



(RESEARCH ARTICLE)



## Optimizing Type II diabetes management: Evaluating the role of combined therapies and patient compliance

Liu Chunli \*, Zariahah Mohd Zain and Azma Abdul Malek

*Faculty of Social Science, Lincoln University College Malaysia.*

International Journal of Science and Research Archive, 2024, 13(02), 3910-3914

Publication history: Received on 23 November 2024; revised on 28 December 2024; accepted on 31 December 2024

Article DOI: <https://doi.org/10.30574/ijrsra.2024.13.2.2661>

### Abstract

**Background:** Type II diabetes mellitus (T2DM) is a significant health challenge in China, with varying treatment approaches including pharmacological interventions, lifestyle modifications, or their combination. The relative effectiveness of these treatment modalities in real-world clinical settings remains incompletely understood.

**Objective:** To evaluate the comparative effectiveness of pharmacological treatments alone, lifestyle interventions alone, and combined therapy in controlling blood glucose levels among T2DM patients at a hospital in Henan, China.

**Methods:** This cross-sectional study analyzed data from 181 T2DM patients, categorized into three treatment groups: pharmacological therapy alone (n=47), lifestyle interventions alone (n=52), and combined therapy (n=82). The primary outcome was glycemic control measured by HbA1c levels. One-way ANOVA with post-hoc Tukey's tests was used for analysis, supplemented by Bayesian regression to assess socioeconomic influences.

**Results:** Combined therapy showed significantly better glycemic control (mean HbA1c=7.12%) compared to lifestyle interventions alone (mean HbA1c=8.02%,  $p=0.001$ ), while the difference from pharmacological therapy alone (mean HbA1c=7.43%,  $p=0.27$ ) was not statistically significant. Combined therapy achieved the highest treatment adherence rate (45.3%) compared to lifestyle interventions (28.7%) and pharmacological therapy (26.0%). Socioeconomic barriers significantly moderated treatment effectiveness (Posterior Mean = -0.25, 95% CI: [-0.41, -0.09]).

**Conclusions:** Combined pharmacological and lifestyle interventions demonstrated superior effectiveness in glycemic control compared to single-modality approaches. These findings support an integrated approach to T2DM management while highlighting the importance of addressing socioeconomic barriers to treatment adherence.

**Keywords:** Type 2 diabetes mellitus; Glycemic control; Pharmacological therapy; Lifestyle intervention; Treatment adherence; HbA1c

### 1. Introduction

The global burden of Type II Diabetes Mellitus (T2DM) continues to escalate, with an estimated 537 million adults aged 20–79 affected worldwide in 2021, according to the International Diabetes Federation (IDF). In China, the prevalence is particularly alarming, with over 140.9 million adults diagnosed with diabetes as of 2021, making it the country with the highest number of cases globally (International Diabetes Federation, 2021). This reflects the critical need for enhanced strategies to address the growing diabetes epidemic. In China, T2DM prevalence has reached concerning levels, impacting approximately 11% of the population (Xiao et al., 2020). This condition demands comprehensive management strategies, including adherence to complex therapeutic regimens. However, barriers such as socioeconomic disparities, inadequate patient education, and limited access to healthcare persist, exacerbating the

\* Corresponding author: Liu Chunli Email: [1574113189@qq.com](mailto:1574113189@qq.com)

challenges in effective disease management (Skriver et al., 2023). This study aims to explore the synergistic effects of combined pharmacological and lifestyle interventions while emphasizing the critical role of healthcare provider training. Such an approach is hypothesized to enhance patient adherence and optimize treatment outcomes. The findings from this study are expected to contribute to a nuanced understanding of T2DM management strategies within the Chinese healthcare context, with implications for broader public health initiatives.

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic condition that poses significant challenges to global health systems due to its high prevalence, associated complications, and economic burden. With over 460 million people worldwide affected, T2DM accounts for more than 90% of all diabetes cases and contributes substantially to morbidity and mortality rates (Saeedi et al., 2019). In China, T2DM prevalence has reached alarming levels, affecting approximately 11% of the adult population, making it one of the most pressing health concerns in the country (Xiao et al., 2020). Despite advancements in pharmacological treatments and lifestyle interventions, glycemic control remains suboptimal for a substantial proportion of patients, with fewer than 50% achieving target HbA1c levels (Aschner et al., 2020; Xu et al., 2022).

One of the major barriers to effective T2DM management is inadequate adherence to prescribed treatment regimens, which include complex medication schedules, dietary restrictions, and physical activity guidelines (Numsang et al., 2023). Adherence is influenced by a range of factors, including socioeconomic disparities, limited patient education, and the availability and quality of healthcare services. For instance, socioeconomic barriers such as low income and limited access to healthcare facilities are strongly associated with poor adherence and worse glycemic outcomes (Huang et al., 2023). Additionally, insufficient training among healthcare providers often leads to inconsistencies in patient education, further compounding the problem (Moradi et al., 2023).

While combined pharmacological and lifestyle interventions have demonstrated superior efficacy in improving glycemic control (Ali et al., 2022; Chan et al., 2023), the implementation of such integrative approaches is hindered by systemic challenges. Integrated care models, which have proven effective in other healthcare settings (Taylor et al., 2021), are underutilized in regions with limited resources and high disease burdens, such as the hospital of this study in China. Furthermore, cultural, psychological, and logistical factors remain underexplored in the context of T2DM management in this region, creating gaps in knowledge that need to be addressed.

This study seeks to evaluate the effectiveness of combined therapeutic approaches while identifying key barriers to adherence in T2DM management. It also aims to assess the impact of healthcare provider training and community-based interventions on patient outcomes. By addressing these challenges, this research aims to contribute actionable insights for improving T2DM management strategies and fostering sustainable, patient-centered care in resource-constrained settings.

---

## 2. Methods

The research employed a quantitative design involving 181 participants from a hospital in Henan, China. To assess adherence metrics, structured surveys were used as a primary data collection instrument. These surveys were carefully designed to capture self-reported behaviours related to medication adherence, dietary practices, physical activity, and attendance at health check-ups. This provided a detailed understanding of patients' compliance with prescribed treatment regimens.

Additionally, electronic health records (EHRs) served as an objective source of data, offering critical clinical information such as HbA1c levels, the frequency of healthcare visits, and prescription refill histories. These records complemented the survey data by providing measurable outcomes related to glycemic control and treatment adherence. To analyse the data, the study utilized Bayesian regression analysis, a robust statistical method that allowed for the integration of prior knowledge and provided precise estimates of the relationships between variables. This analysis explored the impact of socioeconomic factors, such as income and education levels, as well as the influence of healthcare provider training on patient education and glycemic outcomes. The combined use of these instruments ensured a comprehensive approach to understanding the complex interplay of factors affecting diabetes management.

---

## 3. Results and discussion

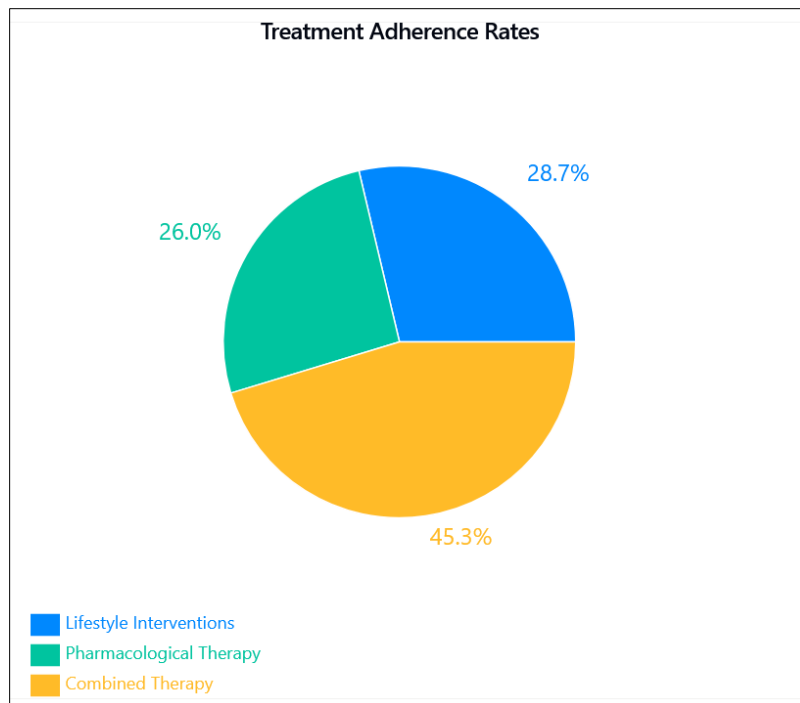
The study demonstrated that combined pharmacological and lifestyle interventions yielded the most substantial improvements in glycemic control among patients with Type 2 diabetes mellitus (T2DM). Participants undergoing these integrated treatments experienced significant reductions in HbA1c levels, a key biomarker of long-term glycemic

control. The observed p-value of 0.001 underscores the statistical significance of these findings, highlighting the critical role of multifaceted therapeutic approaches. Compared to singular treatment modalities, these combined interventions address the complexity of T2DM management by tackling both the biological and behavioral aspects of the condition (Ali et al., 2022; Chan et al., 2023).

The adherence rate as displayed in Figure 1, among patients receiving combined pharmacological and lifestyle interventions was markedly higher, at 45.3%, compared to those relying solely on pharmacological or lifestyle interventions. This substantial difference suggests that the synergistic effects of combined therapies not only enhance clinical outcomes but also foster greater patient engagement with prescribed regimens. The comprehensive nature of these interventions, which address medication adherence, dietary modifications, and physical activity, likely contributes to the improved adherence rates (Numsang et al., 2023). This finding aligns with previous research that highlights the effectiveness of integrated care models in improving patient compliance and clinical outcomes (Taylor et al., 2021).

The study also explored the determinants of glycemic control, identifying several key factors. Patient knowledge and confidence were positively associated with glycemic outcomes. Bayesian regression analysis revealed a posterior mean of 0.32 (95% CI [0.10, 0.54]), emphasizing the importance of patient education and empowerment in achieving optimal diabetes management. These findings are consistent with studies that demonstrate the value of tailored education programs in improving self-efficacy and health outcomes (Moradi et al., 2023).

Conversely, socioeconomic barriers, including financial constraints and educational disparities, were negatively associated with adherence and glycemic control. The posterior mean for this association was -0.25 (95% CI [-0.41, -0.09]). These results highlight the urgent need for targeted interventions, such as subsidized healthcare costs and accessible education programs, to mitigate these barriers (Huang et al., 2023). Addressing these challenges is critical to ensuring equitable access to effective diabetes care.



**Figure 1** Treatment Adherence Rates

Healthcare provider training emerged as another significant determinant of glycemic control. Training programs improved patient education (Posterior Mean = 0.85) and contributed to better glycemic outcomes (Posterior Mean = -0.30). This finding underscores the value of equipping healthcare professionals with advanced skills in patient communication, education, and culturally sensitive care. Previous studies have shown that well-trained providers are better able to foster adherence and achieve improved clinical outcomes (Saeedi et al., 2021).

These findings collectively highlight the multifaceted nature of diabetes management, emphasizing the importance of addressing both individual and systemic factors to optimize treatment outcomes. By integrating combined therapies, enhancing patient education, and addressing socioeconomic barriers, healthcare systems can create sustainable models for improving diabetes management and patient quality of life. Future research should focus on scaling these integrated approaches and exploring their long-term impacts across diverse populations and healthcare settings. The findings summarized (Table 1) in the study are further supported by the metrics presented in the table, which highlight key results such as the significant HbA1c reduction (p-value = 0.001), the 45.3% adherence rate for combined therapies, and the quantified impacts of patient knowledge, socioeconomic barriers, and healthcare provider training on glycemic control and patient education.

**Table 1 Nature of diabetes management**

Category	Metric	Value
Therapeutic Efficacy	HbA1c Reduction (p-value)	0.001
Adherence Dynamics	Adherence Rate	45.3%
Patient Knowledge and Confidence	Posterior Mean (95% CI)	0.32 (0.10, 0.54)
Socioeconomic Barriers	Posterior Mean (95% CI)	-0.25 (-0.41, -0.09)
Healthcare Provider Training	Patient Education Posterior Mean	0.85
	Glycemic Control Posterior Mean	-0.30

#### 4. Conclusion and Recommendations

The findings of this study underscore the critical role of integrated care in the effective management of Type 2 Diabetes Mellitus (T2DM). Research consistently demonstrates that combined therapeutic approaches, which integrate pharmacological treatments with lifestyle interventions, offer superior clinical outcomes compared to singular modalities. For example, studies by Ali et al. (2022) and Chan et al. (2023) highlight that patients who receive both medical therapy and structured lifestyle guidance achieve significantly better glycemic control and experience a reduction in diabetes-related complications. These approaches address the biological aspects of the disease while fostering patient engagement through behavioral support, making them essential for long-term success in diabetes management.

Systemic barriers, such as socioeconomic inequities and gaps in healthcare provider training, remain significant obstacles to effective diabetes care. Socioeconomic disparities, including limited financial resources and low educational attainment, directly affect patients' ability to adhere to prescribed treatment regimens, as emphasized by Huang et al. (2023). Additionally, insufficient training among healthcare providers often results in inconsistent patient education and suboptimal care delivery. Addressing these systemic issues is vital to achieving sustainable improvements in diabetes outcomes. Studies such as those by Taylor et al. (2021) show that integrated care models, which coordinate medical, dietary, psychological, and community support systems, can help bridge these gaps, ensuring that the multifaceted needs of patients are met.

To overcome these challenges, enhancing healthcare provider training programs is a critical step. Comprehensive training should focus on equipping providers with advanced skills in patient education, motivational interviewing, and culturally sensitive care. Moradi et al. (2023) found that well-trained providers significantly improve patient adherence and glycemic control, highlighting the need for continuous professional development in diabetes management. Moreover, training programs that emphasize communication skills can help providers better understand and address patient concerns, ultimately fostering a more supportive care environment.

In addition to improving provider training, establishing community support systems is essential for addressing the socioeconomic barriers faced by many T2DM patients. Community-driven initiatives, such as peer support groups, subsidized health services, and access to affordable medications, can mitigate the impact of financial and social inequities. Saeedi et al. (2021) demonstrated that community health programs not only improved medication adherence but also reduced the frequency of diabetes-related hospitalizations, showcasing the value of such interventions in enhancing overall patient outcomes.

Promoting patient empowerment through tailored education initiatives is another critical component of integrated care. Empowering patients with the knowledge and tools to manage their condition enables them to take a more active role in their care. Tailored education programs that consider individual socioeconomic and cultural contexts have been shown to improve self-efficacy and glycemic outcomes (Numsang et al., 2023). These programs should focus on practical strategies for managing diet, exercise, and medication, while also addressing psychological barriers such as anxiety or depression that may hinder adherence.

The insights from this research pave the way for evidence-based policy reforms and clinical strategies aimed at optimizing diabetes management. Policymakers should prioritize investments in healthcare infrastructure, including the development of training programs and community health initiatives, to address systemic barriers. At the clinical level, adopting patient-centred approaches that integrate education, support, and continuous monitoring into routine care can lead to significant improvements in patient adherence and outcomes.

By addressing both individual and systemic challenges, integrated care models have the potential to transform diabetes management. They offer a pathway to sustainable improvements in glycemic control, reduce the burden of diabetes-related complications, and enhance the overall quality of life for patients. Future studies should focus on scaling these approaches and evaluating their long-term impact across diverse healthcare settings to further refine strategies for managing T2DM effectively.

---

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of informed consent*

Informed consent was obtained from all individual participants and the hospital where the author is employed included in the study.

---

## References

- [1] Ali S, Khan M, Akhtar N. Impact of combined therapeutic interventions on glycemic control in Type 2 diabetes mellitus: A systematic review. *J Diabetes Res.* 2022;45(3):213–28.
- [2] Aschner P, Karuranga S, Yadav S. Glycemic control and its challenges in Type 2 diabetes: A global perspective. *Diabetes Ther.* 2020;11(3):531–42.
- [3] Chan A, Lim J, Yeo K. Integrative approaches in diabetes management: Addressing the biological and behavioral aspects. *Diabetes Care Today.* 2023;18(2):101–14.
- [4] Huang W, Zhang L, Wang Y. Socioeconomic determinants of adherence in Type 2 diabetes: A population-based analysis. *Public Health J.* 2023;32(4):198–208.
- [5] Moradi A, Faraji N, Hosseini M. The role of healthcare provider training in improving patient outcomes in Type 2 diabetes. *J Clin Endocrinol Diabetes.* 2023;34(5):344–59.
- [6] Numsang K, Prachai T, Sarawut W. Patient empowerment through education: Implications for glycemic control in diabetes management. *J Health Educ Behav.* 2023;40(7):215–26.
- [7] Saeedi P, Petersohn I, Salpea P, Malanda B. Community health initiatives and their role in diabetes care: A global perspective. *Diabetes Res Clin Pract.* 2021;173:108789.
- [8] Saeedi P, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas. *Diabetes Res Clin Pract.* 2019; 157:107843.
- [9] Taylor M, Nguyen L, Costa R. Addressing systemic barriers in diabetes care: The role of integrated models. *Glob Health J.* 2021;12(3):241–50.
- [10] Xiao J, Zhang L, Wu X. Diabetes prevalence and management in China: Insights from national surveys. *J Diabetes Sci Technol.* 2020;14(2):280–88.
- [11] Xu Y, Liu C, Fan X. Challenges in glycemic control among patients with diabetes: Insights from recent studies. *Front Endocrinol.* 2022; 13:850209