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CHAPTER 4

THE IMPACT OF PHARMACEUTICAL CARE ON TREATMENT ADHERENCE AND GLYCEMIC CONTROL IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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Maria Gabriella de Souza Milanez[1], Bruna Letícia de Souza Milanez[2], Melissa Cardoso Deuner[3], Elisa Gabrielle Rocha da Silva[4], Beatriz Santos de Medeiros[5], Daniele Araújo de Oliveira[6], Tamires Rodrigues de Sousa[7], Victor Henrique Arruda de Souza[8], Gabrielle Rodrigues da Silva[9] and Gregório Otto Bento de Oliveira[10]

ABSTRACT

This study aims to understand the importance of Pharmaceutical Care in the treatment of Type 2 Diabetes, focusing on how it affects treatment adherence and glycemic control in patients. To this end, the research is based on a literature review of scientific articles from the past ten years, seeking to examine the main pharmaceutical actions related to this disease. Among the topics addressed are the distinction between Pharmaceutical Assistance and Pharmaceutical Care, the complications arising from poor glycemic control, and the main medications used in treatment. The findings indicate that the pharmacist's role in patient follow-up significantly improves glycemic levels and helps prevent disease-related complications. Furthermore, the study highlights the relevance of health education and personalized treatment as fundamental practices to enhance treatment efficacy. The research concludes that Pharmaceutical Care is essential for managing Type 2 Diabetes, playing a crucial role in promoting treatment adherence and improving patients' quality of life.

Keywords: Pharmaceutical Care; Treatment Adherence; Pharmaceutical Counseling; Glycemic Control; Diabetes Mellitus.

[1] Faculdade Anhanguera de Brasília – Taguatinga Campus, Taguatinga, DF
ORCID: https://orcid.org/0009-0005-3597-1370
[2] Faculdade Anhanguera de Brasília – Asa Norte Campus, Brasília, DF
ORCID: https://orcid.org/0009-0002-4070-5614
[3] Faculdade Anhanguera de Brasília – Taguatinga Campus, Taguatinga, DF
ORCID: https://orcid.org/0009-0002-0324-5543
[4] Faculdade Anhanguera de Brasília – Taguatinga Campus, Taguatinga, DF
ORCID: https://orcid.org/0009-0005-9153-9582
[5] Faculdade Anhanguera de Brasília – Taguatinga Campus, Taguatinga, DF
ORCID: https://orcid.org/0009-0008-0178-5432
[6] Faculdade Anhanguera de Brasília – Taguatinga Campus, Taguatinga, DF
ORCID: https://orcid.org/0009-0005-6624-8214
[7] Faculdade Anhanguera de Brasília – Taguatinga Campus, Taguatinga, DF
ORCID: https://orcid.org/0009-0007-0797-8836
[8] Faculdade Anhanguera de Brasília – Taguatinga Campus, Taguatinga, DF
ORCID: https://orcid.org/0009-0002-9313-2039
[9] Faculdade Anhanguera de Brasília – Taguatinga Campus, Taguatinga, DF
ORCID: https://orcid.org/0009-0003-3321-3248
[10] Faculdade Anhanguera de Brasília – Shopping Taguatinga Campus, Taguatinga Sul. DF
ORCID: https://orcid.org/0009-0008-9326-9450

INTRODUCTION

Diabetes Mellitus is a chronic metabolic condition characterized by the body's inability to properly regulate blood glucose levels. Type 2 Diabetes Mellitus (T2DM), which typically manifests in adulthood—particularly among individuals who are overweight or obese—is also associated with lifestyle factors such as physical inactivity and poor dietary habits (Bertonhi & Dias, 2018). Poor glycemic control can lead to complications such as diabetic foot, retinopathy, neuropathy, and nephropathy. Glycemic control is a key component of treatment, which also includes lifestyle modifications, glucose monitoring, physical activity, dietary changes, and appropriate medication use (Nunes et al., 2021).

Adherence to pharmacological treatment remains a challenge for many patients with T2DM. In this context, the role of the pharmacist is essential in reducing glycated hemoglobin levels and preventing long-term complications. Pharmacists can assist in identifying barriers to adherence, provide personalized guidance, and monitor treatment response, thereby contributing to therapeutic success (Nogueira et al., 2020)

Type 2 Diabetes Mellitus is a condition that affects individuals in adulthood, with a high global incidence, and is linked to serious health complications such as cardiovascular and renal diseases. These complications impact the quality of life of affected individuals and place a burden on healthcare systems.

This study aims to analyze how the pharmacist's role encourages the appropriate use of medications, as well as informs and supports patients in their daily routines. This work seeks to highlight the relevance of the pharmacist in managing chronic diseases, providing a foundation for the development of more effective approaches to diabetes control. In doing so, it emphasizes the importance of treatment and, in particular, the understanding of this condition.

Therefore, this study is relevant as it offers the opportunity to examine interventions that may improve treatment adherence, such as Pharmaceutical Care. Pharmaceutical Care has proven to be an effective method for enhancing understanding of the pharmacist's role in treating patients with chronic diseases, emphasizing their contribution to treatment support, patient education, and the promotion of better health outcomes.

Diabetes Mellitus is a chronic metabolic condition marked by the body's inability to adequately regulate blood sugar levels. How does Pharmaceutical Assistance help prevent complications related to poor glycemic control in patients with Type 2 Diabetes Mellitus?

The purpose of this study is to investigate the role of Pharmaceutical Care in the management of Type 2 Diabetes Mellitus, assessing its impact on treatment adherence and glycemic control. To this end, the following specific objectives will be explored: to distinguish between Pharmaceutical Assistance and Pharmaceutical Care, clarifying their conceptual and practical differences; to discuss the complications that may arise from poor glycemic control in patients with Type 2 Diabetes Mellitus, highlighting the

risks associated with inadequate disease management; and to explain the most commonly used medications in the treatment of Type 2 Diabetes Mellitus, discussing their mechanisms of action and relevance in therapy.

DEVELOPMENT

METHODOLOGY

This qualitative-descriptive review analyzed studies published in the SciELO, Google Scholar, and PubMed databases, using Boolean operators such as (Pharmaceutical care OR Pharmaceutical assistance) AND (Type 2 Diabetes Mellitus OR T2DM) and (Glycemic control OR glycemia) AND (Pharmaceutical intervention). Articles were included if they were available in full text, free of charge, and written in Portuguese, Spanish, or English. The focus was on adult patients with T2DM, addressing pharmaceutical interventions and parameters such as HbA1c. Studies on type 1 diabetes, gestational diabetes, or those lacking relevant clinical data were excluded. The selection process followed an adapted PRISMA flowchart, with screening based on title, abstract, and full-text reading.

T2DM is characterized by insulin resistance and progressive loss of pancreatic β-cell function, leading to chronic hyperglycemia and microvascular (neuropathy, nephropathy) and macrovascular (strokes, heart disease) complications. Pharmaceutical care contributes to the optimization of pharmacotherapy (e.g., metformin adjustment, combination with SGLT2 inhibitors or GLP-1 receptor agonists), health education (glycemic monitoring, hypoglycemia prevention), and promotion of adherence, directly impacting HbA1c reduction and quality of life. This synthesis highlights evidence-based strategies without proposing new interventions.

RESULTS AND DISCUSSION

Pharmaceutical Assistance aims to ensure the availability of medications for individuals who lack the financial means to acquire them. Its initial purpose was to organize and simplify the distribution of medications at affordable prices, although it began as a strategy focused primarily on procurement and distribution. This model is fundamental to ensuring that essential medications are accessible to the population, thereby contributing to health promotion and disease prevention. The Pharmaceutical Assistance process encompasses several stages, including selection, planning, procurement, storage, distribution, and delivery of medications (Falcão et al., 2024).

Pharmaceutical care involves multiple actions carried out by pharmacists to guide and monitor patients regarding the appropriate use of medications (Table 1).

Table 1 - Impact of Pharmaceutical Care on Treatment Adherence and Glycemic Control in Patients with Type 2 Diabetes Mellitus.

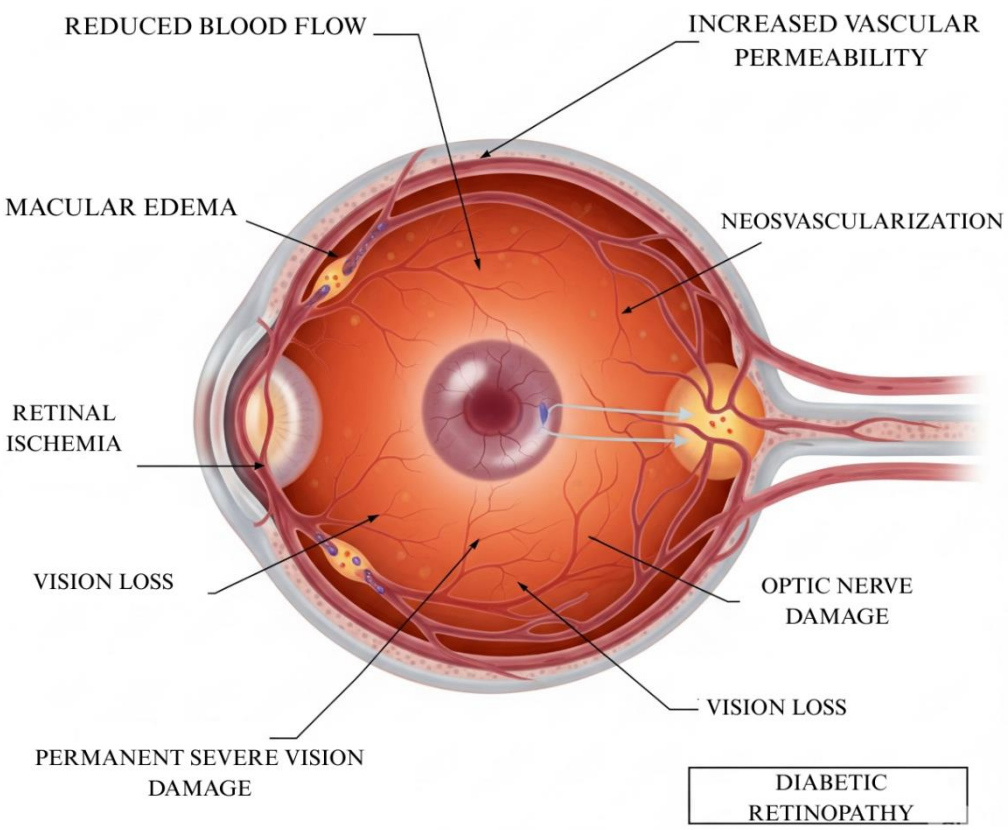
Pharmaceutical Intervention	Mechanism of Action	Results in Adherence	Impact on Glycemic Control (HbA1c)
Individualized Health Education (sessions on self-monitoring, diet, and correct medication use)	Enhances patient knowledge about their condition and treatment, reducing medication errors and improving self-management.	30–50% increase in adherence, with reduced forgetfulness and treatment abandonment.	Average reduction of 1.2–2.0% in HbA1c after 6 months (Costa, 2018).
Systematic Medication Review (evaluation of interactions, duplications, and dosage adjustments)	Identifies issues such as polypharmacy, adverse effects, and inadequate dosages, optimizing therapy.	45% improvement in adherence, with lower risk of discontinuation due to side effects.	Reduction of 0.9–1.5% in HbA1c in 3–6 months (Silva & Ferreira, 2022).
Guided Glycemic Monitoring (recording capillary glucose with pharmacist feedback)	Facilitates identification of hyperglycemic and hypoglycemic patterns, allowing for rapid adjustments.	40% increase in adherence to monitoring and greater engagement in self-care.	Average reduction of 1.8% in HbA1c in patients with monthly follow-up (Rocha et al., 2022).
Adverse Effects Counseling (guidance on managing nausea, hypoglycemia, or weight gain)	Reduces fear of adverse reactions, increasing confidence in therapy.	35% improvement in treatment continuity, especially with metformin and insulin.	1.0% reduction in HbA1c, with lower risk of treatment abandonment (Oliveira, 2025).
Multiprofessional Interventions (team including pharmacist, nutritionist, and endocrinologist)	Holistic approach integrating diet, exercise, and pharmacotherapy for personalized goals.	55% increase in overall adherence, with improved quality of life.	2.2% reduction in HbA1c in programs lasting ≥1 year (Reggiani, 2024).

Source: Author, 2025

These activities include treatment harmonization, pharmacotherapy evaluation, and specific services focused on health promotion and disease prevention. The goal of these actions is to ensure proper treatment adherence and foster collaboration among healthcare professionals to enhance therapeutic outcomes (Costa et al., 2021).

Hyperglycemia, caused by issues in insulin production or action, is often associated with other conditions such as dyslipidemia, hypertension, and endothelial dysfunction. Over time, persistently elevated blood glucose levels can lead to microvascular and macrovascular complications, affecting organs such as the eyes (Figure 1), kidneys, nerves, heart, and arteries (Figure 2). Regarding the eyes, these complications impact the retinal microvasculature, resulting in insufficient circulation, increased vascular permeability, and abnormal vessel growth in the retina. This can lead to severe and permanent vision loss, which occurs gradually (Almeida et al., 2019).

Figure 1 – Parameters of diabetic retinopathy

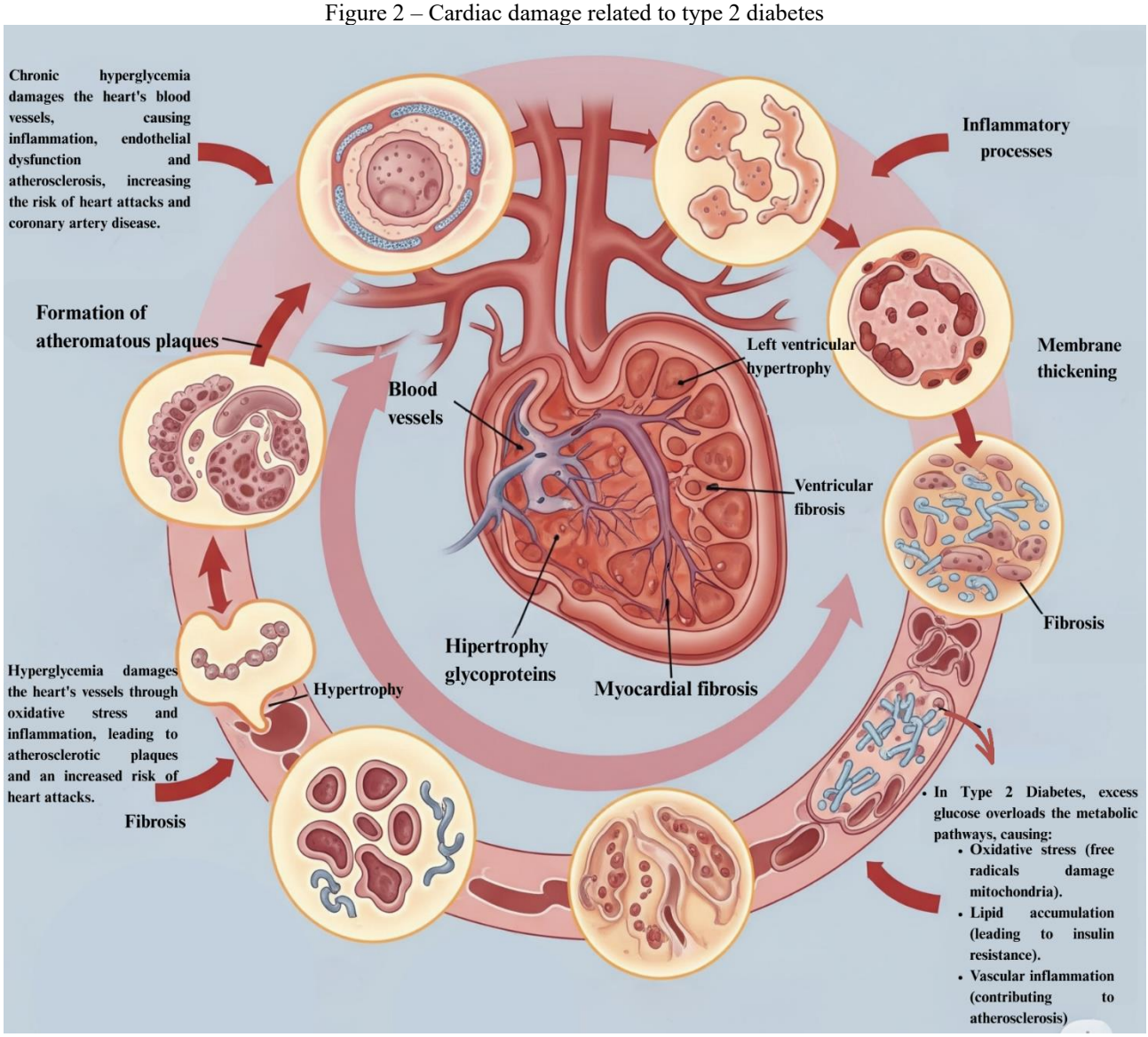


Source: (Adapted). Author, 2025

Metformin, according to Cláudia Costa Pereira et al. (2020), belongs to the biguanide class and functions by reducing hepatic glucose production through inhibition of gluconeogenesis—a process that is typically intensified in individuals with Type 2 Diabetes. Additionally, it enhances glucose uptake and utilization by muscle tissue, reduces sugar absorption in the digestive tract, promotes fatty acid oxidation, and lowers both low- and high-density lipoprotein levels in the bloodstream. These mechanisms help regulate blood glucose levels without causing hypoglycemia or lactic acidosis.

Insulin is a hormone produced by the pancreatic beta cells located in the islets of Langerhans and is responsible for regulating blood glucose levels. These cells increase insulin production to compensate for insulin resistance. However, as the disease progresses, they become overburdened and impaired, compromising their ability to meet the body's insulin demands. This contributes to peripheral insulin resistance, characterized by reduced glucose uptake by tissues and increased hepatic glucose output. Treatment involves various types of insulin, including NPH, ultra-long-acting insulins such as glargine and degludec, and rapid-acting and ultra-rapid-acting insulins such as regular insulin, lispro, and glulisine (Moraes et al., 2021).

Figure 2 – Cardiac damage related to type 2 diabetes



Source: (Adapted). Author, 2025

Oral medications known as DPP-4 inhibitors increase GLP-1 levels, thereby enhancing postprandial insulin secretion without affecting basal insulin levels. This is particularly beneficial for patients with T2DM who experience impaired insulin production due to pancreatic beta-cell depletion. These agents can be used alone or in combination with other drugs such as metformin and sulfonylureas. Their advantages include a low risk of weight gain and hypoglycemia, as insulin release is food-dependent. However, some adverse effects have been reported, including pancreatitis and hepatic complications (Lissi & Zanetti, 2023).

According to Santos et al. (2021), physical exercise has proven to be a crucial component in the treatment of Type 2 Diabetes Mellitus. In addition to improving quality of life, it positively influences physiological responses. In the United States, the Food and Drug Administration (FDA) already recognizes and approves physical activity as a form of “prescribed medication” for this condition. Just as

medications and diets are tailored to individual needs, exercise programs can also be customized and recommended as part of treatment. Resistance training, when supervised by qualified professionals, is particularly recommended as it helps control blood glucose, blood pressure, cholesterol levels, and cardiovascular risk, while also reducing the likelihood of injury. Studies conducted over 12 weeks with intensive exercise programs in elderly and overweight individuals showed increased insulin sensitivity, suggesting improved glycogen storage in skeletal muscles. Exercise also supports weight loss, enhances muscle tone, heart rate, and respiratory capacity. These specific benefits in metabolic control make physical activity a significant non-pharmacological intervention for individuals with Type 2 Diabetes Mellitus.

Diabetes-related complications can significantly affect patient well-being, bringing changes to various aspects of daily life for those living with the disease. These complications may be microvascular—such as retinopathy, neuropathy, and nephropathy—or macrovascular—such as stroke, heart disease, and peripheral vascular disease, which are more common. These conditions impact both health and daily functioning, making routine tasks and autonomy more difficult (Costa et al., 2024).

CONCLUSION

This study enabled a comprehensive understanding of the relevance of Pharmaceutical Assistance in the treatment of Type 2 Diabetes Mellitus, emphasizing its influence on treatment adherence and the control of patients' blood glucose levels. Throughout the research, it was observed that the pharmacist's role significantly contributes to health education, the personalization of therapies, and the prevention of complications arising from poor glycemic control, reinforcing their essential role within the multidisciplinary healthcare team.

The results demonstrate that Pharmaceutical Care promotes therapeutic adherence through continuous follow-up and individualized guidance, leading to improved clinical outcomes. However, challenges such as the lack of professional training and the limited availability of structured services still hinder the widespread implementation of these practices. Therefore, the need for public policies that encourage the integration of pharmacists into direct patient care is emphasized.

Given the limitations of this study, it is suggested that future research further explore the quantitative impacts of Pharmaceutical Care on glycemic control, as well as strategies to expand its applicability across different levels of healthcare. It is concluded, therefore, that Pharmaceutical Care is an indispensable tool for optimizing the treatment of Type 2 Diabetes Mellitus, ensuring improved quality of life for patients.

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