

Evaluating the Clinical Impact of Emerging Pharmacological Therapies for Type 2 Diabetes : A Critical Review of Conceptual and Methodological Challenges

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ABSTRACT

The treatment of Type 2 Diabetes has evolved significantly over recent years, with the introduction of novel pharmacological therapies and lifestyle interventions. However, inconsistencies in the long-term effectiveness and safety of these therapies remain unresolved. This study conducts a Critical Review to evaluate existing therapeutic models, synthesizing insights from high-impact Scopus Q1 publications. The review was conducted through a structured literature search and screening process, focusing on peer-reviewed articles indexed in Scopus Q1 journals published between [YEAR] and [YEAR]. Literature selection followed predefined inclusion and exclusion criteria to ensure relevance, methodological rigor, and direct applicability to Type 2 Diabetes treatment outcomes. A total of [N] studies were identified, of which [N] met the eligibility criteria and were included in the final analysis. Unlike traditional Systematic Reviews, this approach offers a conceptual critique, identifying key theoretical gaps and methodological challenges in the field. The findings reveal that while emerging therapies show promise, their long-term benefits, particularly in diverse populations, have not been thoroughly addressed. This review contributes by proposing an integrated treatment model that combines pharmacological and lifestyle interventions, offering new insights for clinical practice. The study's implications are twofold: it enhances theoretical understanding and provides practical recommendations for improving treatment strategies. Future research should focus on empirical validation of the proposed model and explore the impact of patient adherence and other socio-demographic variables on treatment outcomes.



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INTRODUCTION

In recent decades, the field of Type 2 Diabetes research has witnessed significant advancements, particularly in the application of new therapeutic approaches aimed at improving glycemic control and patient outcomes (Sauer et al., 2024). Previous studies have shown that therapies such as GLP-1 receptor agonists, SGLT2 inhibitors, and combination treatments have led to promising results in managing the disease (Mohapatra et al., 2022). However, as the complexity of diabetes treatment continues to evolve, debates persist regarding the long-term efficacy, safety, and overall impact of these emerging therapies in diverse patient populations. More specifically, existing studies tend to examine therapeutic effectiveness in isolated clinical or pharmacological terms, while giving limited attention to the conceptual assumptions that explain why, for whom, and under what conditions these therapies produce optimal outcomes. This creates a conceptual gap in the literature, particularly in relation to how emerging therapies are theoretically positioned within broader models of chronic disease management, patient adherence, risk reduction, and long-term care.

The growing number of treatment options and their associated challenges has fueled a need for further evaluation of these therapies to better understand their advantages, limitations, and potential for widespread implementation in clinical practice.

Despite the substantial progress made in Type 2 Diabetes treatment, several studies have revealed ongoing issues in understanding the full spectrum of benefits and risks associated with new therapies (Kang et al., 2025). While pharmacological advancements have yielded improved outcomes in terms of glycemic control, there remains a lack of consensus on their long-term effects, including cardiovascular benefits, side effects, and patient adherence.

Furthermore, research on lifestyle interventions often focuses on short-term results without considering long-term sustainability, and there is insufficient critical synthesis of how different therapies compare within diverse populations (Dickerson et al., 2020). Some studies have even failed to address the inherent methodological limitations or the assumptions that underlie previous research (Mukhlis, Suradi, et al., 2023; Mukhlis, 2025b). The absence of a comprehensive conceptual synthesis comparing the theoretical and empirical foundations of these therapies highlights the need for a more critical and evaluative approach.

This article aims to critically evaluate the theories and methodologies applied in recent research on new therapies for Type 2 Diabetes, with a focus on addressing the conceptual weaknesses and empirical limitations identified in prior studies (Walsh et al., 2022). Through the use of the Critical Review method, this article will compare various approaches employed in diabetes treatment research, identify research gaps, and provide new perspectives for overcoming the shortcomings in the existing literature. By doing so, this review does not merely summarize available findings but interrogates the theoretical foundations, methodological choices, and interpretive boundaries that shape current knowledge on emerging therapies for Type 2 Diabetes.

The Critical Review approach was chosen over Systematic Reviews and Scoping Reviews because it allows for a more in-depth analysis of existing theories and methodologies (Liu et al., 2023). Unlike Systematic Reviews, which focus primarily on synthesizing evidence, or Scoping Reviews, which aim to map existing research without critical analysis, the Critical Review enables a thorough evaluation of the underlying assumptions and offers a conceptual synthesis that extends beyond merely summarizing previous findings (Hernigou et al., 2022). This method provides a platform to critically engage with the literature, offering a more comprehensive understanding of the theoretical and practical implications of emerging therapies in Type 2 Diabetes treatment.

This article is organized as follows: The Method section outlines the critical analysis approach used, including the literature search strategy and selection criteria (Asgharian et al., 2022). The Results section presents the key findings from the critical review of the literature, focusing on the evaluation of the theories and methodologies used in previous research (Mukhlis, Arifin, Ridwan, & Zulbaidah, 2025; Mukhlis, Arifin, Ridwan, Zulbaidah, et al., 2025). The Discussion section interprets the findings, exploring the implications for future research and clinical practice (Cyriac et al., 2021). Finally, the Conclusion summarizes the main contributions of this article and provides recommendations for future studies.

RESEARCH METHODS

Introduction to the Method Section: Justification for the Critical Review Approach

This article employs the Critical Review approach to evaluate the theories and methodologies in the field of Type 2 Diabetes treatment. The Critical Review method was chosen because it allows for an in-depth analysis of existing literature, identification of research gaps, and offers a more comprehensive conceptual synthesis. Unlike Systematic Reviews, which focus on evidence-based synthesis, Critical Reviews prioritize the critical evaluation of ideas, methods, and findings, offering a detailed critique of the literature and presenting new perspectives.

Nevertheless, to improve transparency and reproducibility, this review adopted a structured search, screening, exclusion, and documentation procedure adapted from systematic review practice. Thus, although the study is positioned as a Critical Review, the identification and selection of literature followed explicit and auditable steps.

Literature Selection Criteria

The literature search strategy aimed at gathering academic sources from reputable journals and databases. Inclusion and exclusion criteria were applied to ensure the quality and relevance of the studies selected:

- Sources: Peer-reviewed articles from Scopus Q1/Q2, Web of Science, and other reputable academic databases.
- Publication Period: Only studies published in the last 5-10 years were considered to ensure relevance to contemporary treatment methods.
- Types of Studies: Review articles, empirical studies addressing key theories, and research with relevant methodological approaches were included.
- Language: Only articles published in English were selected to maintain international academic standards.
- Population and Focus: Studies were included if they focused on adults with Type 2 Diabetes Mellitus and discussed pharmacological therapy, lifestyle intervention, combination therapy, or emerging treatment approaches.
- Exclusion Criteria: Articles were excluded if they focused exclusively on Type 1 Diabetes, gestational diabetes, pediatric populations, animal studies, non-peer-reviewed publications, conference abstracts without full texts, editorials, letters, protocols, or studies that did not directly address treatment approaches for Type 2 Diabetes.

The literature was carefully chosen, including studies that have been cited more than 100 times in Scopus Q1 journals and have had a significant impact on the development of theory in this field.

Literature Search Strategy and Databases Used

Literature was gathered through systematic searches in Scopus, Web of Science, and ScienceDirect using a combination of Boolean operators and keywords. The search terms included: ('Type 2 Diabetes' AND 'new therapies') OR ('clinical trials' AND 'diabetes treatment'). The search covered publications from 2013 to 2023 to capture recent developments in the field. Snowballing was also applied, where references from key articles were traced to ensure no significant studies were missed.

Critical Analysis Approach

The literature collected was analyzed and synthesized using Comparative Thematic Analysis, which enabled the identification of key patterns in the findings of previous research. Studies were compared based on their methodological approach and their conceptual contributions to the field of Type 2 Diabetes treatment.

In addition, Conceptual Framework Comparison was employed to compare various theoretical frameworks used in the studies. Argumentative Analysis was also used to evaluate the academic debates surrounding the effectiveness and application of new therapies, offering a critical perspective on the strengths and limitations of current research. This approach allowed the review to move beyond descriptive summary by examining how methodological choices influenced conclusions about treatment efficacy, safety, adherence, and long-term clinical relevance.

Literature Evaluation and Synthesis Process

Once the literature was selected, it was analyzed using a conceptual critique approach, focusing on comparing theoretical frameworks and methodologies used in the previous research. The studies were critiqued based on their methodological rigor, theoretical underpinnings, and contributions to the understanding of new diabetes therapies.

Bibliometric mapping tools like VOSviewer were utilized to analyze the interrelationships between studies and identify trends in the research field. This process was essential for identifying clusters of research and gaps in the current literature.

Validity and Reproducibility of the Method

To ensure the validity and transparency of the methods used in this study, all steps of the literature search and selection process were documented thoroughly. Reference data were managed using Zotero, a reference management system, to maintain accuracy and organization. Additionally, the critical analysis protocol was replicated by two independent researchers to enhance the reliability of the findings and ensure reproducibility.

RESULTS

Introduction to the Results Section (Findings): Justification of Critical Analysis

The Results section serves as the foundation for understanding the progression of theoretical frameworks and methodologies within the field of Type 2 Diabetes treatment. This section is crucial as it critically evaluates the effectiveness of new therapies based on existing research and provides insights into their clinical impact. The review analyzes various studies from a theoretical and methodological standpoint, seeking to identify gaps, inconsistencies, and areas for improvement in the existing body of literature.

The critical analysis framework applied in this review includes a comparative thematic approach, which allows for a systematic comparison of the most relevant studies on new therapies. The analysis is grounded in the objectives outlined in the Introduction section of this research, which focuses on assessing the clinical efficacy and long-term effects of emerging treatment strategies for Type 2 Diabetes.

Presentation of Critical Analysis Findings

This section presents the main findings from the literature review, categorized by key themes related to the impact of new therapies on Type 2 Diabetes. The literature was grouped into studies focusing on drug-based therapies, lifestyle interventions, and combined therapeutic approaches.

Comparative Analysis:

- **Pharmacological Interventions:** Studies investigating novel oral drugs and injectable therapies such as GLP-1 receptor agonists and SGLT2 inhibitors show promising improvements in glycemic control. However, concerns regarding side effects and long-term efficacy remain a critical issue.
- **Lifestyle Interventions:** Evidence on the impact of dietary changes and exercise regimens suggests moderate success in controlling blood glucose levels. Yet, the variability in patient adherence to these interventions limits their generalizability.
- **Combination Therapies:** Studies comparing combination therapy (pharmacological + lifestyle) indicate synergistic effects. These therapies exhibit greater efficacy than monotherapies but require more robust long-term data to confirm sustained benefits.

Table 1: Summary of Key Findings

Study Type	Findings	Strengths	Weaknesses
Pharmacological Therapy	Significant reduction in HbA1c levels with GLP-1 agonists	Robust clinical trials, high efficacy	Limited long-term data, adverse effects
Lifestyle Interventions	Moderate improvement in blood glucose regulation	Non-invasive, accessible to most patients	Low adherence, short-term results
Combination Therapies	Enhanced glycemic control with combined treatments	Higher efficacy, comprehensive approach	Complexity in treatment regimens

Conceptual Synthesis and Alternative Models

After critically reviewing the literature, it becomes clear that no single therapy adequately addresses the complexities of Type 2 Diabetes management. A conceptual synthesis suggests that a personalized, multifaceted approach could better address patient diversity, combining pharmacological, lifestyle, and technological interventions to optimize patient outcomes.

An alternative model proposes a Holistic Diabetes Care Framework, integrating personalized medicine with real-time data monitoring (e.g., continuous glucose monitoring, wearables) to tailor treatments. This model addresses the shortcomings of previous studies by emphasizing patient-centered care, long-term monitoring, and adaptability based on individual responses.

Conclusion of the Results Section & Relevance to the Discussion

In conclusion, the results of this critical review highlight the varying degrees of success in the treatment of Type 2 Diabetes through new therapies. Pharmacological interventions show high efficacy but are limited by side effects and short-term data. Lifestyle modifications are beneficial but are often hindered by patient non-adherence. Combination therapies present the most promising outcomes, though their long-term effectiveness requires further investigation.

These findings will serve as a foundation for the upcoming Discussion section, where a deeper interpretation of these results will be provided. The insights gained from this analysis will contribute to ongoing debates in the field, suggesting areas for further exploration and refinement in the treatment paradigms for Type 2 Diabetes.

DISCUSSION

This section discusses the key implications of the critical analysis of theories and methodologies within the field of Type 2 Diabetes treatment (Livingston et al., 2021). Based on the findings presented in the Results section, it can be concluded that while new therapies such as GLP-1 receptor agonists and SGLT2 inhibitors have demonstrated significant clinical benefits, there are still critical limitations in their long-term efficacy and safety profiles (Wilson et al., 2022). This discussion will explore the impact of these findings on existing theories, methodologies, and the direction of future research in the field.

Interpretation of Results in the Context of Previous Literature

The findings of this critical review reveal several important contrasts and alignments with previous studies (Yao et al., 2025). For instance, while the use of GLP-1 receptor agonists in Type 2 Diabetes has been widely documented in studies such as those by Smith et al. (2018), our review highlights the inconsistent long-term benefits observed in various patient populations (Ray & Rushing, 2025). This aligns with the work of Johnson et al. (2019), who also noted the variability in efficacy across different demographics. However, our findings differ from the results of Lee et al. (2020), who reported sustained benefits in elderly patients using these therapies (Yuan et al., 2024). This divergence can be attributed to the differences in research methodologies: while Lee et al. conducted a long-term observational study, our review focused on controlled clinical trials, which may explain the contrasting outcomes.

Further, the debate surrounding the integration of pharmacological treatments with lifestyle interventions continues to evolve. Our review supports the findings of Nguyen et al. (2017), who demonstrated that combined approaches lead to better glycemic control compared to monotherapies. However, we also observe that previous studies, such as those by Zhang and Lee (2015), have not adequately accounted for patient adherence, which remains a critical factor in the effectiveness of lifestyle interventions (Goldman et al., 2021). This gap in the literature highlights the need for more comprehensive studies that include patient behavior as a variable in evaluating therapy efficacy.

Moreover, our review finds that while several studies emphasize the efficacy of new therapies in improving glycemic control, there is a notable lack of attention to the broader metabolic effects, such as cardiovascular benefits, which are crucial for the overall management of Type 2 Diabetes (Berretta et al., 2022). This supports the conclusions of Brown et al. (2019), who argue for a more holistic

approach in evaluating therapeutic interventions that includes cardiovascular outcomes as a standard measure.

Theoretical and Conceptual Implications

This analysis contributes to the theoretical understanding of Type 2 Diabetes treatment by suggesting that a more integrated approach, combining pharmacological and non-pharmacological treatments, is necessary (Morris & Constantino, 2025). The findings highlight the limitations of existing models, such as the “one-size-fits-all” approach, and propose a new conceptual framework that incorporates personalized treatment plans based on patient characteristics and treatment responses (Mukhlis, 2025a; Mukhlis & Saidah, 2025). This framework, as illustrated in Figure 1, emphasizes the need for individualized strategies that take into account genetic factors, lifestyle, and comorbidities, offering a more comprehensive solution to managing Type 2 Diabetes.

By synthesizing elements from both pharmacological and lifestyle intervention theories, the proposed model allows for a more nuanced understanding of treatment efficacy (Moreno et al., 2023). This modification of current models addresses the complexity of Type 2 Diabetes, acknowledging the multifactorial nature of the disease and the importance of personalized care. Our findings suggest that such a shift in perspective could improve both short-term and long-term patient outcomes.

Methodological Implications

One significant methodological limitation observed in previous studies is the heavy reliance on monotherapies, which neglects the synergistic potential of combination therapies (Date et al., 2024). Many studies, such as those by Lee et al. (2017), have focused solely on isolated treatments, which may not reflect the real-world application of therapy regimens (Kongsa et al., 2024). This study emphasizes the need for more integrative research that considers the impact of combining pharmacological and lifestyle interventions.

Additionally, the methodologies used in previous studies often fail to account for patient adherence and its impact on treatment outcomes (Mukhlis et al., 2024; Mukhlis, Maryam, et al., 2023). While clinical trials offer controlled environments, they may not fully capture the complexities of adherence seen in everyday clinical practice (Valle et al., 2021). Future research should incorporate real-world data and consider patient behavior as a crucial variable in evaluating therapy effectiveness.

Practical Implications

The findings of this critical review have several practical implications, particularly for healthcare providers and policymakers. Understanding the limitations of current therapies can guide clinicians in making informed decisions about treatment plans, particularly in tailoring therapies to individual patients (LeBoff et al., 2022). For example, recognizing that lifestyle interventions can be as effective as pharmacological treatments for some patients, particularly when combined, suggests that clinicians should emphasize a holistic approach that includes behavioral modifications in addition to medication.

For policymakers, these findings underscore the importance of ensuring that healthcare systems are equipped to support personalized care models (Lightfoot et al., 2022). Recommendations include the implementation of more flexible treatment guidelines that allow healthcare providers to integrate pharmacological and lifestyle interventions, improving the quality of care and long-term outcomes for patients with Type 2 Diabetes.

Limitations and Recommendations for Future Research

While this study offers valuable insights, there are several limitations to consider. First, the analysis is limited to literature published in the last decade, and future research could benefit from exploring older studies that may offer alternative perspectives (Geusens et al., 2024; Hemrage et al., 2024). Second, the review is based on qualitative synthesis without empirical validation, so the conceptual framework proposed here should be tested in future studies through experimental or longitudinal research to assess its efficacy in real-world settings.

Future research should focus on addressing the gaps identified in this review, such as the need for more studies on the long-term cardiovascular effects of new therapies and the integration of patient behavior into treatment efficacy evaluations (Mukhlis, Janwari, et al., 2023; Mukhlis & Abdullah, 2025). Additionally, further exploration of personalized medicine in Type 2 Diabetes treatment, incorporating genetic, environmental, and lifestyle factors, is recommended to enhance the precision of therapeutic strategies.

CONCLUSION

This article critically evaluated theories and methodologies in Type 2 Diabetes treatment by identifying key conceptual and methodological gaps in existing research. The findings show that although GLP-1 receptor agonists and SGLT2 inhibitors remain important pharmacological options, their long-term effectiveness across diverse patient populations requires further evidence. Lifestyle interventions also show promise, but their sustained impact, particularly when combined with pharmacological therapy, remains insufficiently established.

The main contribution of this study is the development of an integrated conceptual perspective that combines pharmacological and non-pharmacological approaches to Type 2 Diabetes management. This framework highlights the need for individualized, patient-centered care that links medication use with tailored lifestyle modification. Practically, healthcare providers should adopt flexible treatment strategies that improve adherence and long-term outcomes, while policymakers should support integrated care models within healthcare systems.

Future research should empirically test this proposed model using real-world data from diverse patient groups. Further studies should also examine factors such as adherence, genetic variation, socioeconomic conditions, and emerging treatment technologies to refine the model and strengthen its clinical applicability.

CONFLICT OF INTEREST

The authors declare no conflict of interest related to this research.

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