

Evaluating the Effect of Mental Health Nurse-Led Integrated Care on Glycemic Control and Depression in Adults with Type 2 Diabetes: A Quasi-Experimental Study

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Abstract

Adults with Type 2 Diabetes Mellitus (T2DM) and comorbid depression face bidirectional challenges, as poor glycemic control exacerbates depressive symptoms and vice versa. Research demonstrates that integrated care works, but healthcare systems commonly treat these conditions separately since resource restrictions exist. This quasi-experimental study evaluated the effectiveness of a 12-week mental health nurse-led integrated care intervention on glycemic control (HbA1c) and depression (PHQ-9 scores) in adults with T2DM and moderate-to-severe depression. Sixty participants aged 30–65 joined the study by being assigned to one of two groups, with thirty participants each. The intervention group received psychoeducation, motivational interviewing, self-care education, and weekly follow-ups through nurses. The control group received standard care only. The study evaluated HbA1c and PHQ-9 scores at the beginning of the research and after 12 weeks. The research used paired t-tests to assess alterations within individual study groups ($p < 0.05$ determined statistical significance). The participants in the intervention group experienced major improvements in HbA1c levels ($1.1\% \pm 0.5$, $P < 0.001$), together with PHQ-9 score reductions (6.7 ± 2.3 , $P < 0.001$), achieving clinically beneficial thresholds among 80% and 83.3% of participants. The HbA1c of controls remained within normal levels ($0.1\% \pm 0.3$, $p = 0.320$) alongside PHQ-9 scores (0.4 ± 1.2 , $p = 0.650$). Only 16.7% and 13.3% of controls met the clinical criteria for improvement. The intervention group participants achieved more consistent outcomes after receiving their health services. Patients with T2DM benefit strongly from the combined interventions of mental health nursing integration. This leads to better blood sugar management and depression symptom control beyond conventional care methods. The approach respects ADA recommendations for complete diabetes patient care while providing managers of limited resources with an adaptable model.

Keywords: Integrated Care, Type 2 Diabetes, Depression, Mental Health Nursing, Glycemic Control

Introduction

Type 2 Diabetes Mellitus (T2DM) appears as a long-term metabolic disease that causes poor insulin function and reduces blood glucose control while producing various serious health complications, including cardiovascular problems, nerve damage, and kidney dysfunction (Amaral et al., 2022). Type 2 Diabetes Mellitus frequently accompanies depression, so the co-occurring disorder strongly affects disease progression. The delivery of extensive treatment depends on healthcare professionals using integrated care principles to work jointly between mental health services and primary care services (Wong et al., 2025). A mental health nurse-led approach in healthcare allows psychiatric or mental health nurses to conduct the entire process from strategy development through care delivery and assessment across physical and psychological conditions (Ghiassi et al., 2021). The terms serve as key concepts to understand how nurse-led interventions enhance results in treating adults with T2DM, together with comorbid depression.

Research shows that depression affects about 20% to 30% of people with T2DM, yet many of these cases remain both unidentified and unattended (Trivedi & Raghuveer, 2024). Depression causes diabetes symptoms to intensify while it deteriorates self-care actions, as well as medicine compliance and lifestyle management, thereby deteriorating blood sugar regulation. The health risks for patients who have T2DM along with depression become much higher compared to patients with diabetes alone, resulting in increased complications and hospitalizations, and elevated mortality rates (Stener-Victorin et al., 2024). The extent of connection between these dual disorders remains obvious, yet health care segments deliver separate physical and mental services that result in treatment fragmentation and unfulfilling results for patients (Wang et al., 2021). Mental health nurses fill the treatment gap by implementing integrated care programs that jointly handle patients' medical and psychological requirements (Hove et al., 2023). Substance abuse nurses apply their communication training while providing patient education and medication management skills combined with therapeutic intervention to effectively identify and respond to depressive symptoms when working on the frontlines (Soltis-Jarrett, 2020). Evidence indicates that nurses participating in chronic disease management lead to better physical and psychological well-being outcomes. Several studies establish that mental health nurse-led interventions help patients stick to their treatments while improving satisfaction levels and minimizing the severity of depression symptoms (Jenkins et al., 2022).

Nurse-led integrated care intervention evaluation benefits from quasi-experimental research using pre-post intervention methodologies to study practical interventions (McParland et al., 2022). Researchers evaluate intervention effects by conducting these studies in clinical practices because randomization is not always possible (Dunn et al., 2021). Implementing an intervention in T2DM patients with depression allows researchers to employ quasi-experimental designs during two periods to measure changes in both HbA1c markers and depression symptoms evaluated by standardized tools, including PHQ-9 (Wu et al., 2024). Increasing numbers of studies at a global level demonstrate that integrated health care approaches and collaborative models deliver effective management of persistent illnesses. Such integrated medical approaches have primarily been studied within high-income nations because these countries possess the required health system strength and funding for such programs (Haque et al., 2020). Medical professionals in limited resource areas must deal with dual condition management because they are overwhelmed, whereas mental health services are scarce or seen unfavorably (Beichler et al., 2023). A mental health nurse-led model presents itself as an affordable approach to fill care gaps by distributing services through a system enabling nurses to take charge of comprehensive treatment plans (Haldane et al., 2020).

Research studies remain sparse regarding dual clinical outcomes from depression and glycemic control obtained through nurse-led integrated healthcare intervention. The evidence supports depression treatment leading to a diabetes outcome (Yu et al., 2022). Yet, research lacks findings regarding the effects of nurse-led programs on simultaneous improvements between clinical HbA1c results and depression severity measurements (Hu et al., 2025). Research must address the impact of these treatment models on demographic groups to enhance their engagement with healthcare, their ability to stick to therapies, and their ability to maintain their quality of life (Yu et al., 2022).

The research assesses how successfully mental health nurses employing integrated care deliver better depression treatment results and glycemic control to Type 2 diabetic patients who present with comorbid depression (Hu et al., 2025). Under a quasi-experimental research design, the study aims to generate evidence that verifies the combination of mental health care with chronic disease management within nursing practice so it can shape regulatory decisions and expand mental health nursing positions in interprofessional care teams.

Methodology

The researchers examined how mental health nurse-delivered complex integrated care affected both diabetes control and mental health outcomes of adults with Type 2 Diabetes Mellitus (T2DM) and comorbid depression at Saidu Teaching Hospital in Swat, Pakistan. Investigation participants consisted of individuals between the ages of 30 - 65 who had a T2DM diagnosis alongside moderate-to-severe depression (PHQ-9 score greater than 10) that researchers selected from the Medical outpatient department. Research participants were excluded because they met any of the following conditions: Type 1 Diabetes, severe psychiatric disorders, cognitive impairment, or acute medical emergencies. The research employed a pre- and post-intervention methodology, which did not use randomization because it simulated actual clinical limitations. The assessment began with measuring HbA1c levels and PHQ-9 scores before mental health nurses conducted a 12-week psychoeducation intervention with motivational interviewing, self-care education, and diabetes specialist coordination. The 12-week follow-up evaluations focused on rechecking patients' HbA1c and PHQ-9 scores to detect changes in glycemic control and depression severity. The hospital teams of endocrinology, psychiatry, and nursing implemented the integrated model while adapting it to fit with operational clinical procedures. The research tracked HbA1c and PHQ-9 score decreases among patients as it evaluated how well nursing care operates within limited tertiary resources. The research developed an adaptable, comprehensive model to improve the management of diabetes-depression combinations between disintegrated healthcare systems.

Data Collection Procedure

The data collection process occurred across two phases, pre-intervention and post-intervention, within a 12-week timeframe at Saidu Teaching Hospital, Swat. A written informed consent procedure allowed eligible patients enrolled following selection from the Medical and Psychiatry outpatient departments who met the inclusion criteria. The structured interview included the PHQ-9 depression severity assessment and recent HbA1c results testing for glycemic control at participants' baseline assessment phase. The study collected extra demographic and clinical data through standardized questionnaires. The participants received 12 weeks of integrated mental health nurse-led healthcare, including psychoeducation, self-care guidance, and adherence support. After the intervention, all data collection tools used identical instruments for PHQ-9 assessment and refreshed HbA1c results. The intervention included follow-up sessions through phone calls for each week to track participant advancement. The researchers manually recorded all data, which later professionals transferred into the SPSS analysis system. The healthcare staff

conducted double-entry verification to preserve data integrity. All participants maintained both confidentiality rights and their rights to anonymity. The established procedure created an identical framework for recording data among all research participants.

Data Analysis Procedure

Analysis of acquired data occurred through SPSS version 27. The researchers applied descriptive statistics to present demographic information and initial clinical measurements of participants. The research used paired t-tests to determine changes between initial and final HbA1c and PHQ-9 measurement results. The researchers used $p < 0.05$ as their cutoff for statistical significance. A successful interpretation of the nurse-led intervention was achieved when patients demonstrated HbA1c drops of at least 0.5% combined with a minimum five-point reduction on PHQ-9 scores.

Results and Analysis

Demographics of participants: HbA1c levels decreased significantly in the intervention participants who lowered their HbA1c from 9.3% to 8.2%, but the control participants maintained their initial HbA1c values near 9.2% to 9.1%. The intervention group exhibited a major decrease in PHQ-9 scores (from 16.5 to 9.8) for depression assessment; however control group scores remained consistent (16.1 to 15.7). Research findings show that the treatment led to both better blood sugar control and lower depression symptoms, yet the control group displayed only small alterations. Patients who received treatment showed reduced variability of their results during the post-intervention period.

Table 1: Baseline Demographic and Clinical Characteristics (N=60)

Characteristic	Intervention Group (n=30)	Control Group (n=30)
Age (years), Mean $\pm$ SD	53.1 $\pm$ 7.9	54.2 $\pm$ 8.3
Baseline HbA1c (%)	9.3 $\pm$ 1.6	9.2 $\pm$ 1.5
Baseline PHQ-9 Score	16.5 $\pm$ 3.0	16.1 $\pm$ 2.8
Diabetes Duration (years)	8.1 $\pm$ 4.2	7.9 $\pm$ 3.9

Pre- and Post-Intervention Outcomes

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Table 2: Pre and Post-Intervention Outcomes

Outcome	Intervention Group (n=30)	Control Group (n=30)
HbA1c (%)		
Baseline	9.3 $\pm$ 1.6	9.2 $\pm$ 1.5
Post-Intervention	8.2 $\pm$ 1.1	9.1 $\pm$ 1.4
PHQ-9 Score		
Baseline	16.5 $\pm$ 3.0	16.1 $\pm$ 2.8
Post-Intervention	9.8 $\pm$ 2.5	15.7 $\pm$ 2.9

Statistical and Clinical Significance

The HbA1c levels in the intervention group decreased substantially ($1.1\% \pm 0.5$, $p < 0.001$), together with significant PHQ-9 score improvements (6.7 ± 2.3 , $p < 0.001$). The control participants displayed negligible changes in HbA1c ($0.1\% \pm 0.3$, $p = 0.320$) and PHQ-9 (0.4 ± 1.2 , $p = 0.650$) scores. Intervention participants achieved clinically significant improvements of 80% for HbA1c levels and 83.3% for PHQ-9 scores in contrast to controls who showed lower rates of such improvement at 16.7% HbA1c and 13.3% PHQ-9 scores.

Table 3: Statistical and Clinical Significance

Outcome	Intervention Group	Control Group	p-value (Within-Group)
HbA1c Reduction	$1.1\% \pm 0.5$	$0.1\% \pm 0.3$	<0.001 (IG) / 0.320 (CG)
PHQ-9 Reduction	6.7 ± 2.3	0.4 ± 1.2	<0.001 (IG) / 0.650 (CG)
Clinically Significant Improvement			
HbA1c ($\geq 0.5\%$)	24 (80%)	5 (16.7%)	-
PHQ-9 (≥ 5 -point drop)	25 (83.3%)	4 (13.3%)	-

Discussion

A purposeful intervention created superior outcomes for glycemic control as well as depressive symptoms among patients with type 2 diabetes over conventional diabetes treatment approaches. Patients in the intervention group showed both important HbA1c reduction at 1.1% ($p < 0.001$) beyond the critical 0.5% goal in diabetes management and progressed to improved depressive symptoms in 83.3% of cases. The dual results support previous research about how blood glucose management is connected to mental well-being in a two-way direction. The integrated diabetes-depression care trial demonstrated equivalent HbA1c reductions (1.0%); however, patients in their study only experienced modest PHQ-9 improvements of 4.5 points, while the current study resulted in superior PHQ-9 declines of 6.7 points, potentially enhancing results through intensified psychological care (Hu et al., 2025).

The intervention successfully treats physiological and psychological outcomes, while most research focuses on individual outcomes. Diabetes self-management programs without integrated mental health care (examples in Brown et al., 2018) show minimal HbA1c decreases (about 0.6%) combined with no significant impact on mood conditions. The practice of delivering CBT or similar depression treatments leads to enhanced PHQ-9 scores. Meanwhile, they fail to modify HbA1c levels (Dailah, 2024). The study results support a systemic effect of combined self-efficacy and mood improvement on metabolic results, which becomes evident through the decreased variability found in intervention participants after treatment (Yu et al., 2022).

The intervention's effectiveness becomes evident through the high number of patients who reached clinically important health outcomes (80% for HbA1c and 83.3% for PHQ-9) after completion. Legal intervention produced better clinical results while requiring less participant commitment than research projects like the Look AHEAD trial (Fanelli et al., 2025). Studies from the literature agree that patients in standard care do not demonstrate significant changes in these outcome measures, thus validating the need for different treatment approaches targeting complex patients (Abbas et al., 2023).

The 6.7-point PHQ-9 reduction effect from this intervention matches the results of antidepressant medication treatments when used with diabetic patients, who usually show 3–5 point

improvements (Whittal et al., 2021). Pharmacological treatment stands alone as an inadequate approach for treating depression within chronic disease. The observed differences between our study and (Skou et al., 2022), stem perhaps from variations in intervention delivery frequency and delivery methods. These differences demonstrate why health services must create specific approaches that suit individual patients' capabilities and treatment choices (De Los Reyes et al., 2022).

Limitations and Future Directions

The research findings maintain promise even though the study faces certain restrictions. The study's analysis of 60 participants and short follow-up periods prevents researchers from analyzing long-term maintenance or extending results to other groups. Long-term data from the DIAMANTE trial (N=500) presented HbA1c changes as 0.4% at month 12, which indicates potential weakening of positive outcomes over time. The study sample selection affected its findings because population members were mainly middle-aged adults with a standardized diabetes duration of around eight years. Future studies should focus on multiple years of follow-up time, cost-benefit research, and biological investigation to determine the relationship between glycemic control and mood dynamics.

Conclusion

The research contributes to existing findings demonstrating that depression-diabetes combined treatments generate better therapy results than sequential patient care approaches. Standard care practices for patients suffering from comorbidities display an obvious weakness due to the difference between intervention and control groups. The intervention model provides a standard approach for chronic disease care improvement according to the ADA's 2023 guidelines by promoting mental health integration in diabetes management. Further research among various contexts will establish this intervention model's universal use and enduring worth.

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