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Association Between Stroke Self-Management and HbA1c Levels Among Patients with Ischemic Stroke and Type 2 Diabetes Mellitus

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Abstract. Patients with ischemic stroke and type 2 diabetes mellitus (T2DM) require ongoing management of stroke-related risk factors and glycemic control. Self-management plays an important role in managing health conditions; however, evidence regarding the direct association between stroke self-management and HbA1c levels in this population remains limited. Objective: This study aimed to examine the association between stroke self-management and HbA1c levels among patients with ischemic stroke and T2DM. Methods: A correlational study with a cross-sectional design was conducted among 44 patients with ischemic stroke and T2DM at a primary healthcare center in Banjarmasin, Indonesia. Stroke self-management was assessed using the *Stroke Self-Management Behaviors Performance Scale* (SSBPS), while glycemic control was assessed based on HbA1c levels. The association between SSBPS scores and HbA1c levels was analyzed using Spearman's rank correlation. Results: The median SSBPS score was 18.00 (IQR: 10.00–26.00), while the median HbA1c level was 7.75% (IQR: 5.85–9.43). A strong, statistically significant negative correlation was observed between SSBPS scores and HbA1c levels ($\rho = -0.854$, $p < 0.001$), indicating that higher stroke self-management scores were associated with lower HbA1c levels. Conclusion: Stroke self-management was significantly associated with glycemic control among patients with ischemic stroke and T2DM. These findings highlight the importance of considering self-management as part of the care of patients with coexisting ischemic stroke and T2DM, particularly in the context of glycemic control.

Keywords: HbA1c, ischemic stroke, self-management, type 2 diabetes mellitus, glycemic control

1. INTRODUCTION

Ischemic stroke and type 2 diabetes mellitus (T2DM) are chronic conditions that can coexist and require ongoing management. T2DM is an important risk factor for stroke, and patients with diabetes have a higher risk of stroke than individuals without diabetes [1], [2]. Among patients who have experienced a stroke, diabetes is also associated with poorer post-stroke outcomes and an increased risk of recurrent stroke [1]. Furthermore, the management of chronic hyperglycemia is an important component of both primary and secondary stroke prevention in patients with diabetes [2].

Glycemic control is an important component of the management of patients with ischemic stroke and T2DM. Glycated hemoglobin (HbA1c) is considered a gold-standard measure for diagnosis and clinical monitoring, reflecting average blood glucose concentrations over the preceding 2–3 months [3]. In patients with stroke, the management of chronic hyperglycemia is relevant not only to metabolic control of diabetes but also to limiting the progression of microvascular complications and preventing recurrent stroke [1], [2]. Therefore, achieving glycemic control requires ongoing management beyond the acute phase of stroke.

Long-term management after stroke relies not only on medical therapy but also on patients' active involvement in managing their health conditions. Post-stroke self-management interventions are multicomponent approaches that support patients in making decisions and managing health and recovery challenges through strategies such as

problem-solving, goal-setting, decision-making, self-monitoring, and coping [4]. These components are intended to help patients maintain the behavioral changes required to manage stroke risk factors, including physical activity, diet, medication adherence, blood pressure, cholesterol, and blood glucose [5]. Recent evidence indicates that post-stroke self-management interventions have demonstrated benefits across several outcomes, including self-management behaviors, functional ability, quality of life, medication adherence, and activities of daily living [6]. However, evidence regarding the effects of self-management on medical risk factors remains limited and inconsistent [5], therefore, the association between stroke self-management and indicators of glycemic control, particularly HbA1c, among patients with ischemic stroke and T2DM warrants further investigation.

Self-management is important in the long-term care of patients after stroke because care extends beyond functional recovery to include health promotion and the management of modifiable stroke risk factors [7]. Among patients with coexisting T2DM, glycemic control is an important aspect of risk factor management. HbA1c is an indicator of long-term glycemic control that reflects average blood glucose concentrations over approximately the preceding three months [8]. Poorer glycemic control, indicated by higher HbA1c levels, has been associated with an increased risk of total and ischemic stroke among individuals with diabetes [8]. Therefore, among patients with ischemic stroke and T2DM, self-management that supports health behaviors and risk factor control is particularly relevant alongside efforts to achieve glycemic control.

Although self-management has been widely investigated among patients after stroke, previous studies have predominantly focused on behavioral changes and risk factor control, while evidence related to glycemic control remains limited. A systematic review found that, among 14 studies of post-stroke self-management, only one reported blood glucose as an outcome [5]. More recent studies have begun to include HbA1c or blood glucose concentrations as outcomes of post-stroke interventions [9] [10]. However, evidence regarding the direct association between stroke self-management and HbA1c, particularly among patients with ischemic stroke and T2DM, remains limited. Therefore, this study aimed to examine the association between stroke self-management and HbA1c levels among patients with ischemic stroke and T2DM. The findings are expected to provide evidence regarding the relationship between post-stroke self-management and glycemic control and to support the development of more integrated approaches to care for patients with stroke and T2DM.

2. METHODS

This study employed a correlational design with a cross-sectional approach to examine the association between stroke self-management and HbA1c levels among patients with ischemic stroke and type 2 diabetes mellitus (T2DM). The study was conducted in the service area of Alalak Selatan Public Health Center, Banjarmasin, and included 44 patients. The inclusion criteria were patients diagnosed with ischemic stroke by a neurologist and with T2DM, able to communicate effectively without aphasia, and willing to participate and provide written informed consent. The exclusion criteria were chronic kidney disease, ongoing treatment or care for depression, and anemia (Hb $\leq$11 g/dL).

Stroke self-management was assessed using the Stroke Self-Management Behaviors Performance Scale (SSBPS), which consists of nine items assessing self-management behaviors among patients with stroke, including physical activity, lifestyle, attendance at follow-up appointments, emotional management, social activities and contact with friends, adjustment of family care, social roles, and care planning with healthcare providers. The instrument was translated by a language expert and a nursing expert, and the translated versions were consolidated before pilot testing. Validity and reliability testing was conducted among 30 patients with stroke and T2DM at Puskesmas 9 November Banjarmasin. All items were found to be valid ($r = 0.560–0.668$; $r \geq 0.361$; $p < 0.05$), and the instrument demonstrated good reliability, with a Cronbach's alpha of 0.791. Glycemic control was assessed using glycated hemoglobin (HbA1c) levels and analyzed as a continuous variable, with higher HbA1c levels indicating less optimal glycemic control.

Data were analyzed using SPSS. Participant characteristics were summarized descriptively using means and standard deviations for numerical data and frequencies and percentages for categorical data. The normality of SSBPS scores and HbA1c levels was assessed using the Shapiro–Wilk test. Because both variables were not normally distributed, the association between SSBPS scores and HbA1c levels was analyzed using Spearman's rank correlation, with the level of statistical significance set at $\alpha = 0.05$.

3. RESULTS AND DISCUSSION

A total of 44 patients with ischemic stroke and type 2 diabetes mellitus (T2DM) participated in this study. The mean age of the participants was 56.86 ± 5.99 years, with an age range of 47–69 years. The majority of participants were aged 45–59 years (68.18%), were female (65.91%), were married (88.64%), had a low income (65.91%), and had completed senior high school or equivalent education (61.36%).

Table 1. Characteristics of Study Participants (n = 44)

Characteristics	n	%
Age (years), mean ± SD (min–max)	**56.86 ± 5.99 (47–69)**	
45–59 years	30	68.18
60–74 years	14	31.82
Marital status		
Married	39	88.64
Widowed	3	6.81
Divorced	2	4.54
Sex		
Female	29	65.91
Male	15	34.09
Income		
Low	29	65.91
High	15	34.09
Education		
Elementary school	3	6.82
Junior high school/equivalent	12	27.27
Senior high school/equivalent	27	61.36
Bachelor's degree	2	4.54

Descriptive analysis showed that the mean *Stroke Self-Management Behavior Performance Scale* (SSBPS) score was 18.70 ± 7.68, with a median of 18.00 and a range of 9–30. The mean HbA1c level was 7.75 ± 2.24%, with a median of 7.75% and a range of 4.40–14.70%. The Shapiro–Wilk test indicated that both SSBPS scores ($p < 0.001$) and HbA1c levels ($p = 0.037$) were not normally distributed. Therefore, the association between SSBPS scores and HbA1c levels was analyzed using Spearman's rank correlation.

Table 2. Descriptive Statistics of Stroke Self-Management and HbA1c (n = 44)

Variables	Mean ± SD	Median (IQR)	Min–Max	Shapiro–Wilk *p*
SSBPS	18.70 ± 7.68	18.00 (10.00–26.00)	9–30	<0.001
HbA1c (%)	7.75 ± 2.24	7.75 (5.85–9.43)	4.40–14.70	0.037

Spearman's rank correlation analysis showed a significant negative association between stroke self-management and HbA1c levels ($\rho = -0.854$, $p < 0.001$). The negative correlation indicates that higher stroke self-management scores were associated with lower HbA1c levels.

Table 3. Association Between Stroke Self-Management and HbA1c Levels

Variables	n	Spearman's ρ	*p*-value
SSBPS and HbA1c	44	**−0.854**	**<0.001**

The findings of this study demonstrated a strong and statistically significant negative association between stroke self-management and HbA1c levels among patients with ischemic stroke and T2DM ($\rho = -0.854$, $p < 0.001$). This finding indicates that higher levels of stroke self-management were associated with lower HbA1c levels. This association may be explained by the role of self-management behaviors in controlling risk factors. Post-stroke self-management involves the ability to manage symptoms, treatment, the consequences of the condition, and lifestyle changes through skills such as goal-setting, decision-making, and self-monitoring [5]. These behaviors are particularly relevant for patients with T2DM, as glycemic management requires consistency in medication use, healthy eating, physical activity, and other self-care behaviors [11].

The findings of this study are supported by evidence from patients with T2DM. A systematic review and meta-analysis showed that patient-centered self-management interventions significantly reduced HbA1c by 0.56% compared with usual care and improved self-care behaviors [12]. More recent evidence from an umbrella review showed that 11 of 12 meta-analyses reported significant reductions in HbA1c, with an overall mean reduction of 0.34%; among self-management interventions, the mean reduction in HbA1c was 0.35% [13]. These findings are also consistent with those of Fadli et al. [11], who reported that an intervention based on the *Individual and Family Self-Management Theory* significantly improved self-care and reduced HbA1c levels among patients with T2DM. Collectively, this evidence supports the association between better self-management and glycemic control, although these previous studies used intervention designs that differed from the design of the present study.

Among patients with stroke, diabetes management may be more complex because patients must manage both conditions simultaneously. Hewitt et al. [14], identified the additional burden of diabetes management after stroke and emphasized the importance of support to enhance patients' self-management capabilities. Post-stroke risk factor management also requires sustained behavioral changes, including increased physical activity, a healthy diet, smoking cessation, and management of metabolic risk factors such as diabetes [15]. Thus, self-management is relevant not only to post-stroke recovery but also to the management of metabolic risk factors associated with stroke.

his study provides additional evidence in a more specific population—patients with ischemic stroke and T2DM—by demonstrating a direct association between stroke self-management and HbA1c levels. These findings extend previous evidence, as post-stroke self-management research has more frequently demonstrated benefits for behavioral risk factors than for medical risk factors, while blood glucose has been relatively infrequently reported as an outcome [5]. However, the association observed in this study does not establish causality. Glycemic control may be influenced by other clinical, therapeutic, and behavioral factors that were not fully examined in this study. The relatively small sample size and the conduct of the study within a single healthcare service area should also be considered when generalizing the findings.

4. CONCLUSIONS

This study demonstrated a significant negative association between stroke self-management and HbA1c levels among patients with ischemic stroke and type 2 diabetes mellitus. Higher stroke self-management scores were associated with lower HbA1c levels, indicating that better self-management was associated with better glycemic control. These findings highlight the importance of considering self-management in the management of patients with ischemic stroke and T2DM, particularly in the context of glycemic control. Further studies with larger sample sizes and longitudinal or interventional designs are needed to confirm these findings and to evaluate the potential causal relationship between stroke self-management and glycemic control.

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