

The Role of Pharmacists in the Treatment and Management of Diabetes

By:

Abdullah Jawad AlMajed

Hanan Joumaah AlKhamees

Fatmah Joumaah AlKhamees

YASSER ALI ALBEN HASSAN

Mustafa Hussain Aljubran

Abdulmajeed jumah ALbeshar

Ekbal Ibrhim Al Ali

Metab Tahear Alatiyyah

HADI HASSAN H AIMUSALLAM

HUSSAIN ALI A ALHASSAN

MURTADHA EISSA H AL OBAIDAN

ALAA YAHYA A ALABDRABULRIDHA

HASSAN ALI N AL SHAGAB

FATIMAH MOHAMMED M AL HASSAN

EMAN YOUSEF M ALBAQSHI

Jassim Hussain Almubarak

Introduction

Diabetes mellitus is a medical condition characterized by high levels of glucose in the blood due to abnormalities in the production or function of insulin. Diabetes mellitus, a progressive metabolic disease, requires careful management to prevent the development of microvascular and macrovascular complications, which can result in long-term illness or death (Shareef et al., 2015).

Therapeutic management, rigorous medicine adherence, and lifestyle modification are lifelong components of diabetes care. For therapy to be applied effectively, communication among the patient, pharmacist, and doctor is vital. A pharmacist's responsibilities have expanded beyond dispensing medication to include serving as a patient advocate and social influencer. Pharmacists' responsibilities extend much beyond the sale of pharmaceuticals, according to a "seven-star concept" put forth by the World Health Organization (WHO, 2018).

Pharmacists, being highly accessible healthcare providers, play a crucial role in improving patients' health. They contribute not only by conducting screenings but also by managing diseases throughout a person's lifetime. Pharmacists can offer guidance to individuals who have been diagnosed with diabetes, advising them on how to effectively monitor their blood sugar levels and handle situations where the levels are not within the desired range. This includes assisting in the creation of a plan of action for instances where blood sugar levels go dangerously low. Pharmacists can assist patients in choosing the most suitable approach to managing hypoglycemia on a personalized level. Pharmacists can provide guidance on a suitable diet and exercise regimen to enhance the effectiveness of medicines in managing diabetes (Morello et al., 2016).

The pharmacist can enhance diabetes management by conducting diabetes screenings, evaluating patients' health status and adherence to medical protocols, making appropriate referrals to other healthcare practitioners, and closely monitoring treatment outcomes (Benedict et al., 2018). For optimal patient education, a pharmacist specializing in diabetes should ideally hold certification as a diabetes educator, display strong marketing acumen, demonstrate effective communication skills, and be willing to dedicate significant time and effort.

In recent years, there has been a significant increase in the variety of treatment options available for diabetes. Pharmacists are in the optimal position to assist patients in comprehending the fundamental aspects and complexities of medication, as well as guiding them in determining which medications are most suitable for their needs. Pharmacists can assist patients in managing adverse effects by providing guidance on how to treat them effectively. They can determine whether it is appropriate to continue with the current therapy or transition to an alternate treatment regimen. The pharmacist can provide guidance to patients who need insulin, explaining the proper administration of the drug and addressing any frequently asked questions or concerns.

1. Overview of Diabetes

High blood sugar, often known as glucose, is the underlying cause of diabetes. It occurs when either the pancreas does not produce any insulin or when the body does not react appropriately to the effects of insulin. Diabetes is a disease that can strike at any age. Medications and lifestyle adjustments can control all types of diabetes, the majority of which are chronic (lifelong).

1.1.Types of Diabetes

Diabetes is a multifaceted metabolic illness marked by increased levels of glucose in the bloodstream caused by a range of underlying processes. Diabetes encompasses various diverse forms, each characterized by its own specific pathophysiology, risk factors, and options for therapy. Gaining knowledge about the many classifications of diabetes is essential for precise identification, tailored therapy, and efficient control of the ailment. Both type 1 and type 2 diabetes pose unique problems and considerations for healthcare practitioners and patients afflicted by the condition. Type 1 diabetes involves the death of insulin-producing cells due to an autoimmune response, while type 2 diabetes is characterized by insulin resistance and decreased insulin production. Diabetes encompasses different types. The prevalent variations encompass:

- Type 1 Diabetes

Type 1 diabetes is an autoimmune disorder characterized by the erroneous assault and subsequent destruction of the insulin-producing beta cells in the pancreas by the body's immune system. Consequently, the pancreas secretes a minimal or negligible amount of insulin. This form of diabetes generally manifests during childhood or adolescence but can also arise at any stage of life. People diagnosed with type 1 diabetes necessitate continuous insulin treatment throughout their lives in order to control their blood glucose levels (Beck et al., 2017). The precise etiology of type 1 diabetes remains incompletely elucidated, however, it is postulated to result from a confluence of genetic susceptibility and environmental stimuli, such as viral infections or exposure to specific chemicals.

- Type 2 Diabetes

Type 2 diabetes is the prevailing type of diabetes, constituting the majority of cases globally. It is defined by the condition of insulin resistance, in which the cells of the body develop a resistance to the actions of insulin, and the pancreas has diminished ability to secrete insulin. Type 2 diabetes is frequently linked to obesity, lack of physical activity, an unhealthy diet, a family history of diabetes, specific ethnic backgrounds, and increasing age (Unnikrishnan et al., 2017). Although it usually emerges during adulthood, there is a growing trend of diagnosing it in children and adolescents as a result of the increasing prevalence of obesity and sedentary behaviors. At first, it is advised to make changes to one's lifestyle, such as adjusting nutrition and engaging in physical activity, to manage type 2

diabetes. However, as the condition advances, it may become necessary to use medication and insulin therapy.

- Gestational Diabetes

Gestational diabetes arises during pregnancy when the body fails to generate sufficient insulin to satisfy the heightened requirement. It generally emerges between the 24th and 28th week of pregnancy and typically resolves after giving delivery. Gestational diabetes elevates the likelihood of difficulties for both the mother and the baby, such as preeclampsia, cesarean delivery, macrosomia (excessive birth weight), hypoglycemia in the infant, and the onset of type 2 diabetes in both the mother and kid.

Maternal age, obesity, family history of diabetes, and specific ethnic backgrounds are considered risk factors for gestational diabetes.

1.2.Risk Factors

The likelihood of having diabetes is impacted by a multitude of factors, including genetic predisposition, lifestyle habits, and environmental effects. It is essential to identify these risk factors in order to recognize individuals who are at a higher risk of getting the condition and to implement preventive strategies to lower their risk. Comprehending the diverse risk factors linked to diabetes, ranging from obesity and lack of physical activity to family history and ethnicity, offers valuable knowledge about the complex nature of the disease. This understanding guides targeted interventions that aim to promote health and prevent complications associated with diabetes. The risk factors for diabetes may differ based on the specific type of diabetes, but there are certain shared characteristics that are linked to a higher likelihood of having the condition:

- **Obesity:** Having too much body weight, especially around the abdomen, significantly increases the likelihood of developing type 2 diabetes. Adipose tissue, particularly visceral fat, secretes hormones and cytokines that can lead to insulin resistance and inflammation.
- **Physical Inactivity:** The absence of consistent physical activity is closely linked to a heightened susceptibility to type 2 diabetes. Physical activity enhances insulin sensitivity, facilitates weight reduction, and supports overall metabolic well-being (Kanaley et al., 2022).
- **Unhealthy Diet:** An eating regimen that consists of a significant amount of processed carbs, sugar, saturated and trans fats, and lacks in dietary fiber and essential nutrients is associated with an increased susceptibility to developing type 2 diabetes. The consumption of sugary beverages, processed foods, and big portions can lead to an increase in body weight and the development of insulin resistance.

- **Family History:** The presence of diabetes in one's immediate family, especially in parents or siblings, elevates the likelihood of having diabetes. Genetic factors can have a substantial impact on an individual's vulnerability to both type 1 and type 2 diabetes.
- **Age:** The likelihood of having type 2 diabetes escalates with advancing age, especially after the age of 45. The process of aging is linked to alterations in metabolism, reduced responsiveness to insulin, and a higher occurrence of obesity and other long-term health issues.
- **Gestational Diabetes:** Women who have experienced gestational diabetes during pregnancy have a higher likelihood of getting type 2 diabetes in the future. In addition, their offspring are at an increased risk of developing obesity and type 2 diabetes.

1.3.Symptoms

Diabetes may present with a diverse array of symptoms, which might differ according on the kind and seriousness of the ailment. It is crucial to identify these symptoms early on in order to recognize, diagnose, and intervene promptly to avoid or reduce the advancement of the disease and its related problems. By comprehending the wide range of symptoms linked to diabetes, both healthcare providers and individuals can effectively monitor their health and take proactive measures. These symptoms include common signs such as frequent urination and excessive thirst, as well as less obvious indicators like unexplained weight loss and blurred vision. Symptoms of diabetes might differ based on the type and gravity of the ailment, however typical symptoms may encompass (Bettencourt-Silva et al., 2019):

- **Frequent Urination (Polyuria):** Elevated levels of glucose in the bloodstream might result in heightened frequency of urination as the kidneys endeavor to eliminate the surplus sugar from the body.
- **Excessive Thirst (Polydipsia):** Frequent urination can lead to dehydration, which can cause an increase in thirst.
- **Weight Loss:** Individuals with diabetes may experience unexplained weight loss despite having an increased appetite and calorie consumption. This is because their bodies are unable to effectively use glucose for energy.
- **Fatigue:** Cells experiencing inadequate glucose uptake may result in weariness and weakness, as they are deprived of their main energy supply.
- **Blurred Vision:** Elevated blood sugar can lead to fluid imbalances in the eyes, which can impair focus and produce blurry vision.
- **Slow Healing of Wounds:** Inadequately managed diabetes can hinder blood flow and immune system performance, resulting in slowed wound recovery, particularly in the feet and limbs.

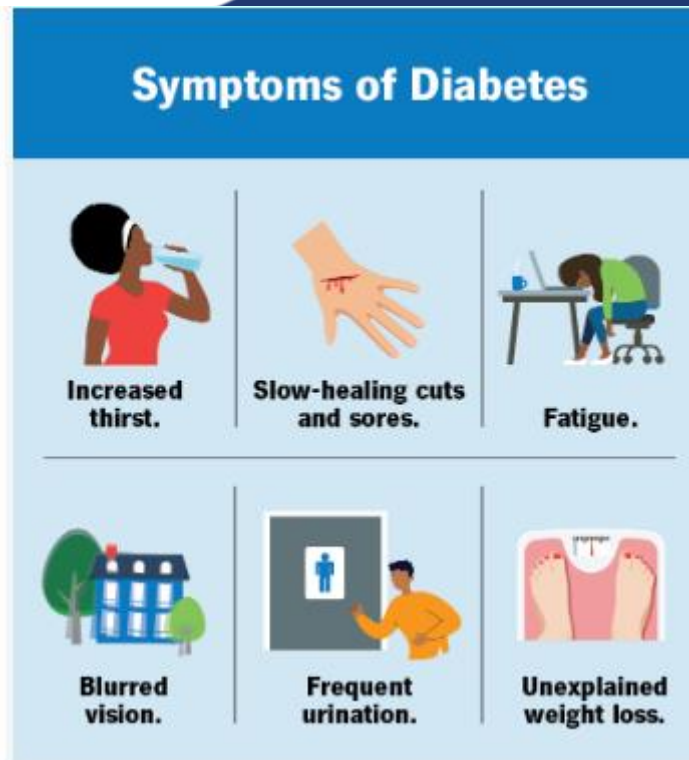


Figure (1): Symptoms of Diabetes

1.4.Complications of Diabetes

Diabetes complications have the potential to impact numerous organs and systems across the body, thereby causing substantial morbidity and mortality if not appropriately managed or treated. The following is a synopsis of the complications that are linked to diabetes:

- **Coronary Heart Disease:** Diabetes markedly elevates the likelihood of developing coronary heart disease, including illnesses like angina (chest discomfort) and myocardial infarction (heart attack). Elevated glucose levels, in conjunction with additional risk factors such as hypertension, atypical lipid levels, and excessive body weight, can result in the accumulation of plaque (atherosclerosis) within the coronary arteries, causing their constriction and diminishing the cardiac blood supply.
- **Neuropathy:** Diabetic neuropathy refers to the condition of nerve damage that arises from long-term elevated levels of blood sugar. Peripheral neuropathy is a condition that can impact different nerves in the body, resulting in symptoms including tingling, numbness, burning sensations, or pain. Typically, these symptoms begin in the feet and legs. Neuropathy can also impact the autonomic nerves, which regulate involuntary bodily activities such as digestion, heart rate, and blood pressure.
- **Nephropathy:** Diabetic nephropathy refers to the renal impairment resulting from diabetes. High blood glucose levels and unregulated hypertension can cause harm to the tiny blood vessels and filters in the kidneys, leading to a decrease in their efficiency to properly remove waste substances from the bloodstream.

- **Retinopathy:** Diabetic retinopathy is a prevalent consequence of diabetes and a primary factor in the loss of vision and blindness among people. Elevated glucose levels can cause harm to the blood vessels in the retina, which is the light-sensitive tissue located at the posterior part of the eye. This can result in retinal edema, leakage, and the development of anomalous blood vessels. If not addressed, these alterations can negatively impact eyesight, resulting in symptoms such as hazy vision, specks in the field of vision, or abrupt visual deterioration.
- **Stroke:** A significant medical emergency that occurs when blood flow to the brain is interrupted or reduced, depriving brain cells of oxygen and nutrients, diabetes raises the risk of stroke. Elevated concentrations of glucose in the blood can cause harm to various blood vessels, including those in the brain, thereby elevating the susceptibility to atherosclerosis (arteries harden and occlude) and blood clotting.
- **Peripheral Vascular Disease (PVD):** Conditions that affect the blood vessels beyond the heart and brain, specifically those supplying the limbs and legs, are referred to as peripheral vascular disease. By damaging the nerves and blood vessels in the extremities, diabetes can induce peripheral vascular disease (PAD), which impairs blood flow and raises the risk of complications including leg pain, sluggish wound healing, infections, and, in extreme cases, gangrene and amputation of the affected limb.

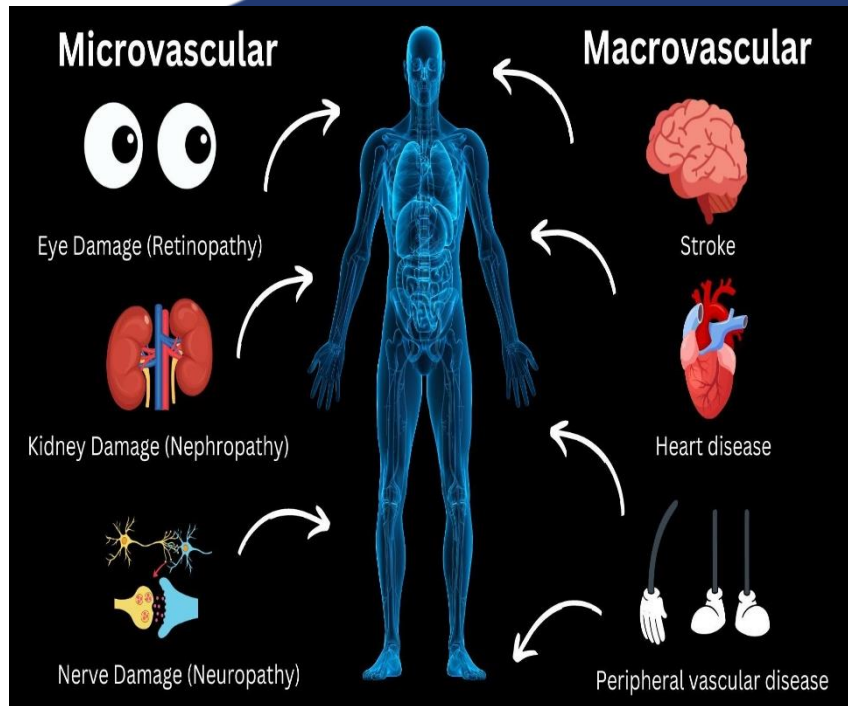


Figure (2): The Most Common Complications of Diabetes

2. The Role of Pharmacists in the Treatment and Management of Diabetes

Pharmacists play a crucial role in the healthcare team for treating and managing diabetes. Due to their extensive knowledge of pharmaceuticals, they are able to take on a crucial role in guaranteeing that patients are provided with suitable pharmacotherapy that is customized to their individual requirements. This involves offering advice on insulin regimens, oral hypoglycemic medicines, and injectable treatments such as GLP-1 receptor agonists (Meece et al., 2017). Pharmacists work together with doctors and other healthcare professionals to improve prescription plans, making sure that patients get the best therapy with the least chance of negative side effects.

Pharmacists have a vital role in promoting medication adherence among patients with diabetes, in addition to managing their medications. They collaborate closely with individuals to tackle obstacles to adherence, such as intricate dose schedules and adverse effects. Pharmacists enhance patients' treatment outcomes by providing them with comprehensive education and counseling, enabling patients to actively participate in their own care and so improving their adherence rates and overall health outcomes (Mohiuddin, 2019).

According to (Lokhande et al., 2023), Pharmacists also offer valuable assistance in aiding patients in the management of their diabetes through lifestyle adjustments. They provide advice on proper nutrition, consistent physical activity, and effective stress coping methods, all of which are vital elements of diabetes control. Pharmacists have a role in promoting long-term disease management and preventing complications by assisting patients in making well-informed decisions regarding their lifestyle behaviors.

Additionally, pharmacists have a crucial role in providing patients with education regarding the monitoring and interpretation of blood glucose levels. Their role includes aiding patients in choosing suitable glucose monitoring equipment, delivering instruction on their efficient utilization, and providing advice on the interpretation of blood glucose results. Pharmacists empower patients by allowing them to monitor their blood glucose levels and make necessary adjustments to their treatment plan. This enables patients to take charge of their diabetes care and enhance their overall well-being.

3. Barriers to Pharmacists' Contribution to Diabetes Care

Pharmacists face numerous obstacles that impede their capacity to actively contribute to diabetes care. A major obstacle they face is the limited amount of time available for their daily practice. Pharmacists frequently experience time constraints as a result of multiple obligations, including distributing medications, overseeing inventory, and handling administrative duties (Mohamed & Mahmoud, 2016). Consequently, their chances for engaging in thorough patient interactions, which are essential for delivering comprehensive diabetes education and counseling, may be restricted.

According to (Szafran et al., 2019), Pharmacists and other healthcare practitioners involved in diabetes care, such as physicians, nurses, and dietitians, may have restricted collaboration and communication in some healthcare settings. Lack of efficient collaboration and synchronization can pose difficulties for pharmacists in obtaining patient data, organizing treatment plans, and executing comprehensive diabetes management techniques.

Sunday (2019) asserted that Pharmacists in numerous healthcare systems may not be adequately remunerated for offering diabetes management services, such as medication therapy management (MTM) and patient counseling. In the absence of financial incentives, pharmacists may exhibit reduced motivation to allocate time and resources towards providing comprehensive diabetes care.

Furthermore, several pharmacists may possess insufficient professional training and education in the field of diabetes management. Pharmacists may feel inadequately prepared to meet the intricate requirements of patients with diabetes if they lack enough knowledge and abilities in areas such as medication management, dietary counseling, and blood glucose monitoring. Insufficient training opportunities can impede pharmacists' assurance and proficiency in delivering appropriate treatment for persons with diabetes.

4. The Impact of Pharmacist-led interventions on Patient Outcomes

Pharmacists have a vital role in effectively managing diabetes by providing specialized therapies that lead to better patient outcomes and improved healthcare delivery. These treatments are essential elements of pharmacist-led diabetes care approaches, with the goal of maximizing medication utilization and empowering patients via knowledge and skills.

Studies (Erku et al., 2017; Bindu Murali et al., 2016) have demonstrated that treatments led by pharmacists in medication therapy management (MTM) have a positive impact on patients with diabetes, improving their adherence to medication, glycemic control, and overall health outcomes. Pharmacists can detect any drug interactions, dosage modifications, and medication-related problems that could impact patients' diabetes control through medication reviews. In addition, pharmacists offer instruction and guidance to patients regarding appropriate drug usage, potential adverse reactions, and adjustments to their lifestyle, enabling them to actively participate in managing their diabetes. Diabetes education programs offered by pharmacists facilitate self-management behaviors, strengthen patients' comprehension of their disease, and boost their confidence in handling diabetes-related responsibilities. Pharmacists empower patients by providing them with the essential knowledge and skills needed to make educated decisions regarding their diabetes management and to adopt healthy lifestyle practices. Research (Ojieabu et al., 2017) has demonstrated that diabetes education sessions taught by pharmacists lead to better management of blood sugar levels, and an increased overall well-being for individuals with diabetes.

According to (Paulino et al., 2019) Pharmacists evaluate patients' prescription consumption patterns, offer instruction on the significance of adherence, and resolve any worries or misunderstandings regarding their drugs. Pharmacists employ motivational interviewing and individualized counseling sessions to cooperatively assist patients in identifying strategies to overcome obstacles to adherence, such as forgetfulness, financial worries, or pharmaceutical side effects. Research (Sanii et al., 2016) has shown that when pharmacists take the lead in providing counseling to promote medication adherence, it leads to higher rates of following medication instructions, and improved health outcomes for patients with diabetes.

5. Patients' Perceptions of the Role of Pharmacists in Diabetes Management

Patients' perceptions for pharmacist-led services in diabetes treatment differ based on individual requirements and inclinations. Research (Olson et al., 2021) has indicated that patients highly appreciate customized and patient-centered care delivered by pharmacists. Their preferences encompass a wide range of services, including medication counseling and education, adherence assistance, and point-of-care testing. Factors like ease, accessibility, and the perceived skill and integrity of pharmacists can impact patient preferences.

Patients recognize numerous advantages linked to pharmacist participation in diabetes management. Gregory & Austin (2021) suggest that patients highly appreciate the knowledge and availability of pharmacists, as well as the all-encompassing character of services provided by pharmacists. The perceived advantages encompass higher compliance with medication, heightened comprehension of diabetes control, improved self-regulation abilities, and expanded availability of healthcare services.

Patients also like the convenience of pharmacist-led therapies, which are frequently accessible without the need for an appointment and are situated in community settings.

Although there are potential advantages, patients may face obstacles when it comes to interacting with pharmacists in the management of diabetes. Common impediments encompass insufficient information regarding the role of pharmacists in diabetes care, as well as issues such as time limitations or obstacles related to transportation (Moczygamba et al., 2019). It is crucial to identify and overcome these obstacles in order to encourage patient involvement and maximize the impact of interventions conducted by pharmacists.

The level of trust that patients have in pharmacists and the quality of their relationship with them are important determinants that impact their involvement with services offered by pharmacists. Evidence indicates that patients who see pharmacists as possessing expertise, being accessible, and being reliable are more likely to seek their aid and comply with their suggestions (Esmalipour et al., 2021). Establishing trust and a positive relationship with patients' needs proficient communication, empathy, and a regard for patients' autonomy and preferences.

Conclusion

Pharmacists have a vital role in managing medications. They conduct thorough assessments of medications, provide guidance to patients on how to use medications correctly, and optimize treatment plans to maintain adequate control of blood sugar levels. With their profound knowledge of pharmacotherapy principles, which encompasses understanding the mechanisms of action and safety profiles of antidiabetic drugs, these individuals are able to tackle medication-related concerns and guarantee the secure and efficient utilization of pharmaceuticals in the management of diabetes.

Pharmacists not only handle drug management but also play a role in educating patients and providing assistance for self-management. This helps patients gain the necessary knowledge and skills to effectively control their illness. Pharmacists provide patients with the necessary knowledge and help to make informed choices about managing their diabetes. This includes education programs and advice on modifying their lifestyle, enabling them to adopt healthy behaviors that lead to the best possible health results.

In the context of treating and managing diabetes, pharmacists play a crucial role that is defined by their unwavering focus on patient-centered care, their dedication to optimizing drug therapy, and their proactive efforts to enhance patient outcomes. Pharmacists, as esteemed members of the healthcare team, work together with other healthcare practitioners and involve patients in joint decision-making to enhance comprehensive and individualized diabetes care. Healthcare organizations can improve the effectiveness and efficiency of diabetes care delivery and promote the health and well-being of individuals with diabetes by acknowledging and supporting the crucial role of pharmacists in diabetes management.

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