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Evaluating Care Models for Type 2 Diabetes: Clinical Outcomes in University Medical Centres in Rivers State

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ABSTRACT

Diabetes mellitus remains one of most prevalent and significant metabolic disease that has a deleterious impact on the patients' quality of life, productivity and involves enormous health costs for virtually every society. This study investigated the effects of multidisciplinary diabetes management programs versus standard care on glycemic control, blood pressure regulation, and body mass index/weight management among type 2 diabetes mellitus (T2DM) patients at university medical centres in Rivers State. This study adopted a quasi-experimental research design, involving a pre-test-post-test control group design. The population of this study included adults aged 18–65 years receiving care at the Rivers State University (RSU) medical centre and Ignatius Ajuru University of Education medical Centre, and are residents within Port Harcourt and Obio/Akpor LGAs of Rivers State in the last one year. The sample for this study comprised 560 participants who were recruited using multistage sampling procedure. This study utilized data from primary and secondary sources. Data collection was conducted after physician consultation sessions, with informed consent obtained from all participants. Sociodemographic, behavioural, and clinical data were collected through face-to-face interviews using a pre-tested structured questionnaire derived from various literature sources. The instrument was validated by experts and a pre-test was conducted on 5% of randomly selected T2DM patients who were not be part of the sample of this study to determine the reliability coefficient. The study used quantitative and qualitative analyses. Descriptive statistics of frequency tables, means, standard deviation were used to answer research questions while a paired z-test assessed significant differences between intervention and control groups. The result showed that the majority of respondents at both RSUMC and IAUEMC agreed with items 1–10 with mean scores ≥ 2.50 ; the grand means (3.12 for RSUMC and 3.09 for IAUEMC) indicate substantial knowledge of T2DM among patients in both centres. The grand means (RSUMC = 2.93; IAUEMC = 2.98) indicate generally good adherence at both centres, although RSUMC showed lower means on items related to physical activity, glucose monitoring and appointment attendance. With equal grand means (2.89) for both centres, socio-demographic factors such as understanding of doctors' instructions, family support, marital status, age, convenience of the centre, and technology use positively predicted adherence, whereas low household income and poor insurance coverage were constraints. The findings of this study revealed that multidisciplinary diabetes management programs and standard care produced comparable yet commendable outcomes across several dimensions of diabetes care among T2DM patients attending Rivers State University (RSU) medical centre and Ignatius Ajuru University of Education medical centre.

Keywords: Care Models, Type 2 Diabetes, Clinical Outcomes, University Medical Centres, Rivers State.

INTRODUCTION

Type II diabetes is a metabolic system disorder that causes considerable morbidity or relative deficiency in insulin, dysfunctional organs, and mortality (ADA, 2023). Because they retain the ability to secrete some endogenous insulin, they are considered to require insulin but not depend on it. Nevertheless, given the potential for confusion due to classification based on treatment rather than aetiology, the older terms have been abandoned. Another older term for type II diabetes mellitus was adult-onset diabetes. Currently, because of the epidemic of obesity and inactivity in children, type II diabetes mellitus is occurring at younger and younger ages. Although type II diabetes mellitus typically affects individuals older than 40 years, it has been diagnosed in people of all ages who have a family history of diabetes.

Ling, et al. (2020) estimated that in 2012, about 1.5 million people died of diabetes. Diabetes is responsible for the additional death of 2.2 million individuals due to complications such as cardiovascular disease and other related diseases; overall, 3.7 million deaths are associated with high blood glucose, out of which 43% of the deaths occurred to individuals who are 70 years and above. Furthermore, in 2014, the global prevalence of diabetes among adults was recorded at 8.5% (WHO, 2019). Projections by the International Diabetes Federation (2014) indicated that this number could rise to 552 million by the year 2030. High glucose levels, also known as hyperglycemia, damage body organs over time, while hypoglycemia is low glucose (ADA, 2017). In 2022, 14% of adults aged 18 years and older were living with diabetes, an increase from 7% in 1990. More than half (59%) of adults aged 30 years and over living with diabetes were not taking medication for their diabetes in 2022. Diabetes treatment coverage was lowest in low- and middle-income countries. In 2021, diabetes mellitus was directly responsible for approximately 1.6 million deaths worldwide, highlighting its significant impact on global health. Alarmingly, nearly half (47%) of these diabetes-related deaths occurred in individuals under the age of 70, underscoring the premature mortality associated with the disease and its complications. Beyond its direct toll, diabetes also contributed to an estimated 530,000 deaths from kidney disease, primarily due to diabetic nephropathy—a condition in which prolonged high blood sugar levels damage the kidneys' filtering system.

Moreover, elevated blood glucose levels were linked to roughly 11% of all cardiovascular-related deaths, reflecting the strong association between diabetes and heart disease. Chronic hyperglycaemia accelerates atherosclerosis, increases blood pressure, and impairs vascular function, thereby raising the risk of heart attacks, strokes, and other cardiovascular events. These statistics from the Global Burden of Disease Collaborative Network (GBDCN, 2024) emphasize the urgent need for comprehensive diabetes prevention, early diagnosis, and effective management strategies to reduce its widespread and multifaceted health burden. Since 2000, mortality rates from diabetes have been increasing. By contrast, the probability of dying from any one of the four main noncommunicable diseases (cardiovascular diseases, cancer, chronic respiratory diseases or diabetes) between the ages of 30 and 70 decreased by 20% globally between 2000 and 2019.

Type 2 diabetes mellitus imposes a growing burden on Rivers State, Nigeria, affecting ~3% of the population and driving rising non-communicable disease rates, earlier onset, and complications like diabetic foot ulcers, cardiovascular disease, and renal impairment particularly in urban areas such as Port Harcourt (Ezeama & Enwereji, 2019). Globally, it incurs massive costs (\$412.9 billion annually in the US in 2022, with diabetics facing 2.6 times higher expenses), yet Nigerian public health responses remain inadequate despite WHO prioritization, exacerbating financial strains from lifelong therapy (Parker et al., 2024). Optimal glycemic control is essential for reducing acute/chronic complications and improving quality of life, but barriers including poor adherence, unhealthy diets, obesity, prolonged disease duration (≥ 10 years), hyperlipidemia, hypertension, advanced age, male gender, low health literacy, limited education, and unemployment hinder success (Anioke et al., 2019; Asmelash et al., 2019; Dedefo et al., 2020).

While multidisciplinary care models integrating endocrinologists, dietitians, nurses, physiotherapists, and mental health specialists demonstrate international efficacy in enhancing clinical outcomes and care continuity, evidence on their implementation and impact in Sub-Saharan Africa, particularly Rivers State Nigeria is lacking. This gap emphasizes the need to evaluate multidisciplinary versus standard care

models on glycemic control and complication reduction among type 2 diabetes patients in Rivers State. The purpose of this study was to investigate the effects of multidisciplinary diabetes management programs versus standard care on glycemic control, blood pressure regulation, and body mass index/weight management among type 2 diabetes mellitus (T2DM) patients at university medical centres in Rivers State.

METHODOLOGY

This study adopted a quasi-experimental design employing a pretest-posttest control group design was carried out at the main campuses of Rivers State University (RSU) Medical Centre and Ignatius Ajuru University of Education Medical Centre, both in Port Harcourt, Rivers State. The population comprised adults aged 18–65 years receiving care at these centres and residing in Port Harcourt or Obio/Akpor Local Government Areas (LGAs) within the past year. Exclusion criteria included acute/critical illness, lack of HbA1c-confirmed glycemic data within four weeks, inability to provide clinical information, or gestational diabetes, ensuring focus on type 2 diabetes mellitus (T2DM). A sample of 560 participants was recruited using Cochran's formula for two proportions. Primary and secondary data were collected post-physician consultation with informed consent. Sociodemographic, behavioral, and clinical data were obtained via pre-tested questionnaires and patient records, targeting HbA1c-influencing factors. Trained research assistants conducted interviews, while weight and height followed standard protocols. Laboratory assessments included HbA1c (Wondfo Rapid Quantitative Test), fasting blood sugar (FBS), renal function, and lipid profiles using calibrated analyzers under strict standard operating procedures (SOPs) and quality controls. Validity was ensured through adapted questionnaires (partly translated to Pidgin English), assistant training, and pre-testing on 5% of non-sample T2DM patients at the University of Port Harcourt Teaching Hospital (UPTH), with adjustments based on feedback. Principal investigators supervised daily data integrity checks. Laboratory processes involved fasting blood collection in labeled tubes, same-day processing, coding, and documentation for accuracy and traceability. Data collection occurred in phases after ethical approval. A multidisciplinary team comprising physician, pharmacy specialist/case manager, dietitian, diabetic/health educators, and social worker was recruited. The team met twice weekly to assess eligibility and care plans, with enrollment via physician referral. Participants required baseline HbA1c testing and ≥ 3 months' follow-up; incomplete records prompted exclusion. Clinical outcomes (HbA1c, FBS, blood pressure, lipid profile, weight) were measured at baseline, 3, and 6 months. Care adhered to ADA (2023) guidelines but was individualized, with the case manager coordinating appointments, compliance monitoring, and adverse event tracking. Patients consulted all team members at least once (social worker as needed). Interventions included frequent visits, outcome monitoring, education, self-management support, dose adjustments, insulin titration, adherence promotion, social support, reminders, and follow-up calls. Data collection spanned three months and was analyzed using SPSS v25.

RESULTS

Research Question One: *What is the comparative effect of multidisciplinary diabetes management programs versus standard care on glycemic control among T2DM patients in both medical centres?*

Table 1: Mean score and standard deviation of the comparative effect of multidisciplinary diabetes management programs versus standard care on glycemic control among T2DM patients in both medical centres

S/N	Items	RSUMC (n=280)			IAUEMC (n=280)		
		\bar{x}	SD	Decision	\bar{x}	SD	Decision
.1	My diabetes care team works together to create a unified treatment plan	3.13	0.48	Agree	3.12	0.48	Agree
.2	I receive clear, individualised advice about diet, exercise, and medications from multiple specialists.	2.91	0.62	Agree	2.92	0.62	Agree
.3	I can easily consult diabetes educators or nutritionists when needed, not just my primary doctor	2.76	0.77	Agree	2.75	0.79	Agree
.4	My care team addresses both my medical needs and emotional/mental health related to diabetes	3.26	0.70	Agree	3.28	0.72	Agree
.5	My care team schedules regular follow-ups to monitor my progress and adjust treatments	3.54	0.71	Agree	3.57	0.71	Agree
.6	My recent lab results show better blood sugar control since starting this care model	3.14	0.62	Agree	3.14	0.63	Agree
.7	I take my medications as prescribed because I understand their importance from my care team.	2.87	0.85	Agree	2.87	0.91	Agree
.8	I consistently follow dietary and exercise recommendations due to ongoing support from my team	2.32	0.94	Disagree	2.52	1.01	Agree
.9	I rarely experience severe high/low blood sugar episodes thanks to better guidance	3.39	0.69	Agree	3.39	0.72	Agree
.10	I feel confident managing my diabetes daily because of the education and tools provided.	3.38	0.64	Agree	3.37	0.67	Agree
Grand Mean		3.07			3.09		

Criterion Mean = 2.5, Mean: 1.0-2.49 = Disagree, 2.5-4.00= Agree.

Table 1 presents the mean scores and standard deviations on the comparative effect of multidisciplinary diabetes management programs versus standard care on glycemic control among T2DM patients in RSUMC and IAUEMC. The result shows that the majority of respondents from RSUMC agreed with items 31–37 and 39–40, with mean scores equal to or greater than the criterion mean (2.50), while they disagreed with item 38, which recorded a mean score below 2.50. The grand mean of 3.07 indicates that patients at RSUMC generally perceive the multidisciplinary diabetes management approach as having a positive effect on glycemic control. The result suggests that collaboration among healthcare professionals, individualised care, regular follow-ups, and patient education contribute significantly to improved blood sugar control and overall diabetes management.

Similarly, findings from IAUEMC reveal that most respondents agreed to all items except for item 38, where opinions were slightly divided but still within the “agree” range ($\bar{x} = 2.52$). The grand mean of 3.09 indicates that patients at IAUEMC also reported substantial benefits from the multidisciplinary diabetes management model. These include enhanced coordination of care, better glycemic monitoring, and increased confidence in daily diabetes self-management.

Comparatively, with grand means of 3.07 and 3.09 for RSUMC and IAUEMC, respectively, it can be inferred that both medical centres implement effective multidisciplinary care programs that positively influence glycemic control among T2DM patients. The slightly higher grand mean at IAUEMC suggests a marginally stronger effect of the multidisciplinary management model in promoting better blood sugar regulation and patient empowerment.

Research Question Two: *To what extent do multidisciplinary care and standard care differ in their impact on blood pressure regulation among T2DM patients at Rivers State University Medical Centre and Ignatius Ajuru University of Education Medical Centre?*

Table 2: Mean score and standard deviation of the extent to which multidisciplinary care and standard care differ in their impact on blood pressure regulation among T2DM patients at RSUMC and IAUEMC

S/N	Items	RSUMC (n=280)			IAUEMC (n=280)		
		\bar{x}	SD	Decision	\bar{x}	SD	Decision
.11	My diabetes care team works together to create a unified treatment plan	2.35	1.08	Disagree	2.31	1.13	Disagree
.12	I receive clear, individualised advice about diet, exercise, and medications from multiple specialists.	3.13	0.62	Agree	3.13	0.62	Agree
.13	I can easily consult diabetes educators or nutritionists when needed, not just my primary doctor	2.87	0.85	Agree	2.85	0.90	Agree
.14	My care team addresses both my medical needs and emotional/mental health related to diabetes	2.92	0.90	Agree	2.84	0.96	Agree
.15	My care team schedules regular follow-ups to monitor my progress and adjust treatments	3.34	0.70	Agree	3.40	0.72	Agree
.16	My recent lab results show better blood sugar control since starting this care model	3.13	0.61	Agree	3.13	0.62	Agree
.17	I take my medications as prescribed because I understand their importance from my care team.	2.87	0.84	Agree	2.85	0.90	Agree
.18	I consistently follow dietary and exercise recommendations due to ongoing support from my team	2.90	0.89	Agree	2.84	0.96	Agree
.19	I rarely experience severe high/low blood sugar episodes thanks to better guidance	3.43	0.68	Agree	3.40	0.72	Agree
.20	I feel confident managing my diabetes daily because of the education and tools provided.	2.91	0.74	Agree	2.79	0.77	Agree
Grand Mean		2.99			2.95		

Criterion Mean = 2.5, Mean: 1.0-2.49 = Disagree, 2.5-4.00= Agree.

Table 2 shows the extent to which multidisciplinary care and standard care differ in their impact on blood pressure regulation among T2DM patients at RSUMC and IAUEMC. The result revealed that the majority of the respondents from RSUMC agreed with items 42–50, with their mean scores greater than or equal to the criterion mean (2.50), while they disagreed with item 41, which recorded a mean score below 2.50. The grand mean of 2.99 indicates that most patients receiving treatment at RSUMC perceive multidisciplinary care as having a considerable positive effect on blood pressure regulation. This suggests that collaborative care involving regular follow-ups, individualised advice, and professional guidance

contributes significantly to improved management of both blood sugar and blood pressure levels among patients.

Furthermore, the result showed that the majority of the respondents from IAUEMC also agreed with items 42–50, with their mean scores above the criterion mean (2.50), while they disagreed with item 41. The grand mean of 2.95 indicates that most patients at IAUEMC likewise view multidisciplinary care as beneficial to blood pressure control, particularly through ongoing professional support, tailored health education, and consistent monitoring.

Comparatively, with grand means of 2.99 and 2.95 for RSUMC and IAUEMC, respectively, it can be inferred that patients from both centres experienced similar benefits from multidisciplinary care in regulating blood pressure. However, the slightly higher grand mean recorded at RSUMC suggests a marginally stronger perception of the effectiveness of multidisciplinary diabetes management in improving blood pressure control compared to standard care. This minor difference may be due to differences in team coordination, patient follow-up systems, or access to support resources.

Research Question Three: *What differences exist in body mass index (BMI) changes and weight management outcomes between T2DM patients under multidisciplinary care and those receiving standard care in both medical centres?*

Table 3: Mean score and standard deviation of the differences that exist in body mass index (BMI) changes and weight management outcomes between T2DM patients under multidisciplinary care and those receiving standard care in both medical centres

S/N	Items	RSUMC (n=280)			IAUEMC (n=280)		
		\bar{x}	SD	Decision	\bar{x}	SD	Decision
.21	My healthcare team provides comprehensive weight management guidance	3.01	0.63	Agree	3.00	0.66	Agree
.22	I receive consistent weight management advice from all members of my care team	2.94	0.70	Agree	2.92	0.68	Agree
.23	I have regular access to a dietitian/nutritionist as part of my diabetes care	3.00	0.52	Agree	2.98	0.58	Agree
.24	The nutritional advice I receive is practical and tailored to my lifestyle	3.26	0.72	Agree	3.22	0.74	Agree
.25	My care team provides specific exercise recommendations for weight management	3.29	0.58	Agree	3.28	0.60	Agree
.26	My weight and BMI are regularly monitored and discussed with me	2.98	0.64	Agree	2.91	0.72	Agree
.27	I have noticed improvements in my weight since starting this care approach	2.99	0.61	Agree	2.96	0.64	Agree
.28	I feel motivated to maintain a healthy weight because of my care team's support	2.89	0.72	Agree	2.86	0.71	Agree
.29	My care team helps me address emotional/behavioural aspects of weight management	3.46	0.64	Agree	3.38	0.68	Agree
.30	I am satisfied with how my care team supports my weight management goals	2.89	0.93	Agree	2.84	0.96	Agree
	Grand Mean	3.07			3.04		

Criterion Mean = 2.5, Mean: 1.0-2.49 = Disagreed, 2.5-4.00= Agreed.

Table 4.7 shows the differences that exist in BMI changes and weight management outcomes between T2DM patients under multidisciplinary care and those receiving standard care in both RSUMC and IAUEMC. The result revealed that the majority of respondents from RSUMC agreed to all items (51–60), with mean scores greater than or equal to the criterion mean (2.50). The grand mean of 3.07 indicates that

most patients receiving treatment at RSUMC perceive multidisciplinary care as having a positive impact on their weight management and BMI improvement. This implies that the integration of dietitians, physical activity guidance, and emotional support from the care team contributes to effective weight control among patients.

Furthermore, the result showed that the majority of respondents from IAUEMC also agreed to all items (51–60), with mean scores above the criterion mean (2.50). The grand mean of 3.04 indicates that patients at IAUEMC likewise recognise that multidisciplinary care supports positive weight management outcomes. They reported satisfaction with individualised nutrition counselling, continuous motivation, and consistent follow-up, which collectively enhance adherence to healthy lifestyle practices.

Comparatively, with grand means of 3.07 and 3.04 for RSUMC and IAUEMC, respectively, it can be inferred that patients from both centres experience similar improvements in BMI and weight management outcomes under multidisciplinary care compared to standard care. However, the slightly higher grand mean at RSUMC suggests that patients in this centre perceive a marginally stronger influence of the multidisciplinary approach on weight and BMI control. This minor variation may be attributed to more structured weight monitoring routines, better access to nutritionists, or stronger behavioural support systems at RSUMC.

DISCUSSION OF FINDINGS

Comparative effect of multidisciplinary management versus standard care on glycaemic control

Both centres reported positive perceptions of multidisciplinary care on glycaemic control (grand means RSUMC = 3.07; IAUEMC = 3.09). Overall, the findings highlight that coordinated care involving doctors, nurses, dietitians, and diabetes educators is more effective than standard care alone in achieving sustained glycaemic control and improving the quality of life of diabetic patients in both institutions. Furthermore, the result of hypothesis four revealed that there is no significant difference in glycaemic control between T2DM patients receiving multidisciplinary diabetes management programs and those receiving standard care in both medical centres. This is consistent with randomised and quasi-experimental evidence showing multidisciplinary/ integrated care improves HbA1c and other metabolic outcomes. Tourkmani et al. (2018) reported significant reductions in HbA1c, FBG and some cardiovascular risk factors following an integrated multidisciplinary program, and Phillips et al. (2021) found a multidisciplinary clinic produced larger reductions in A1c and improved behavioural outcomes versus usual care. Similarly, a recent comparative implementation study (Ahmed et al., 2024) observed greater HbA1c improvement in a multidisciplinary program than in a primary-level clinic. These studies support the present findings that coordinated multidisciplinary care enhances glycaemic control compared to standard care.

The extent multidisciplinary care and standard care differ in impact on blood pressure regulation

Grand means (RSUMC = 2.99; IAUEMC = 2.95) indicate that patients perceive multidisciplinary care as beneficial for blood pressure regulation. Overall, the findings imply that multidisciplinary care exerts a more positive influence on blood pressure regulation among T2DM patients than standard care in both medical centres, highlighting the importance of integrated, patient-centred approaches to chronic disease management. Furthermore, the result of hypothesis five revealed that multidisciplinary care and standard care do not differ significantly in their impact on blood pressure regulation among T2DM patients at Rivers State University Medical Centre and Ignatius Ajuru University of Education Medical Centre. This aligns with systematic evidence that team-based interventions reduce systolic and diastolic BP (Tandan et al., 2024), and with the integrated care trial by Tourkmani et al. (2018), which demonstrated modest but significant reductions in systolic and diastolic BP in the intervention group. The convergence of our results with these studies suggests that multidisciplinary approaches that include medication review, lifestyle counselling and frequent follow-up can positively influence BP control among T2DM patients.

Differences in BMI changes and weight management outcomes (multidisciplinary vs standard care)

Both centres recorded positive perceptions of multidisciplinary care on weight management (grand means RSUMC = 3.07; IAUEMC = 3.04), especially regarding tailored nutrition, exercise guidance and emotional/behavioural support. Overall, the findings imply that multidisciplinary diabetes management

positively influences weight management and BMI regulation among T2DM patients in both institutions, underscoring the effectiveness of coordinated, team-based care in promoting holistic diabetes outcomes. Furthermore, the result of hypothesis six revealed that there is no significant difference in body BMI changes and weight management outcomes between T2DM patients under multidisciplinary care and those receiving standard care in both medical centres. This is supported by multidisciplinary weight management programs that report improved weight outcomes and glycaemic control. Bishay et al. (2013) showed significant long-term weight loss and improved glycaemic control in an intensive, multidisciplinary program for obese T2DM patients, while Taïeb et al. (2022) reported improved HbA1c (though not always weight loss) after a short hospitalised multidisciplinary intervention with sustained follow-up. Silveira et al. (2023) also demonstrated that structured diabetes education within multidisciplinary teams improved glycaemic control and reduced complications, underscoring the role of integrated behavioural and nutritional support in weight management.

CONCLUSION

Based on the analysis of findings, this study concluded that while multidisciplinary diabetes management (MDM) is positively perceived by patients and supported by extant literature as an effective model for holistic care, its implementation in the studied contexts did not yield statistically superior clinical outcomes relative to standard care. The study affirmed the conceptual alignment of MDM with evidence-based practice for Type 2 Diabetes Mellitus. It underlined the necessity for optimized implementation and robust evaluation to ensure that the structural advantages of multidisciplinary care consistently manifest in significant clinical improvements.

RECOMMENDATIONS

The following recommendations were made based on the findings of this study:

1. Hospitals should sustain and expand multidisciplinary diabetes management teams that include physicians, nurses, dietitians, and psychologists to provide holistic glycaemic management services.
2. Hospitals should integrate hypertension screening and management within diabetes clinics, ensuring that patients receive comprehensive cardiovascular risk reduction services alongside diabetes treatment.
3. Regular weight monitoring, nutrition counselling, and structured exercise programs should be integrated by hospital management into diabetes follow-up visits to enhance weight and BMI outcomes.

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