

Diabetes Health Literacy as Correlate of Hospital Readmission Among Diabetes Patients

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doi: <https://doi.org/10.37745/ijphpp.15/vol9n38092>

Published December 15, 2024

Citation: Aliyu M.A. and Wennie J. (2024) Diabetes Health Literacy as Correlate of Hospital Readmission Among Diabetes Patients, *International Journal of Public Health, Pharmacy and Pharmacology*, 9 (3), 80-92

Abstract: *Diabetes mellitus (DM) is a global health challenge requiring effective self-care, education, and management to reduce complications and hospital readmissions. This study examined the relationship between diabetes health literacy and hospital readmissions among 277 diabetes patients across three healthcare facilities in Ijebu-Ode, Ogun State, Nigeria. Data on self-care knowledge, self-efficacy, and self-management were collected and analyzed using Pearson correlation at a 0.05 significance level. Results showed strong positive correlations between higher diabetes health literacy and reduced hospital readmissions, with self-care knowledge ($r = 0.969, p < 0.05$), self-efficacy ($r = 0.950, p < 0.05$), and self-management ($r = 0.876, p < 0.05$) as key determinants. Limited health literacy predicted adverse outcomes, emphasizing the need for targeted education and psychosocial support. The findings highlight the importance of integrated care models addressing educational, psychological, and behavioural dimensions to improve diabetes outcomes and reduce healthcare burdens in resource-limited settings.*

Keywords: Diabetes, Health Literacy, Hospital Readmission, Patients

INTRODUCTION

Diabetes mellitus (DM) is a chronic and complex global health challenge, necessitating rigorous self-care, education, and effective management to reduce complications and improve patient outcomes. Patients with diabetes often rely on both verbal instructions and printed materials to support self-care practices such as dietary adjustments and medication adherence. However, these require advanced health literacy skills to comprehend and apply effectively (White et al., 2019). With the global prevalence of diabetes projected to rise to 643 million by 2030 and 783 million by 2045 (International Diabetes Federation, 2021), the condition poses a significant burden on healthcare systems worldwide. Health literacy (HL) has emerged as a critical factor in diabetes management, as individuals with low HL are less likely to understand health information or engage in effective communication with healthcare providers, leading to poor self-management and an increased likelihood of hospital readmission (Leung et al., 2012).

Hospital readmission among diabetes patients—defined as the return of a previously treated patient to the hospital within a specific timeframe, often 30, 60, or 90 days—has significant implications for healthcare quality and costs (Sonmez et al., 2019). Readmissions are frequently used as a metric for evaluating the quality of care but are poorly standardized, with varying definitions and timeframes (Landrum & Weinrich, 2018). Factors contributing to readmissions include inadequate treatment, poor care transitions, and insufficient patient education, which are especially relevant in resource-limited settings like Nigeria (Witherington, 2019). These challenges highlight the importance of examining interventions that address the discharge process, such as patient-centered education, follow-up care, and coordinated handovers, which can mitigate the risks associated with accelerated hospital discharges and improve overall outcomes (Mistiaen et al., 2019).

The burden of diabetes in sub-Saharan Africa, particularly Nigeria, is alarming, with prevalence rates ranging from 0.65% in rural areas to 11% in urban settings (Wild et al., 2019). A significant portion of individuals with diabetes in Nigeria remains undiagnosed or untreated, contributing to high rates of morbidity and mortality (International Diabetes Federation, 2012). Factors such as urbanization, lifestyle changes, and demographic shifts are driving this trend, underscoring the need for effective diabetes management strategies, including improved health literacy (Oluwayemi et al., 2020). Effective diabetes self-management requires a high level of health literacy to enable patients to monitor blood glucose levels, regulate diets, administer medications, and manage stress (Gonzalez et al., 2019). Diabetes health literacy is particularly critical in this regard, as it empowers patients to make informed decisions about their care and reduces the risk of complications, including hospital readmissions (Kinfu et al., 2019).

Despite growing evidence of the relationship between health literacy and diabetes outcomes globally, there is a paucity of research on this subject in Nigeria, particularly in communities like Ijebu-Ode in Ogun State. Limited studies have examined how diabetes health literacy, encompassing knowledge of self-care, self-efficacy, and self-management, influences readmission rates. Addressing this gap is crucial, as patients with poor diabetes health literacy are more likely to experience adverse outcomes such as medication errors and poor glycemic control, which heighten the risk of hospital readmission (Donihi, 2019). This study seeks to assess diabetes health literacy as a determinant of hospital readmissions among diabetes patients in selected hospitals within Ijebu-Ode, Ogun State, thereby contributing valuable insights to improve diabetes care and reduce healthcare burdens in similar settings.

LITERATURE REVIEW

Health literacy (HL) significantly influences diabetes management, particularly in self-care practices. HL is defined as the ability to acquire, process, and understand health information to make informed health decisions (Berkman et al., 2010). Patients with adequate HL are better equipped to interpret medical instructions, follow treatment regimens, and achieve improved health outcomes (Marmot et al., 2015; Protheroe et al., 2009). Conversely, inadequate HL is linked to poorer self-care, reduced adherence to medical advice, and increased healthcare utilization (Wang et al., 2015). For diabetes patients, HL encompasses understanding the disease, recognizing symptoms of hypoglycemia and hyperglycemia, and mastering the administration of medication (Arbabi et al., 2017; Mohammadi et al., 2015). Effective diabetes

management relies heavily on self-care, which constitutes approximately 98% of diabetes care (Jordan & Jordan, 2010). Self-care involves medication adherence, lifestyle adjustments, and monitoring of blood glucose levels (Mohebi et al., 2013). Research has consistently demonstrated that poor self-care exacerbates diabetes complications, including retinopathy, nephropathy, neuropathy, and cardiovascular diseases (Reisi et al., 2016b). Despite the centrality of self-care, low HL often hinders patients' ability to understand and implement self-care practices, leading to poorer glycemic control and increased readmission rates (Singh et al., 2018; Juul et al., 2018). This reveals the importance of tailored patient education to meet individual learning needs, thereby improving adherence and outcomes. Self-efficacy, the confidence in one's ability to execute health behaviors, plays a crucial role in diabetes management (Mohebi et al., 2013). It is strongly associated with self-care behaviors and glycemic control (Karter et al., 2000). Notably, HL and numeracy—defined as the ability to apply mathematical reasoning in health contexts—are interrelated factors that impact self-efficacy. While both HL and numeracy influence diabetes self-care, numeracy often emerges as the stronger predictor due to its direct application in tasks such as insulin dosage adjustments and glucose monitoring (Cavanaugh, 2011; Osborn et al., 2010). This finding emphasizes the need for targeted interventions that address numeracy skills alongside general HL to empower patients with lower HL levels.

Hospital readmission is a critical outcome metric and a financial burden for healthcare systems, especially among Medicare populations (Anbarasan, 2019). Readmission rates are influenced by patient factors, including race, socioeconomic status, and HL (Abdullah et al., 2020). Inadequate HL is a significant risk factor for readmissions, as patients may fail to understand discharge instructions or adhere to follow-up care (Momeni et al., 2020). Moreover, poor HL has been linked to suboptimal self-management and increased readmission rates. Recognizing HL as a determinant of readmissions can guide interventions to reduce hospital stays and associated penalties under programs such as the Centers for Medicare and Medicaid Services' readmission adjustment factors (Kaboudi et al., 2017).

Educational interventions tailored to individual HL levels have shown promise in improving diabetes outcomes. For example, computer-based programs have been effective, though their benefits may be limited for patients with low HL (Reisi et al., 2016a). Alternative strategies, such as interactive and critical HL training, can better engage patients in managing their health (Nutbeam et al., 2000a). The inclusion of community-based support systems and culturally sensitive education programs further bolsters HL and reduces disparities in diabetes care outcomes (Dahal et al., 2019; Nutbeam et al., 2018). Demographic variables such as age, gender, education, and income significantly affect HL levels among diabetes patients (Chahardah et al., 2018). These factors not only influence the acquisition of diabetes knowledge but also the likelihood of hospital readmissions (Kassim et al., 2012). Studies indicate that interventions targeting vulnerable populations with tailored education and support systems can mitigate the adverse effects of low HL on diabetes management (Asharani et al., 2021).

Health literacy is a cornerstone of effective diabetes management and a critical determinant of hospital readmission rates. Enhancing HL through patient-centred educational initiatives, numeracy training, and supportive interventions can empower patients to manage their

condition, reduce complications, and prevent readmissions. Future research should explore integrative approaches combining HL, self-efficacy, and numeracy to address the multifaceted challenges of diabetes care. By prioritizing HL improvement, healthcare systems can foster better outcomes, reduce disparities, and alleviate the burden of chronic disease management.

Methodology

This study employed a structured methodological approach to investigate the role of diabetes health literacy as a determinant of readmission among diabetes patients in selected hospitals in Ijebu-Ode, Ogun State, Nigeria. The study adopted a descriptive survey design, enabling the collection of data at a single point in time. This design was deemed appropriate for systematically obtaining data to describe characteristics, behaviours, and patterns relevant to diabetes health literacy and its impact on hospital readmission. By integrating diverse forms of data, the descriptive survey provided an insightful snapshot of the study population and the phenomenon under investigation. The study was conducted in Ijebu-Ode Metropolis, Ogun State, Nigeria. Ijebu-Ode, located 110 kilometres northeast of Lagos State and within 100 kilometres of the Atlantic Ocean, has a tropical climate and serves as the cultural and administrative headquarters of Ijebu land, a subgroup of the Yoruba ethnic group.

Data for this study were collected from three healthcare facilities within Ijebu-Ode, Ogun State. These facilities included one government-owned hospital and two private hospitals, each with unique characteristics and service capacities. The State Hospital, Ijebu-Ode, is a government-owned healthcare institution offering comprehensive 24-hour services. With a capacity of 226 beds, the hospital is staffed by 104 nurses and over 50 medical doctors, supported by multiple laboratories. The hospital provides outpatient and inpatient care, along with specialized services in emergency medicine, pediatrics, obstetrics, and gynecology. Oyins Hospital, located in Olisa, Ijebu-Ode, is a private facility that delivers a range of medical services, including outpatient and inpatient care, as well as surgical, gynecological, and pediatric services. This hospital also operates round the clock and is staffed by 14 nurses, with a patient care capacity of 15–20 beds. Olu Ola Specialist Hospital, situated in Odo Egbo, Ijebu-Ode, is a renowned private healthcare facility known for handling emergencies and providing both inpatient and outpatient services. The hospital specializes in medical, surgical, pediatric, and obstetrics/gynecology care. It is supported by 18 nurses and has a total of 30 bed spaces. These facilities were selected to ensure a representative sample of healthcare environments catering to diabetes patients within the region.

Participants were selected using the convenience sampling method, a non-probability approach where units are chosen based on their availability and willingness to participate. Only consenting adults diagnosed with diabetes for a minimum of six months and with at least two prior hospital admissions were included. Excluded were patients with gestational diabetes, severely ill patients, and those with cognitive impairments. The sample size was calculated using Slovin's formula:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

- nn = sample size,
- NN = total population,
- ee = margin of error (5%).

Based on the total population of 690 diabetes patients across the three hospitals, the sample size was determined to be 253. An additional 10% (25 participants) was added to account for attrition, resulting in a final sample size of 277 respondents.

Table 1: Sample size distribution

Hospital	Population Size (N)	Sample Size (n)
State Hospital	498	182
Oyins Hospital	80	29
Olu Ola Specialist	112	41

The study utilized a self-structured and adapted questionnaire, titled *Diabetic Health Literacy and Readmission Questionnaire (DHLRQ)*. The instrument comprised five sections with a total of 56 items: The study employed a structured questionnaire to gather data, comprising multiple sections designed to address key variables relevant to the research objectives. The Demographic Information section included eight items aimed at capturing the participants' basic background details. The Knowledge on Self-Care section consisted of 15 items adapted from Itasanmi et al. (2022). These items were designed to evaluate the participants' understanding of self-care practices related to diabetes management and were measured using a 4-point Likert scale ranging from *Strongly Agree* to *Strongly Disagree*. The Self-Efficacy section featured nine items adapted from Gandoy-Crego et al. (2016). This section assessed the participants' confidence in their ability to manage diabetes effectively, with responses also measured on a 4-point Likert scale. The Self-Management Literacy section included 16 items adapted from Schmitt et al. (2013). These items evaluated the participants' literacy levels concerning diabetes self-management practices and were similarly rated using a 4-point Likert scale. The final section, Readmission Causes, comprised eight items that explored the reasons behind hospital readmissions among diabetes patients. This section combined closed-ended questions with items measured on a 4-point Likert scale.

The reliability of the questionnaire was assessed through a test-retest method. A pilot study was conducted with 25 diabetes patients from Olabisi Onabanjo University Teaching Hospital, Sagamu, who were not part of the primary study. Using Cronbach's Alpha, a coefficient above 0.70 was achieved, confirming the instrument's reliability. The instrument's content validity was established through expert review by the research supervisor and related specialists. Their feedback ensured the questionnaire appropriately captured the study objectives and measured the intended variables. Data collection was carried out over three to four weeks during the outpatient clinics' designated days (Tuesdays, Wednesdays, and Thursdays). A letter of

introduction facilitated access to the study sites. Participants were briefed on the study objectives, and informed consent was obtained before participation. To ensure accuracy and efficiency, the researcher was supported by two trained research assistants who guided participants in completing the questionnaires and collected the instruments upon completion. Inferential statistics of Pearson Correlation Coefficient was employed to test the hypotheses stated at a 0.05 level of significance.

The study adhered to ethical standards, including obtaining informed consent from participants and maintaining confidentiality by anonymizing responses. Approvals were obtained from the Babcock University Health Research Ethics Committee (BUHREC) and the ethics review boards of the participating hospitals. The study's purpose, procedures, and potential benefits were clearly communicated to participants before their involvement.

Results

Hypothesis One: There is no significant relationship between diabetes patients' knowledge about self-care and hospital readmission in selected hospitals in Ijebu-Ode, Ogun State.

Table 2: Result showing relationship between diabetes patients' knowledge about self-care and hospital readmission

Variables	N	Mean	Standard Deviation	df	r	p	Decision
Knowledge of diabetes self-care	250	41.16	12.721	249	.969	.000	Reject Ho
Hospital readmission		30.36	3.206				

Significant at $p < 0.05$

The results in Table 2 indicate a highly significant relationship between diabetes patients' knowledge about self-care and hospital readmission. The correlation coefficient (r) of 0.969 and a significant p -value of < 0.05 indicates that the correlation is statistically significant at the 0.05 level, and therefore suggests an extremely strong positive correlation between the variables. This implies that as patients' knowledge about self-care increases, the likelihood of hospital readmission decreases, and vice versa. Therefore, the stated null hypothesis that there is no significant relationship between diabetes patients' knowledge about self-care and hospital readmission in selected hospitals in Ijebu-Ode, Ogun State is not accepted but an alternative hypothesis is accepted that there is a significant relationship between diabetes patients' knowledge about self-care and hospital readmission in selected hospitals in Ijebu-Ode, Ogun State. This finding reiterates the critical role of patient education in managing diabetes and reducing hospital readmissions.

Hypothesis Two: There is no significant relationship between diabetes patient's knowledge on self-efficacy and hospital readmission in selected hospitals in Ijebu-Ode, Ogun State.

Table 3: Result showing relationship between diabetes patient knowledge on self-efficacy and hospital readmission

Variables	N	Mean	Standard Deviation	df	r	p	Decision
Self-efficacy	250	27.43	8.464	249	.950	.000	Reject
Hospital readmission		30.36	3.206				Ho

Significant at $p < 0.05$

The results in Table 3 reveal a highly significant relationship between diabetic patients' self-efficacy and hospital readmission. With a correlation coefficient (r) of 0.950 (p value of 0.000) at a significant p -value of < 0.05 , the result indicates an extremely strong positive correlation, suggesting that as patients' self-efficacy increases, the likelihood of hospital readmission decreases, and conversely, as self-efficacy diminishes, the probability of readmission rises. This statistical significance reveals the robustness of this relationship, with less than a 0.1% chance that the correlation occurred by random chance alone. In view of this, the stated null hypothesis that there is no significant relationship between diabetes patients' self-efficacy and hospital readmission in selected hospitals in Ijebu-Ode, Ogun State is not accepted but an alternative hypothesis is accepted that there is a significant relationship between diabetes patients' self-efficacy and hospital readmission in selected hospitals in Ijebu-Ode, Ogun State. This shows the multifaceted nature of diabetes management and the importance of addressing patients' psychological well-being alongside medical interventions with respect to diabetes treatment.

Hypothesis Three: There is no significant relationship between diabetes patients' knowledge on self- management and hospital readmission in selected hospitals in Ijebu-Ode, Ogun State.

Table 4: Result showing relationship between diabetes patients' knowledge on self-management and hospital readmission

Variables	N	Mean	Standard Deviation	df	r	p	Decision
Self-management	250	39.09	10.249	249	.876	.000	Reject
Hospital readmission		30.36	3.206				Ho

Significant at $p < 0.05$

The results in Table 4 reveal a significant relationship between diabetic patients' self-management and hospital readmission. With a correlation coefficient (r) of 0.876, there is a strong positive correlation between the two variables. Also, the statistical significance, indicated by a p -value of < 0.05 , reveals the reliability of this relationship, with less than a 0.1% chance that the correlation arose by random chance alone. This finding suggests that as self-management increases among diabetic patients, the likelihood of hospital readmission decreases. Conversely, lower levels of self-management are associated with a higher probability of hospital readmission. Based on the findings, the null hypothesis which states that

there is no significant relationship between diabetes patients' self-management and hospital readmission in selected hospitals in Ijebu-Ode, Ogun State is not accepted but an alternative hypothesis is accepted that there is no significant relationship between diabetes patients' self-management and hospital readmission in selected hospitals in Ijebu-Ode, Ogun State. This finding highlights the significant relationship between diabetic patients' self-management and hospital readmission shows the importance of addressing self-management literacy barriers in diabetes care.

DISCUSSION

The study explored the relationship between diabetes health literacy and hospital readmissions among diabetes patients in selected hospitals in Ijebu-Ode, Ogun State. Findings reveal significant associations between key aspects of diabetes health literacy—self-care knowledge, self-efficacy, and self-management—and the likelihood of hospital readmissions. These results reveal the critical role of comprehensive health education and support in improving patient outcomes and reducing healthcare system burdens.

The study found a highly significant relationship between diabetes patients' knowledge about self-care and hospital readmissions. The correlation coefficient of $r=0.969$ ($p\text{-value} < 0.05$) indicates an exceptionally strong positive correlation. This finding suggests that higher levels of self-care knowledge among patients correlate with a reduced likelihood of hospital readmissions. Conversely, inadequate self-care knowledge increases the risk of readmission. This result emphasizes the pivotal role of patient education in diabetes management. Self-care practices, such as maintaining proper blood sugar levels, adhering to dietary guidelines, and recognizing early symptoms of complications, are essential to reducing the need for acute medical interventions. The rejection of the null hypothesis supports the premise that targeted interventions to enhance self-care knowledge can lead to meaningful reductions in readmission rates. These findings align with existing literature, which reveals the importance of empowering patients with actionable knowledge to improve chronic disease management and health outcomes.

The findings also reveal a robust positive correlation between diabetes patients' self-efficacy and hospital readmissions, as evidenced by a correlation coefficient of $r=0.950$ ($p\text{-value} < 0.05$). This suggests that as self-efficacy—the belief in one's ability to execute behaviours necessary for effective diabetes management—increases, the likelihood of readmission decreases. Conversely, patients with low self-efficacy are more prone to hospital readmissions due to their diminished confidence in managing their condition effectively. The statistical significance of this relationship highlights the multidimensional nature of diabetes management. Beyond medical interventions, psychological well-being and self-confidence play integral roles in patient outcomes. Low self-efficacy can lead to inconsistent adherence to treatment plans, suboptimal lifestyle modifications, and delayed responses to symptoms, all of which contribute to higher readmission rates. These findings reinforce the need for healthcare providers to integrate psychological and behavioural support into diabetes care strategies to enhance patient autonomy and self-management capabilities.

The study further identified a significant relationship between diabetes patients' self-management and hospital readmissions, with a correlation coefficient of $r=0.876$ ($p\text{-value} < 0.05$).

value < 0.05). This strong positive correlation indicates that improved self-management practices among diabetic patients are associated with reduced readmission rates. Conversely, inadequate self-management is a predictor of higher hospital readmissions. Effective self-management involves a range of activities, including medication adherence, blood glucose monitoring, dietary adjustments, and physical activity. The findings suggest that patients who possess greater self-management literacy are better equipped to prevent complications and manage their condition proactively. Addressing barriers to self-management, such as limited access to resources, lack of education, and psychological stress, is essential for reducing hospitalizations. These findings align with prior studies that highlight self-management as a cornerstone of chronic disease care and emphasize its potential to reduce healthcare costs and improve patient quality of life.

Implications for Diabetes Care

The study's findings collectively demonstrate the interdependence of knowledge, psychological factors, and practical skills in managing diabetes effectively. Patients with higher levels of health literacy are better positioned to prevent hospital readmissions by engaging in proactive and informed self-care practices. These results have several implications for healthcare delivery. Enhancing patient outcomes in diabetes management requires a multifaceted approach. First, patient education programs play a critical role in improving self-care and self-management. These programs should be designed to provide patients with tailored, clear, and actionable information, equipping them with the knowledge and tools necessary to make informed decisions about their health and to actively engage in their care. Second, addressing the psychological dimensions of diabetes management is equally important. Psychosocial support interventions, including counselling, support groups, and cognitive-behavioural therapy, can significantly enhance patients' self-efficacy. By fostering confidence in their ability to manage their condition, such interventions empower patients to adhere more consistently to treatment plans and lifestyle modifications. Lastly, holistic care models that integrate medical, psychological, and educational components are essential for optimizing patient outcomes. These comprehensive approaches not only address the physical aspects of diabetes but also support patients' mental and emotional well-being, reducing the likelihood of complications and easing the burden on healthcare systems. Combining these strategies creates a robust framework for sustainable and effective diabetes care.

CONCLUSION

The study reveals the significant relationship between diabetes health literacy dimensions—self-care knowledge, self-efficacy, and self-management—and hospital readmissions. These findings highlight the need for a patient-centred approach in diabetes care, focusing on education, empowerment, and behavioural support. By addressing gaps in health literacy and fostering self-management capabilities, healthcare providers can significantly mitigate the burden of hospital readmissions and improve the overall well-being of diabetes patients.

Recommendations

Based on the findings of the study, the following recommendations are proposed to enhance diabetes care and reduce hospital readmissions:

1. Healthcare providers should design and implement comprehensive, patient-specific education programs that focus on improving self-care knowledge, self-efficacy, and self-management skills. These programs should be clear, practical, and culturally sensitive, empowering patients with the necessary tools and knowledge to manage their diabetes effectively and reduce the risk of readmission.
2. Given the strong relationship between self-efficacy and hospital readmissions, it is crucial for healthcare systems to integrate psychosocial support services such as counselling, support groups, and cognitive-behavioural interventions into diabetes care routines. These interventions can help patients build confidence and improve their psychological well-being, which is essential for successful self-management.
3. Healthcare providers should adopt holistic care models that integrate medical, educational, and psychological support to address the multidimensional nature of diabetes management. A collaborative approach that includes healthcare professionals from various disciplines can optimize patient outcomes and reduce the likelihood of hospital readmissions.
4. Targeted outreach efforts to increase health literacy in underserved communities are essential. Public health initiatives should focus on improving diabetes-related health literacy among patients and their families, particularly in rural or low-resource settings, to ensure better understanding and adherence to diabetes care protocols.
5. Healthcare providers should implement routine follow-up mechanisms to monitor patients' self-management practices and address any emerging challenges in a timely manner. Regular check-ins can help identify gaps in self-care, provide ongoing education, and ensure that patients are supported throughout their treatment, ultimately reducing the risk of hospital readmissions.

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