



Assessing Disparities in Type II Diabetes Care: Self-Care Behaviours and Glycemic Outcomes in Public and Private Hospitals in India

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Abstract: This cross-sectional study investigated disparities in self-care behaviours and glycemic control among 303 Type II diabetes patients treated at public and private hospitals in rural India. Participants were assessed using the Diabetes Self-Management Questionnaire (DSMQ) and their most recent HbA1c level. Results indicated that patients treated at private hospitals exhibited significantly better self-care behaviors ($p < 0.001$) and marginally better glycemic control ($p < 0.05$) than those treated at public hospitals. Strong negative correlations were observed between HbA1c levels and glucose monitoring ($r = -0.692$), physician contact ($r = -0.557$), overall self-care management perception ($r = -0.632$), diet adherence ($r = -0.455$), and physical activity ($r = -0.455$). Regression analysis revealed that glucose monitoring, physical activity, and overall self-care management perception accounted for 51.5% of the variance in the HbA1c levels. These findings suggest that public healthcare systems need to address disparities in diabetes management by providing comprehensive care, including psychological support and improved access to resources. Enhancing patients' self-care behaviors and creating supportive healthcare environments may reduce the burden of Type II diabetes and improve health outcomes for all patients regardless of their socioeconomic status.

Keywords: *Type II Diabetes, Self-Care Behavior, Glycemic Control, Public Hospitals, Private Hospitals, Rural India, Healthcare Environment*

1. Background of the Study

Diabetes mellitus is a chronic metabolic condition defined by either insufficient insulin production or inability of the body to effectively utilize insulin for glucose energy extraction. The International Diabetes Federation reports that approximately 10.5% of adults aged between 20 and 79 years currently have diabetes worldwide, with estimates suggesting an increase to 783 million by 2045 (IDF, 2024). In India, approximately 73 million people live with diabetes, and 47% of the cases are undiagnosed, indicating a high prevalence of poor self-management practices (Basu & Sharma, 2019). The public sector primary care system in India provides free services, but lacks patient-centered care, undermining diabetes self-management education and support. Factors such as poor patient knowledge, suboptimal medication adherence, and clinical inertia worsen diabetes care standards in Indian primary care settings (Basu and Sharma 2019). Interestingly, while educational level may not be a good predictor of better therapeutic compliance, patients with higher education levels demonstrated better awareness of complications and higher rates of adherence to diet. However, there is a high rate of poor adherence to diet (68%) and exercise (79.4%) among patients with diabetes, especially among females (Al-Rasheedi, 2014). This contradicts findings from other studies that show consistent evidence of no disparities in exercise, and some evidence of reverse disparities in diet and self-monitoring of blood glucose among different ethnic groups (Mayberry et al., 2016). To address disparities in diabetes care in India, there is a need for government initiatives to provide comprehensive outpatient care, including uninterrupted drug supplies, essential laboratory investigations, qualified diabetes educators, and specialist support (Basu & Sharma, 2019). Additionally, integrating depression screening and smoking cessation services at the primary care level is necessary. Educational programs emphasizing adherence to treatment regimens, especially diet, exercise, and regular follow-up, are crucial for improving glycemic control (Al-Rasheedi, 2014). Further research is needed to assess disparities in self-foot examinations, smoking cessation, and diabetes-specific problem-solving and coping strategies in the Indian context (Mayberry et al., 2016).

The main objective in managing diabetes is to assist patients in achieving blood glucose levels close to normal, thus reducing the risk of long-term complications, such as vascular problems, while simultaneously avoiding metabolic risks and maintaining the highest possible quality of life. The effective management of diabetes involves maintaining optimal blood sugar levels through self-management strategies. People with diabetes should limit their intake of carbohydrates by selecting appropriate foods, following a well-balanced diet with low glycemic impact, controlling glucose levels with suitable medications, consistently checking blood sugar levels using proper devices, and participating in sufficient exercise under the supervision of healthcare professionals (Davies et al., 2017).

Persistent or recurring high blood sugar levels elevate the likelihood of developing serious long-term diabetic complications, including nerve damage, kidney disease, foot problems, and eye disorders. Additionally, inadequate blood glucose control is linked to increased risks of acute metabolic issues, such as severe low or extremely high blood sugar, which can lead to ketoacidosis or hyperosmolar coma (Alam et al., 2008; Schmidt C., 2018; Davies MJ et al., 2008).

Effective management of diabetes by patients themselves is essential for controlling disease progression. Regular assessment of relevant behaviors in individuals with diabetes can highlight areas requiring improvement and guide the provision of appropriate education and support in clinical settings (Schmitt et al., 2021). Despite governmental efforts to combat diabetes at both the state and national levels, its prevalence continues to increase. While Type II diabetes was once primarily associated with older adults, it is now increasingly affecting younger populations due to lifestyle changes and rising obesity rates. Consequently, younger patients are now being diagnosed with Type II diabetes.

For patients with Type II diabetes, maintaining proper blood sugar levels and engaging in self-management practices are crucial for effective treatment. The type of healthcare facility, whether it is a public sector hospital, specialized diabetes treatment center, or local medical institution, can play a significant role in determining patient results. This study examined how various hospital settings influence self-management behaviours and blood glucose control among individuals diagnosed with Type II diabetes.

1.1 Self-care Practices

In diabetes management, self-care involves dietary changes, regular exercise, blood glucose monitoring, medication adherence, and consistent medical checkups. Research indicates that these behaviors may be influenced by the type of hospital that provides care. Many adults with type 2 diabetes mellitus struggle to maintain health-care behaviours.

Self-care practices play a crucial role in the management of type 2 diabetes mellitus (T2DM). Studies across various countries have shown that these practices significantly affect glycemic control and overall health outcomes in patients with diabetes. Key self-care activities included medication adherence, blood glucose monitoring, dietary modification, physical activity, and foot care. However, compliance with these practices varies significantly. Although most patients tend to adhere to medication regimens, other self-care activities often result in lower compliance rates. Factors influencing self-care practices included sex, age, educational level, and income. Notably, males and those with lower incomes were less likely to engage in self-care activities (Johani et al., 2015).

Interestingly, some studies have revealed contradictions in self-care behaviors. For instance, while one study found that over 90% of respondents were compliant with not eating high-fat foods and regularly monitoring glucose (Sirari et al., 2018), another study indicated that only 15% of the

participants achieved good glycemic control (Johani et al., 2015). This discrepancy highlights the complex nature of diabetes management and potential gap between knowledge and practice. While self-care practices are essential for managing T2DM, there is room for improvement in patient compliance. Healthcare systems, especially in developing countries, need to prioritize and support the integration of self-care practices into diabetes management strategies (Abiodun et al., 2024).

Emphasis should be placed on educating patients, particularly those with lower educational levels and income, about the importance of comprehensive self-care, including diet, physical activity, and foot care (Sirari et al., 2018). Tailored interventions and regular follow-ups may help bridge the gap between knowledge and practice, ultimately leading to better glycemic control and improved quality of life in T2DM patients.

Specialty diabetes centers have demonstrated significant benefits in delivering comprehensive diabetes education and management programs, leading to improved patient outcomes and self-care practices. Studies have shown that patients receiving care at specialty diabetes centers experience higher quality care, fewer complications, and improved survival rates than those receiving standard primary care (Paul et al., 2019). These centers often employ a multidisciplinary team approach, including endocrinologists, nurse practitioners, certified diabetes educators, and nutritionists, to provide comprehensive care (Malkani et al., 2023).

The International Diabetes Center in Minneapolis has been at the forefront of developing and disseminating diabetes education programs globally since 1967, training thousands of health professionals and establishing a network of affiliated centers (Etzwiler, 1986). Interestingly, although specialty centers have shown benefits, access to these facilities can be limited in medically underserved areas. To address this issue, innovative approaches, such as the Endo ECHO program, have been developed to connect specialists at academic medical centers with primary care providers through virtual clinics, showing comparable quality measures to in-person specialty care for many aspects of diabetes management (Paul et al., 2019). Additionally, nurse-led diabetes clinics have emerged as potential solutions to address physician shortages, although patient acceptance of this model varies (Al-Alawi & Al-Mandhari, 2020). Specialty diabetes centers play a crucial role in improving diabetes management and patient outcomes. However, to ensure equitable access to high-quality diabetes care, innovative approaches such as telemedicine and nurse-led clinics are being explored to extend the reach of specialty care in underserved populations.

1.2 Glycaemic Control

The relationship between hospital type and blood sugar management is complex. Studies have consistently demonstrated that patients treated at specialized diabetes facilities or private clinics tend to achieve better glycemic control than those receiving care in public hospitals.

The relationship between hospital type and glycemic control in patients with diabetes is complex, with limited direct evidence provided in the given context. However, some relevant insights can be drawn from the available information, and a study conducted at a tertiary hospital in Bangladesh found that 71.3% of the patients had uncontrolled diabetes (Islam et al., 2020). This suggests that even in specialized healthcare settings, achieving glycaemic control remains challenging. The study also highlighted that patients who did not visit a physician or healthcare center in the past three months had twice the odds of having uncontrolled diabetes compared to those who did (Islam et al., 2020). Interestingly, research from a Veterans Affairs (VA) medical center in the United States found no significant association between self-monitoring of blood glucose (SMBG) and glycemic control in patients with type 2 diabetes treated with oral hypoglycemic medications (Wen et al., 2004). This finding contradicts the common assumption that more frequent monitoring in specialized settings leads to better glycemic control.

A study from a primary care setting in Saudi Arabia revealed alarmingly low rates of concomitant control over multiple diabetic care goals. Only 43.7% of patients achieved glycemic control, and even fewer achieved concomitant control of blood pressure and lipids along with glycemic control (Alhamwy et al., 2019). This suggests that even in primary care settings, comprehensive diabetes management remains a challenge. While the context does not provide direct comparisons between different types of hospitals, it suggests that achieving glycemic control is challenging across various healthcare settings, from tertiary hospitals to primary care clinics. Factors such as regular physician visits, comprehensive care addressing multiple health parameters, and patient education may be more critical in determining glycemic control than the hospital type alone.

1.3 Rationale for the Present Study

This study aimed to investigate the potential disparities in self-care behaviours and glycemic control among patients with Type II diabetes treated at public versus private hospitals in rural India. By examining these differences, we can gain valuable insights into the factors that influence diabetes management and identify areas for improvement in health care delivery.

1.4 Research Questions

- a) Do people with type II diabetes have adequate self-care behaviours in rural India?
- b) Does the preference/option of choosing a type of hospital make a difference?
- c) Does glycemic control of treatment seekers change with regard to the type of hospital?
- d) Does better self-care behaviour lead to better glycemic control?

1.5 Objectives of the Study

- a) To assess the adequacy of self-care behaviours among people with Type II diabetes in rural India, we addressed the gap in knowledge about diabetes management practices in this specific population.

- b) Determine whether the type of hospital (public or private) influences patients' self-care behaviours and glycemic control, potentially highlighting systemic differences in diabetes care quality and patient education.
- c) To explore the relationship between self-care behaviors and glycemic control, reinforcing the importance of patient education and self-management support in diabetes care.
- d) To identify specific self-care practices that have the most significant impact on glycemic control and guide future interventions and resource allocation in diabetes management programs.
- e) To provide evidence to inform health policy decisions and guide improvements in diabetes care delivery, particularly in resource-limited settings such as rural India.

By addressing these objectives, this study aimed to contribute to the improvement of Type II diabetes management in rural India and potentially reduce the burden of this chronic condition on patients and healthcare systems. These findings may also have broader implications for diabetes care in other developing countries facing similar challenges in healthcare delivery and resource allocation.

2. Methods

The present study was conducted to determine whether there is any difference in self-care behaviour and glycemic control according to the type of hospital where patients with type II diabetes are receiving treatment using cross sectional research design.

2.1 Sample

Using purposive sampling, this study assessed 303 patients with type II diabetes from public and private hospitals in the Madurai and Krishnagiri districts of Tamil Nadu, India.

2.2 Tools

Data were collected using the following instruments.

2.2.1 The diabetes self-care management questionnaire (Schmitt et al. 2013)

The Diabetes Self-Management Questionnaire (DSMQ) developed by Schmitt et al. (2013) is a validated instrument designed to assess self-care behaviors in individuals with diabetes. This questionnaire evaluated various aspects of diabetes self-management, including the following:

1. Glucose management
2. Dietary control
3. Physical activity
4. Healthcare use

The DSMQ consists of 16 items rated on a 4-point Likert scale ranging from 0 (does not apply to me) to 3 (applies to me very much). It provides a total score and subscale scores for each self-care behavior domain.

Researchers and healthcare professionals use the DSMQ to

- a) Assess patients' self-care behaviours
- b) Identify areas for improvement in diabetes management
- c) Evaluate the effectiveness of diabetes education programs
- d) Monitor changes in self-care behaviours over time

The questionnaire comprises 16 items, with seven phrased positively and nine negatively in relation to effective self-care practices. It enables the calculation of a 'Sum Scale' score and four subscale scores. Based on their content, the subscales are categorized as 'Glucose Management' (questions 1, 4, 6, 10, 12), 'Dietary Control' (questions 2, 5, 9, 13), 'Physical Activity' (questions 8, 11, 15), and 'Health-Care Use' (questions 3, 7, 14). An additional item (16) asks for an overall self-care assessment and is exclusively included in the 'Sum Scale' calculation.

The questionnaire evaluation process involved inverting negatively phrased items to ensure that higher values corresponded to more effective self-care. The sum totals of item scores were calculated for each scale and then converted to a 0-10 range by dividing the raw score by the maximum possible score and multiplying by 10. For instance, in the 'Glucose Management' subscale, a raw score of 12 would result in a transformed score of 8 ($12 / 15 * 10$). A score of 10 represented the highest self-assessment of the behavior in question. Items marked as 'not required as a part of my treatment' were excluded, and the scale score calculation was adjusted accordingly by reducing the maximum theoretical score by three points.

2.2.2 Glycaemic index level recorded in the patient's recent medical report along with socio-demographic data sheet

2.3 Ethical consideration

Before collecting the data, the participants were informed about the study and its purpose, and written consent was obtained from all participants. The present study obtained the necessary ethical clearance from the university ethical research board committee for studies involving human participants.

2.4 Data Analysis

Data analysis was performed using Jamovi software. Descriptive statistics, Pearson product-moment correlation, independent sample t-test, and multiple regression were performed to analyse the collected data.

3. Results and Discussion

Table 1. Participant profile

Parameters	Frequency (n)	Percentage (%)
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Gender		
Male	151	49.8
Female	152	50.2
Age		
Upto 53	151	49.8
54- 75	152	50.2
Type of Hospital		
Public	149	49.2
Private	154	50.8

The table presents a demographic overview of the study sample, showing the distribution of participants according to sex, age, and hospital type. The gender distribution was nearly equal, with 49.8% (n=151) males and 50.2% (n=152) females, ensuring a balanced representation. In terms of age, the sample was evenly divided between two groups: 49.8% (n=151) of participants were aged 53 years or younger, while 50.2% (n=152) were aged between 54 and 75 years. Regarding hospital type, 49.2% (n=149) of participants received care in public hospitals and 50.8% (n=154) were treated in private hospitals, reflecting a nearly equal split between the two sectors. This demographic composition suggests a diverse and representative sample, providing a solid foundation for analyzing the relationship between self-care behaviors and glycaemic control across healthcare settings.

Table 2: *The relationship between Self-care Behaviour and Glycaemic Control (HbA1c)*

Self-care Behaviour	Glycaemic Control (HbA1c)
Glucose Monitoring	-0.692***
Physician Contact	-0.557***
Diet Adherence	-0.455***
Physical Activity	-0.455***
Overall self-care management perceived by patients	-0.632***

Note: *** P < 0.001

The results indicated a significant relationship between various self-care behaviors and glycemic control, as reflected by HbA1c levels. Strong negative correlations were found between glucose monitoring (-0.692), physician contact (-0.557), overall self-care management as perceived by patients (-0.632), diet adherence (-0.455), and physical activity (-0.455) with HbA1c levels. These findings suggest that improvements in self-care behaviors are associated with better glycaemic control, with glucose monitoring showing the strongest influence. Regular monitoring of blood glucose levels, consistent contact with healthcare providers, and positive self-perception of self-care appear to be particularly effective in managing blood glucose levels. While diet adherence and physical activity also contribute to better glycaemic control, their relationships with HbA1c were

somewhat weaker but still significant. Collectively, these results underscore the critical role of structured and consistent self-care practices in achieving optimal diabetes management and improving long-term health outcomes including monitoring, medical support, and lifestyle choices.

Variables	Type of Hospital	Mean	SD	"t"	P value
Glucose Monitoring	Public	3.81	3.21	5.11***	<0.001
	Private	5.72	3.32		
Physician Contact	Public	6.33	2.91	2.99**	<0.05
	Private	7.32	2.88		
Diet Adherence	Public	5.37	2.33	2.95**	<0.05
	Private	6.17	2.37		
Physical Activity	Public	4.90	3.56	2.88**	<0.05
	Private	6.10	3.71		
Overall self-care management perceived by patients	Public	4.41	3.96	3.99**	<0.05
	Private	6.26	4.09		
HBA1c	Public	8.52	1.50	5.20**	<0.05
	Private	7.66	1.37		

The independent sample t-test results in Table 3 show that participants treated at a private hospital were found to have better self-care behavior than those treated at public hospitals, leading to rejection of the null hypothesis that no significant difference exists between self-care behavior and the type of hospital. This difference may be attributed to the psycho-educational programs regularly provided to patients in private diabetic hospitals, a practice lacking in public hospitals' non-communicable departments. Consequently, a slight but significant difference in glycemic control was observed between private and public hospital treatment seekers, necessitating further exploration of the factors influencing self-care behavior in patients with type II diabetes. Private hospitals tend to attract different patient populations than public hospitals. Beckert and Kelly (2017) indicated that poor and ethnic minority patients were less likely to choose private hospitals after reforms, allowing private providers to compete with public ones. This finding suggests potential disparities in access and utilization between public and private facilities. Interestingly, Kelly and Stoye (2020) found that when private hospitals entered the market for elective procedures such as hip replacements, it increased the overall capacity and number of procedures performed, but did not reduce volumes at public hospitals or improve quality metrics such as readmission rates. This implies that private hospitals may not necessarily provide better care or outcomes than public hospitals.

Table 4: *Regression analysis***Influence of Self-care behaviour and HbA1c levels in patients with type II diabetes**

Selfcare behaviours	'B'	Sig.	Model summary
Glucose monitoring	-0.247	<0.001	$r^2 = 0.515$ F=63 P=0.001
Physician contact	-0.013	0.707	
Diet Adherence	-6.402	0.986	
Physical activity	0.065	<0.009	
Perception of overall self-care management	-0.104	<0.001	
Intercept	9.564		

Outcome Variable: *HbA1c*

Predictors: *Glucose monitoring, Physician Contact, Diet, Physical Activity, Perception of overall selfcare management*

Table 4 shows various self-care behaviours that influence HbA1c levels in patients with type II diabetes. Three specific factors were found to have a negative influence on HbA1c levels: glucose monitoring (-0.247), physical activity (0.065), and perception of overall self-care management (-0.104). A negative influence suggests that as these behaviours increase, HbA1c levels tend to decrease, which is desirable for diabetes management. The table shows that self-care behaviour accounted for 51.5% of the variance in HbA1c levels ($r^2 = 0.515$). This indicates that a substantial portion of the variability in HbA1c levels can be explained by self-care behaviours.

Our results confirmed that self-monitoring of blood glucose was a protective factor for better HbA1c control. This indicates a positive influence on glycemic control rather than a negative influence. Physical activity, particularly moderate activity, is significantly associated with lower HbA1c levels (Min & Harvey, 2022). Additionally, structured exercise training, including aerobic exercise, resistance training, or a combination of both, is associated with a decline in HbA1c levels (Umpierre, 2011). This suggests that physical activity has a positive impact on glycemic control. Interestingly, these studies have presented contradictory findings. While most studies indicate that physical activity and glucose monitoring improve HbA1c levels, Min and Harvey (2022) found that sedentary behavior was associated with lower HbA1c levels ($P=0.04$). However, this unexpected result warrants further investigation. While, the majority of evidence suggests that glucose monitoring and physical activity have a positive influence on HbA1c levels, contrary to the statement in the question.

4. Conclusion

This study highlights the urgent need for public healthcare systems to address disparities in diabetes management, emphasizing the importance of comprehensive care, which includes psychological support and improved access to resources. By focusing on enhancing patients' self-care behaviour's and creating supportive healthcare environments, we can potentially reduce the burden of Type II diabetes and improve the overall health outcomes for all patients, regardless of their socioeconomic status.

Limitation(s) of the study

The cross-sectional nature of this study limits the ability to establish causal relationships between variables. It provides a snapshot of the situation at a single point in time rather than examining changes over time. This study was conducted in specific districts of Tamil Nadu, which may limit the generalizability of the findings to other regions in India or other countries. Using a single HbA1c measurement may not fully capture long-term glycemic control. While the study compared public and private hospitals, it may not have fully explored the underlying socioeconomic factors that influence hospital choice and care quality.

Implications of the study

The study identified significant differences in self-care behaviours and glycemic control between patients in public and private hospitals, indicating disparities in quality of diabetes care and education across healthcare settings. The inverse relationship between self-care behaviours and HbA1c levels highlights the essential role of patient education and self-management in diabetes care. Public hospitals may need to improve their diabetes education programs to enhance their patient outcomes. Specific self-care behaviours (glucose monitoring, physical activity, and overall self-care management) significantly influenced glycemic control. This information can guide healthcare providers in prioritizing patient education and support. Public health care systems need to allocate more resources to comprehensive diabetes care, including psychological support and better access to self-management tools and education. This study underscores the benefits of a comprehensive, multidisciplinary approach to diabetes management, which is more common in private healthcare. Public hospitals should explore incorporating these approaches into their resource constraints. The impact of self-care behaviours on glycemic control emphasizes the need for ongoing patient support and monitoring both during hospital visits and in community settings. This study suggests further research into the factors contributing to better outcomes in private hospitals and how these can be adapted in public healthcare settings.

Statements and Declarations

1. Author Contribution:

A. wrote the main manuscript, conceptualization, Methodology, data collection, Data Analysis, Study administration.

B. Conceptualization, Study administration, Data Analysis, supervision, review of the manuscript.

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10. Informed Consent: Written consent has been taken before conduction of the study.

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