdles. In addition to enhancing individual health, removing these obstacles helps achieve the larger objective of lessening the financial and social toll that diabetes-related illnesses have on healthcare systems.

REFERENCES

1. Mohamadzadeh S, Ezate G. A determination of self-care performance among diabetic patients in endocrine clinic of Taleghane hospital in Tehran. *Iran J Nurs Res.* 2014;4(31):11–18.
2. Masoudnia E, Foroozannia K, Montazeri M. Relationship between perceived social support and adherence to medical advices among patients with coronary heart disease after bypass surgery. *J Shahid Sadoughi Univ Med Sci Health Serv.* 2012;19(6):798–806.
3. Malik C, Khanna S, Jain Y, Jain R. Geriatric population in India: Demography, vulnerabilities, and healthcare challenges. *J Family Med Prim Care.* 2021;10(1):72.
4. Jha AK, Aubert RE, Yao J, Teagarden JR, Epstein RS. Greater adherence to diabetes drugs is linked to less hospital use and could save nearly \$5 billion annually. *Health Aff (Millwood).* 2012;31(8):1836-46.
5. Gonzalez JS, McCarl LA. Cognitive behavioral therapy for adherence and depression (CBT-AD) in type 2 diabetes. *J Cogn Psychother.* 2010;24(4):329.
6. Morisky DE1, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. *J Clin Hypertens (Greenwich).* 2008;10(5):348–54.
7. Sontakke S, Jadhav M, Pimpalkhute S, Jaiswal K, Bajait C. Evaluation of adherence to therapy in patients of type 2 diabetes mellitus. *J Young Pharm.* 2015;7(4s):462.
8. Curkendall SM, Thomas N, Bell KF, Juneau PL, Weiss AJ. Predictors of medication adherence in patients with type 2 diabetes mellitus. *Curr Med Res Opin.* 2013;29(10):1275-86.
9. Nau DP. Recommendations for improving adherence to type 2 diabetes mellitus therapy—focus on optimizing oral and non-insulin therapies. *Am J Manag Care.* 2012;18(3):49.
10. Tabish SA. Is diabetes becoming the biggest epidemic of the twenty-first century? *Int. J. Health Sci.* 2007;1(2):132-9
11. Lorenzati B, Zucco C, Miglietta S, Lamberti F, Bruno G. Oral hypoglycemic drugs: pathophysiological basis of their mechanism of action. *Pharmaceuticals.* 2010 ;3(9):3005-20.
12. Ahmed NO, Abugalambo S, Almethen GH. Adherence to oral hypoglycemic medication among patients with diabetes in Saudi Arabia. *Int. J. Health Sci.* 2017;11(3):45.
13. Jimmy B, Jose J. Patient medication adherence: measures in daily practice. *Oman Med. J.* 2011;26(3):155.
14. Wang Y, Perri III M. A systematic review of patient-reported satisfaction with oral medication therapy in patients with type 2 diabetes. *Value in Health.* 2018;21(11):1346-53.



15. Adu MD, Malabu UH, Malau-Aduli AE, Malau-Aduli BS. Enablers and barriers to effective diabetes self-management: A multinational investigation. *PloS one*. 2019;14(6):e0217771.
16. Allen-Meares P, Lowry B, Estrella ML, Mansuri S. Health literacy barriers in the health care system: barriers and opportunities for the profession. *Health & Social Work*. 2020;45(1):62-4.
17. Kalra S, Jena BN, Yeravdekar R. Emotional and psychological needs of people with diabetes. *Indian J Endocrinol Metab*. 2018;22(5):696.
18. Wong H, Singh J, Go RM, Ahluwalia N, Guerrero-Go MA. The effects of mental stress on non-insulin-dependent diabetes: determining the relationship between catecholamine and adrenergic signals from stress, anxiety, and depression on the physiological changes in the pancreatic hormone secretion. *Cureus*. 2019;11(8).
19. Miller TA, DiMatteo MR. Importance of family/social support and impact on adherence to diabetic therapy. *Diabetes, metabolic syndrome and obesity: targets and therapy*. 2013:421-6.
20. Rezaei M, Valiee S, Tahan M, Ebtakar F, Ghanei Gheshlagh R. Barriers of medication adherence in patients with type-2 diabetes: a pilot qualitative study. *Diabetes, metabolic syndrome and obesity: targets and therapy*. 2019:589-99.
21. Polonsky WH, Henry RR. Poor medication adherence in type 2 diabetes: recognizing the scope of the problem and its key contributors. *Patient preference and adherence*. 2016:1299-307.
22. Lam WY, Fresco P. Medication adherence measures: an overview. *BioMed Res*. 2015;6(9)2015.
23. Muhammad Haskani NH, Goh HP, Wee DV, Hermansyah A, Goh KW, Ming LC. Medication Knowledge and Adherence in Type 2 Diabetes Mellitus Patients in Brunei Darussalam: A Pioneer Study in Brunei Darussalam. *Int. J. Environ. Res. Public Health*. 2022;19(12):7470.
24. Faisal K, Tusiimire J, Yadesa TM. Prevalence and factors associated with non-adherence to antidiabetic medication among patients at Mbarara Regional Referral Hospital, Mbarara, Uganda. *Patient preference and adherence*. 2022:479-91.
25. Bhattarai B, Bista B, Shrestha S, Budhathoki B, Dhamala B. Contributing factors of non-adherence to treatment among the patients with type II diabetes mellitus. *Journal of Manmohan Memorial Institute of Health Sciences*. 2019;5(1):68-78.
26. Syed ST, Gerber BS, Sharp LK. Traveling towards disease: transportation barriers to health care access. *Journal of community health*. 2013;38:976-93.
27. Williams JL, Walker RJ, Smalls BL, Campbell JA, Egede LE. Effective interventions to improve medication adherence in Type 2 diabetes: a systematic review. *Diabetes Management (London, England)*. 2014;4(1):29.
28. Ingersoll KS, Cohen J. The impact of medication regimen factors on adherence to chronic treatment: a review of literature. *J Behav Med*. 2008; 31:213-24.
29. Cooney D, Pascuzzi K. Polypharmacy in the elderly: focus on drug interactions and adherence in hypertension. *Clin Geriatr Med*. 2009; 25:221–33.
30. Hanchak NA, Patel MB, Berlin JA, Strom BL. Patient misunderstanding of dosing instructions. *Journal General Internal Medicine*. 1996; 11:325–328.

31. Marcum ZA, Gellad WF. Medication adherence to multidrug regimens. *Clinics in geriatric medicine*. 2012;28(2):287-300.
32. Stoehr GP, Lu SY, Lavery L, et al. Factors associated with adherence to medication regimens in older primary care patients: the Steel Valley Seniors Survey. *Am J Geriatr Pharmacother*. 2008; 6:255–63.
33. Nieuwlaat R, Wilczynski N, Navarro T, et al. Interventions for enhancing medication adherence. *Cochrane Database Syst Rev*. 2014;2014(11).
34. Taylor SI. The high cost of diabetes drugs: disparate impact on the most vulnerable patients. *Diabetes Care*. 2020;43(10):2330.
35. Piragine E, Petri D, Martelli A, Calderone V, Lucenteforte E. Adherence to Oral Antidiabetic Drugs in Patients with Type 2 Diabetes: Systematic Review and Meta-Analysis. *J. Clin. Med*. 2023;12(5):1981.
36. Beck RS, Daughtridge R, Sloane PD. Physician-patient communication in the primary care office: A systematic review. *J Am Board Fam Pract*. 2002;15(1):25–38.
37. Heisler M, Cole I, Weir D, Kerr EA, Hayward RA. Does physician communication influence older patients' diabetes self-management and glycemic control? Results from the Health and Retirement Study (HRS) *J Gerontol A Biol Sci Med Sci*. 2007;62(12):1435–1442.
38. Bezreh T, Laws MB, Taubin T, Rifkin DE, Wilson IB. Challenges to physician-patient communication about medication use: A window into the skeptical patient's world. *Patient Prefer Adherence*. 2012; 6:11–18.
39. Peron EP, Ogbonna KC, Donohoe KL. Antidiabetic medications and polypharmacy. *Clinics in geriatric medicine*. 2015;31(1):17-27.
40. Grant RW, Devita NG, Singer DE, Meigs JB. Polypharmacy and medication adherence in patients with type 2 diabetes. *Diabetes Care*. 2003;26(5):1408-1412.
41. Sendekie AK, Netere AK, Kasahun AE, Belachew EA. 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*. 2022;17(9):e0274971.
42. Donnan PT, MacDonald TM, Morris AD. Adherence to prescribed oral hypoglycaemic medication in a population of patients with Type 2 diabetes: a retrospective cohort study. *Diabetic Medicine*. 2002;19(4):279-84.
43. Cramer JA. A systematic review of adherence with medication for diabetes. *Diabetes Care*. 2004; 27:1218–24.
44. Stack RJ, Bundy C, Elliott RA, New JP, Gibson JM, Noyce PR. Patient perceptions of treatment and illness when prescribed multiple medicines for co-morbid type 2 diabetes. *Diabetes Metab Syndr Obes*. 2011; 4:127–35.
45. Odegard PS, Capoccia K. Medication taking and diabetes. *Diabetes Educ*. 2007; 33:1014–29.
46. 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; 4:175–194.

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