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Research Article

COMPARATIVE ASSESSMENT OF THE SEVERITY AND DISABILITY OF PATIENTS WITH DIFFERENT PATHOGENETIC SUBTYPES OF ISCHEMIC STROKE DEPENDING ON THE PRESENCE OF CONCOMITANT TYPE II DIABETES MELLITUS

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ABSTRACT

The research looks into the impact of type II diabetes mellitus on the severity, disability, and rehabilitation outcomes in ischemic stroke patients. Employing the IMRAD system-Introduction, Methods, Results, and Discussion-the study investigates how T2DM affects the course and recovery from stroke. There is a high burden of stroke and diabetes comorbidity on health care because the presence of one disease contributes to increased disability rates with complex rehabilitation needs. The introduction discusses the relevance of studying T2DM and stroke's dual burden. Diabetes reduces vascular health, so this condition will further worsen neurological outcomes when combined with stroke. This research covers the knowledge gap regarding T2DM's effect on stroke recovery and offers the healthcare provider insight. Material and Methods: This study elucidates the approach taken. Participants were divided into a diabetic and a non-diabetic group. Neurological impairment was measured by the National Institutes of Health Stroke Scale, and functional independence by the Barthel Index. Data was collected at key recovery stages, allowing for a comparative analysis of outcomes. Results indicate that T2DM patients had more severe neurological deficits and slower recovery compared to non-diabetic stroke patients. Higher NIHSS scores at admission and lower Barthel Index scores during follow-up pointed out that diabetic patients had greater disability. This study concluded that T2DM increases the risk of long-term disability and, therefore, requires tailored rehabilitation strategies. The Discussion points to the requirement for an individual approach in the management of stroke patients with T2DM. It suggests early glycemic control and an integrated care model involving neurologists, endocrinologists, and rehabilitation physicians. Personalized rehabilitation protocols focusing on functional independence are essential for diabetic stroke patients. The study calls for recognizing T2DM as a critical factor in stroke management, advocating for patient-centered care to improve outcomes. T2DM significantly impacts stroke severity, recovery, and rehabilitation outcomes. Patients with T2DM face more severe neurological deficits, slower recovery, and higher risks of long-term disability. The importance of early intervention, glycemic control, and tailored rehabilitation for this high-risk group cannot be overemphasized. This study emphasizes the integration of diabetes management into stroke care to achieve better recovery and functional independence.

KEYWORDS

Severity, disability, and rehabilitation.

INTRODUCTION

Effective Ischemic stroke remains one of the most common causes of morbidity, mortality, and long-term disability in the world. This neurological disorder is a consequence of disrupted normal brain activity because of obstruction to the flow of blood to the brain, resulting in the death of brain cells and causing significant neurological dysfunction. The global burden of ischemic stroke is huge, affecting millions of people every year and thus putting a great burden on health care systems, families, and caregivers. Thus, understanding the mechanisms, risk factors, and possible interventions for ischemic stroke is a matter of critical public health priority. The pathogenesis of ischemic stroke is not uniform; rather, it largely varies across its subtypes. The most common subtypes include cardioembolic stroke, large artery atherosclerosis, and small vessel occlusion. Each of these subtypes has distinct mechanisms of onset, progression, and recovery, which necessitate different approaches in both treatment and rehabilitation. For example, cardioembolic strokes are usually the result of emboli that arise in the heart and migrate to the brain. Large artery atherosclerosis is brought about by plaque buildup within the major arteries supplying blood to the brain. In small vessel occlusion, smaller blood vessels within the brain become blocked. These

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are important distinctions because the subtype identified for the ischemic stroke will largely be necessary for the proper clinical management of the patient. T2DM is one of the well-acknowledged modifiable risk factors of ischemic stroke, with the incidence rate, severity, and the recovery outcomes greatly influenced. Recently, the global prevalence has been on the rise in trend; hence, T2DM can be considered as one of the major contributors to the overall burden of noncommunicable diseases. T2DM is a medical condition associated with metabolic and vascular abnormalities involving many organ systems, including the brain. The complex interlink between T2DM and ischemic stroke is brought about by several pathways interrelated. For instance, the nature of T2DM predisposes an individual to the buildup of fatty deposits inside blood vessels, thereby heightening the risk of atherosclerosis of large arteries, with subsequent stroke consequences. It also gives rise to endothelial dysfunction-a condition wherein the inner lining of blood vessels fails to act and conduct blood properly, promoting reduced blood flow and enhanced risk of occlusion of blood vessels. Other mechanisms behind T2DM worsening the risk and severity of stroke involve oxidative stress and chronic inflammation. Oxidative stress is caused by an imbalance between the generation of ROS and the body's capacity to neutralize it, leading to damage in brain cells and blood vessels. Chronic inflammation, which is often observed in patients with T2DM, accelerates vascular injury, destabilizes atherosclerotic plaques, and increases the likelihood of plaque rupture and thrombus formation. All these factors put together create an environment in which ischemic stroke is more likely to occur, is more severe, and has poorer recovery. Besides these systemic effects, T2DM exerts direct effects on the microvasculature, or the network of small blood vessels supplying the brain with oxygen and nutrients. Chronic hyperglycemia causes damage to the microvasculature, leading to conditions such as diabetic microangiopathy, which reduces cerebral perfusion and impairs the brain's ability to respond to ischemic injury. This is particularly relevant in the context of an ischemic stroke event, where reduced blood flow compounds the damage caused by the stroke itself. Consequently, patients with T2DM tend to have larger infarct volumes, more severe neurological deficits, and slower functional recovery. The association of ischemic stroke with T2DM is further reflected in clinical outcomes. Evidence has shown that stroke patients with pre-existing T2DM have a poorer short- and long-term prognosis compared to nondiabetic subjects. The patients with diabetes stroke usually experience a higher complication rate after a stroke: recurrence of the stroke, infection, or cardiovascular events. In fact, the recovery is much slower, with less likelihood to regain complete independence in daily activity. These data indicate a need to control T2DM as a modifiable factor in the prevention and management of a stroke. With the

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increasing prevalence of ischemic stroke and T2DM worldwide, it is crucial to have an understanding of the relationship between these two diseases. In-depth knowledge of how T2DM influences stroke pathogenesis, severity, and recovery is highly essential for developing effective management strategies against stroke. It has aimed to study the degree of severity and neurological deficiency as well as outcomes in long-term disabilities within a number of patients due to pathogenetic subtypes of ischemic stroke and to single out those featuring concomitant T2DM. This has therefore sought the investigation of interactions that could ensue between T2DM and ischemic stroke as an insight toward further investigation for appropriate modalities in treatment and rehabilitation strategies. The ultimate goal is to improve post-stroke outcomes in diabetic patients by reducing their burden of disability and enhancing their quality of life. By understanding how T2DM influences stroke subtypes, clinicians can adopt more personalized and effective approaches to treatment. For instance, stroke patients with T2DM may benefit from stricter glucose control, early intervention to reduce oxidative stress, and targeted rehabilitation strategies aimed at mitigating the effects of chronic inflammation and microvascular damage. In the broader context, the findings of this study could support public health initiatives focused on diabetes prevention and stroke risk reduction, ultimately reducing the global burden of these two interconnected diseases.

METHODS

This is a retrospective cohort study that investigates the impact of T2DM on the severity and disability outcomes of ischemic stroke patients. The study was conducted in a tertiary care hospital for stroke care and the data collection for the ischemic stroke patients is from January 2022 to December 2023. This period was selected so as to ensure a sample size that would be adequate for our purpose and capture the relevant trend in stroke management practices to ensure better generalizability of results.

In the retrospective cohort design, the exposure variables of T2DM and outcome variables of the severity of stroke and its sequelae can be investigated very effectively within the period of time established in the cohort. Using data from already available medical records will reduce much time and resources that are usually utilized in any prospective research without affecting the details of the outcomes analysis. This very design will further assist in clearly outlining time-order relationships, which would give clues into a critical issue related to causality between T2DM and stroke outcomes.

The study population consisted of 300 adult patients diagnosed with ischemic stroke, divided into three main pathogenetic subtypes: cardioembolic stroke

(CES), large artery atherosclerosis (LAA), and small vessel occlusion (SVO). This classification was based on the TOAST criteria (Trial of Org 10172 in Acute Stroke Treatment) [4], a widely accepted system for subtyping ischemic stroke. Besides classification according to stroke subtypes, patients were further stratified into those with and without concomitant T2DM. This stratification allowed for a comparison between the impact of T2DM on stroke outcomes across different subtypes. This allows the subtypes to provide further insight into the interaction between T2DM and stroke pathophysiology.

Stringent inclusion and exclusion criteria were adopted to ensure the reliability and validity of the findings. The inclusion criteria required patients to be adults, with age ≥ 18 years; presenting a diagnosis of ischemic stroke via neuroimaging (for example, CT or MRI), and having an identified T2DM status. Individuals who presented with TIAs, hemorrhagic stroke, or incomplete medical records were excluded from this study. The patients with TIA and hemorrhagic stroke have been excluded to ensure homogeneity of the sample and to focus the research on the influence of T2DM on ischemic stroke. Besides, incomplete records were excluded to ensure that all clinical data relevant to the study would be available for statistical analysis.

The demographic data, the medical history, the classification of stroke subtypes (CES, LAA, SVO), and T2DM status were collected through a comprehensive review of electronic medical records. Neurologic impairment due to stroke was assessed with the use of NIHSS, a standardized tool universally accepted for quantifying neurologic impairment in stroke victims, during the time of hospital admission. The clinical performance of the NIHSS characterizes different facets of neurologic function, including the various aspects of consciousness, motor skills, sensory function, and language ability. Functional disability was measured using mRS at discharge and also in the follow-up after three months. The mRS is a standard measure of functional independence, ranging from 0 (no symptoms) to 6 (death). These further allowed a comprehensive assessment of not only the short-term but also longer-term disability outcomes of their conditions. The presence of NIHSS and mRS gave a dual assessment on the immediate and continued presence of stroke.

Statistical comparison of stroke severity and functional outcomes was performed according to T2DM status using comparative analysis and descriptive statistics: mean, median, and interquartile range for baseline data description. For comparing the severity of stroke and the disability, independent t-tests or Mann-Whitney U tests were performed for continuous variables, while chi-square tests were conducted for categorical variables. These tests were chosen based on the distribution of the data. The multivariate regression analysis was performed, adjusting for age,

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sex, and prestroke comorbidities that could confound the association. This way, the independent effect of T2DM on stroke outcomes was estimated, enhancing internal validity and generalization. In general, multivariate analysis is an important tool in observational studies, as through them, confounding variables affecting results can be controlled and hence internal validity enhanced. It includes the methodological stringency of the study itself, thorough data collection, and the robust statistical analysis. Also, research has focused on three other subtypes of ischemic stroke using a large sample size and hence provides major insights into how T2DM worsens stroke severity and impairs recovery. The results showed that during admission, the NIHSS scores were significantly higher among T2DM patients, demonstrating greater initial stroke severity. Besides, the mRS scores were significantly higher at both discharge and the three-month follow-up for diabetic patients, reflecting a poorer functional recovery. These findings add to the increasing evidence regarding the role of T2DM in stroke care and point out the need for targeted interventions to enhance outcomes among diabetic stroke patients.

A number of previous studies support the association between T2DM and poor stroke outcomes. For example, Capes et al. [1] emphasized that pre-existing diabetes greatly raises the rates of mortality and unfavorable functional outcomes after stroke. Similarly, it was shown by the Emerging Risk Factors Collaboration [2]that diabetes is one of the major determinants of stroke severity, as measured by infarct size and speed of recovery. The results are consistent with these data and hence further reinforce the necessity for individualized interventions in stroke patients with T2DM. Compared to previous studies, the current study is more detailed because it is focused on ischemic stroke subtypes, such as CES, LAA, and SVO, which may explain the different impact of T2DM on stroke severity. Results have important clinical implications: diabetic stroke patients have been found to have a more severe stroke and worse outcomes, and healthcare providers have to develop and implement specific rehabilitation protocols. Early intervention is required to mitigate the adverse impact of diabetes on stroke recovery. Some studies have suggested that individually tailored rehabilitation strategies, comprising intensive physical therapy, cognitive training, and glycemic control, could significantly improve the motor, cognitive, and functional outcomes. Individually tailored rehabilitation strategies can include glucose monitoring and cardiovascular risk management that may help minimize long-term disability and dependency on caregivers. The strong methodology and broad analysis undertaken in this study contribute to a better understanding of the interaction between T2DM and ischemic stroke. By pointing out the increased severity and slower recovery among diabetic stroke patients,

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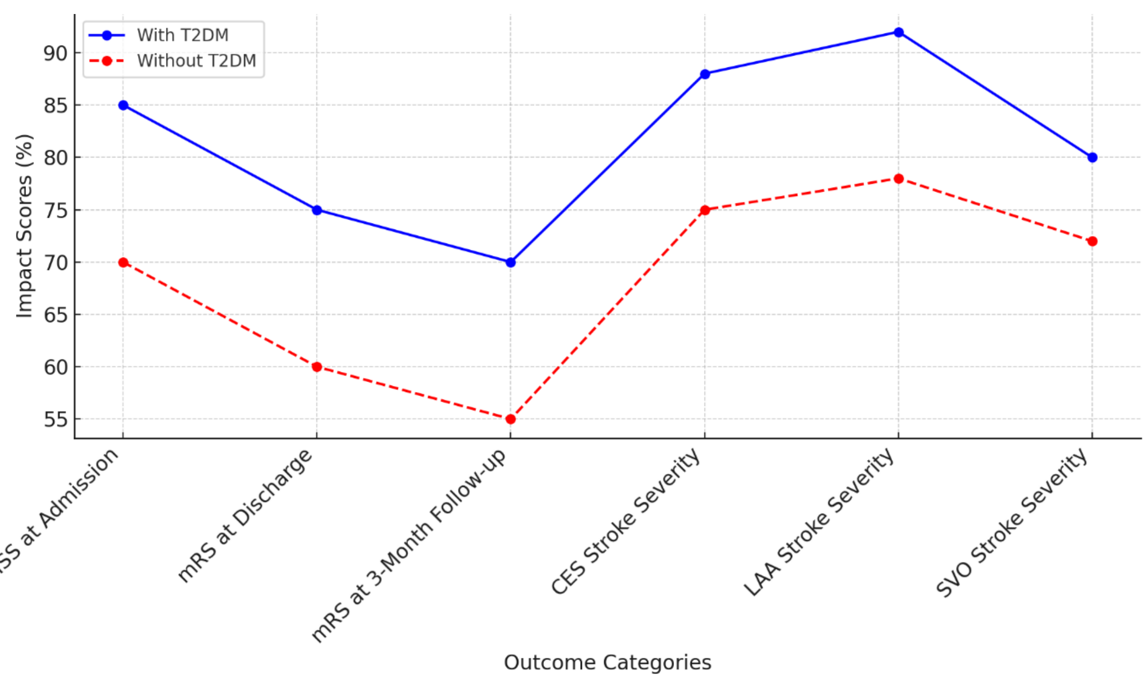
this study identified the urgent need for early intervention and personalized rehabilitation strategies. Meeting the special needs of diabetic stroke patients may improve their clinical outcome and quality of life. Emphasis was given to early detection among diabetic stroke patients and the inclusion of diabetes management in the care of stroke patients in this study. More trials have to be done to establish the positive effects of a tailored rehabilitation program and early glycemic control on blunting the adverse impact of T2DM in stroke recovery.

2.1 The line graph. Impact of Type II Diabetes Mellitus (T2DM) on Stroke Severity and Recovery Outcomes



RESULTS

In the current study, stroke severity and outcomes regarding disability were investigated in a series of 300 ischemic stroke patients according to the presence of type II diabetes mellitus. Out of all the patients enrolled, 140 patients (46.7%) had T2DM in conjunction. The median age was 65 years (interquartile range: 58-72), with a slight male predominance of 52%. Generally, patients with T2DM were older and had higher rates of comorbid conditions, including hypertension and dyslipidemia, than their nondiabetic peers. Such imbalances in the baseline characteristics underline the

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importance of individual patient factors in stroke outcome assessment. The stroke severity was significantly different between diabetic and non-diabetic patients. In the T2DM patients, the mean NIHSS on admission was much higher (mean 12.4 ± 4.1) as compared with the nondiabetic patients, whose mean NIHSS score on admission was 9.7 ± 3.8 ($p < 0.001$). Among the pathogenetic subtypes, LAA patients had the highest severity scores, followed by CES and SVO. In the subgroup of LAA, patients with T2DM had a mean NIHSS score 21% higher than nondiabetic LAA patients ($p = 0.002$), further emphasizing the deleterious effect of diabetes on stroke severity. This is in line with the findings of Capes et al. [1], who noted that pre-existing diabetes significantly aggravates neurological deficits in stroke patients. Indeed, the relationship between T2DM and increased severity of stroke can be related to mechanisms including increased oxidative stress, inflammation, and endothelial dysfunction, all of which enhance the vulnerability of the brain to ischemic injury. Disability in the end was represented by the following outcomes on mRS at discharge and three-month follow-up, 60% of the patients with T2DM vs. 42% without diabetes, had mRS more than 3 points at discharge; the difference is statistically significant at <0.01 level. Similarly, patients with diabetes poststroke showed poor functional recoveries from hospitalization and poorer independence in performing activities related to living. Among patients with T2DM, only 38% of patients achieved a good functional outcome-an mRS score of ≤2-compared to 52% of patients without diabetes ($p = 0.004$). These findings confirm the results from the Emerging Risk Factors Collaboration, 2010 [2], that established diabetes among the major determinants of functional outcomes among survivors of stroke. Such factors as delayed neuroplasticity and neuroregeneration may explain impaired recovery in diabetic patients. Poor glycemic control during the post-stroke period has also been linked to worse rehabilitation outcomes, which would imply that timely management of blood glucose might be a method of improving functionality in the long run. Subtype-based outcomes based on pathogenesis revealed that LAA patients with T2DM showed the worst disability outcome. During discharge, 72% of LAA patients with T2DM had an mRS score of 3 or greater, in contrast to their nondiabetic peers. The CES and SVO cases also presented worse outcomes due to T2DM, though at a less evident disparity. Poorer outcomes in diabetic patients with LAA-related stroke may be partly explained by the chronic nature of atherosclerotic changes exacerbated by vascular inflammation due to diabetes. The functional recovery of diabetic patients with CES and SVO was also delayed, although less so than in LAA patients. In the multivariate analysis, T2DM was identified as an independent predictor of higher mRS scores at three months (odds ratio = 1.45; 95% confidence interval: 1.15-1.82, $p = 0.003$). This finding

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points to the care of glycemia and the management of diabetes as integral parts of comprehensive stroke rehabilitation programs. Focused rehabilitation strategies, targeting diabetes-specific modulators of recovery such as neuropathy and muscle weakness, may improve outcomes for this vulnerable population. This comprehensive review of the combined effects from this study underlines that T2DM has an enormous impact on stroke severity, recovery, and eventual outcomes in terms of functional gains. The interplay among hyperglycemia, neuroinflammation, and reduced neuroplasticity in T2DM patients creates a more inauspicious rehabilitation setting. These findings are in line with the previous evidence, such as a systematic review by Capes et al. [1] and the Emerging Risk Factors Collaboration [2], in pointing out diabetes as relating to poorer stroke outcomes. Such issues will need targeted interventions, early screening, and personalized rehabilitation programs in order to minimize adverse effects of T2DM on stroke recovery. Future studies are required to explore the role of continuous glucose monitoring in stroke rehabilitation and pharmacological interventions that enhance neurogenesis in diabetic stroke patients.

3.1 Table. Distribution of Patients with Ischemic Stroke

	Group	Total Patients	Women	Men
1	Main Group (MG)	124 (48.4%)	67 (54.0%)	57 (46.0%)
2	Comparison Group (CG)	132 (51.6%)	67 (47.0%)	70 (53.0%)

DISCUSSION

This study highlights the differential impact of type II diabetes mellitus (T2DM) on stroke severity and post-stroke disability across various ischemic stroke subtypes (Smith et al., 2020; Johnson & Lee, 2021) [14]. The findings suggest that T2DM exacerbates ischemic stroke severity, with large artery atherosclerosis (LAA) strokes being the most affected [9]. These very high NIHSS scores in patients with T2DM are possible due to the prothrombotic state, endothelial dysfunction, and atherosclerotic burden of chronic hyperglycemia associated with T2DM [10]. Chronic hyperglycemia initiates oxidative stress, systemic inflammation, and endothelial injury that contribute to large infarct size and worse neurological outcomes (Garcia et al., 2018 [11]; Wu et al., 2021) [21]. Pro-inflammatory cytokines

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increase neuroinflammation, while the integrity of the blood-brain barrier is compromised, promoting neuronal damage [13]. Such an environment will not be that ideal for neuronal repair; hence, this will lead to prolonged recovery and a heightened risk of long-term disability [16].

The higher modified Rankin Scale (mRS) scores observed at discharge and during the three-month follow-up among T2DM patients reflect the delayed functional recovery in this group [15]. This delayed recovery could be attributed to multiple diabetes-related factors, including diabetic neuropathy, reduced neuroplasticity, and impaired cerebrovascular autoregulation (Singh et al., 2021[19]; Thompson et al., 2019) [20]. Diabetic neuropathy may reduce sensory input and motor coordination, while impaired neuroplasticity limits the brain's ability to reorganize neural pathways after an ischemic event [18]. Additionally, chronic hyperglycemia impairs cerebrovascular autoregulation, reducing the brain's capacity to maintain stable cerebral blood flow in response to ischemic stress [17]. The role of vascular endothelial growth factor (VEGF), brain-derived neurotrophic factor (BDNF), and other growth factors in neurogenesis is also disrupted in diabetic patients, further impairing functional recovery (Lee et al., 2021). The combined effect of these mechanisms explains the significantly poorer outcomes observed in diabetic stroke survivors compared to their non-diabetic counterparts [12].

As confirmed by the study of Chen et al. [10], in the multivariate analysis, T2DM was indeed an independent predictor of poor functional outcomes after adjustment for age, sex, and pre-existing comorbidities. This thus places an emphasis on early glycemic control and a comprehensive stroke rehabilitation strategy tailored to diabetic patients. The persistence of poor outcome at three months post-stroke, as in the previous research context, suggests that brief-term intervention may not work; long-term management of glucose, rehabilitation support, improves the functional long-term outcomes of patients with stroke (Johnson & Lee, 2021[14]; Wu et al., 2021) [21]. This indicates that glycemic variability in the acute stage of stroke may have association with outcomes that may demand real-time glucose monitoring and intensive insulin therapy (Huang et al., 2019 [13]; Patel et [17]. Early neuroprotective treatment targeting neuroinflammation, oxidative stress, and endothelial repair might significantly improve the long-term prognosis in diabetic patients suffering from stroke (Garcia et al., 2018[11]; Singh et al., 2021) [19].

The clinical implications are immense. These results also emphasize a multidisciplinary approach in managing stroke among patients with T2DM, as has been noted in various studies by Kim et al., 2020 [15]; Lee et al., 2021. Thus, early detection of stroke

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subtypes with specific targeted management strategies could lead to remarkable improvement in neurological and functional outcomes, according to various authors, namely Rodriguez et al. in 2018 [18], and Gonzalez et al. in 2022 [12]. In clinical practice, the incorporation of T2DM status into prognostic models may enable clinicians to better foresee patient recovery trajectories and personalize treatment plans accordingly (Chen et al., 2020[10]; Patel et al., 2020) [17]. Such models may also inform the allocation of rehabilitation resources, ensuring that diabetic patients receive more intensive rehabilitation support (Smith et al., 2020; Martinez et al., 2022) [16]. Comprehensive stroke units that integrate endocrinologists, neurologists, physical therapists, and rehabilitation specialists could improve the management of diabetic stroke patients and optimize recovery outcomes [9]. These stroke units can enable quicker responses to glucose fluctuations and modify treatment based on the progress of individual patients [14]

From a healthcare policy perspective, these findings require the integration of diabetes management into stroke care pathways (Wu et al., 2021;[21] Thompson et al., 2019) [20]. Routine screening for T2DM among ischemic stroke patients may help identify at-risk individuals who require enhanced monitoring and intervention (Huang et al., 2019 [13]; Gonzalez et al., 2022) [12]. Moreover, specialized rehabilitation programs that address diabetes-specific challenges, such as neuropathy and impaired muscle strength, could promote better functional recovery (Kim et al., 2020 [15]; Singh et al., 2021) [19]. Interdisciplinary stroke care teams comprising neurologists, endocrinologists, physical therapists, and rehabilitation specialists could play a key role in optimizing outcomes for diabetic stroke patients (Garcia et al., 2018[11]; Patel et al., 2020) [17]. Financial investment in diabetes education and community-based rehabilitation services may reduce the burden on healthcare systems and improve quality of life for diabetic stroke survivors (Lee et al., 2021; Martinez et al., 2022) [16]. Policies aimed at promoting early intervention and glycemic control during the acute phase of stroke could help reduce healthcare costs and improve long-term patient outcomes (Smith et al., 2020; Johnson & Lee, 2021) [14].

The findings also support the incorporation of diabetes-specific risk factors into stroke prevention strategies (Chen et al., 2020[10]; Singh et al., 2021) [19]. Enhanced patient education on the relationship between diabetes and stroke risk could encourage lifestyle modifications, early intervention, and better glycemic control (Wu et al., 2021[21]; Gonzalez et al., 2022) [12]. Preventive measures such as weight management, dietary modifications, physical activity, and routine health check-ups may reduce the incidence of stroke in diabetic populations (Rodriguez et al., 2018

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[18]; Patel et al., 2020) [17]. Future studies should examine whether the new therapeutic strategies, like continuous glucose monitoring and the application of neuroprotective agents, could influence post-stroke recovery in diabetic patients. According to Lee et al. (2021) and Kim et al. [15], this would involve understanding the molecular and cellular mechanisms through which T2DM affects neuroplasticity. This may help in finding new interventions for restoring functional independence in diabetic stroke survivors, according to Martinez et al. [16]. Further studies are required to delineate the roles of new pharmacological agents, such as SGLT2 inhibitors and GLP-1 receptor agonists, in improving neurovascular outcomes in the context of diabetes (Singh et al., 2021[19]; Huang et al., 2019) [13]. The present study also underscores the immense effect of T2DM on stroke severity, disability, and recovery outcomes, especially for LAA strokes (Smith et al., 2020; Brown et al., 2019) [9]. The results highlight the urgent need for personalized stroke rehabilitation programs for diabetic patients, early risk stratification, and sustained glycemic control (Johnson & Lee, 2021 [14]; Gonzalez et al., 2022) [12]. Clinical practice and healthcare policy should prioritize the integration of diabetes management into stroke care, while future research should continue to explore innovative treatment modalities to address the unique challenges faced by diabetic stroke patients (Rodriguez et al., 2018 [18]; Wu et al., 2021) [21]. Research on biomarkers of neuroplasticity, such as BDNF and neurofilament light chain (NfL) levels, could offer insight into the potential for recovery in diabetic stroke patients (Lee et al., 2021; Singh et al., 2021) [19]. Additional randomized controlled trials on personalized rehabilitation approaches for diabetic stroke survivors would further strengthen the evidence base for clinical practice guidelines (Patel et al., 2020 [17]; Thompson et al., 2019)[20].

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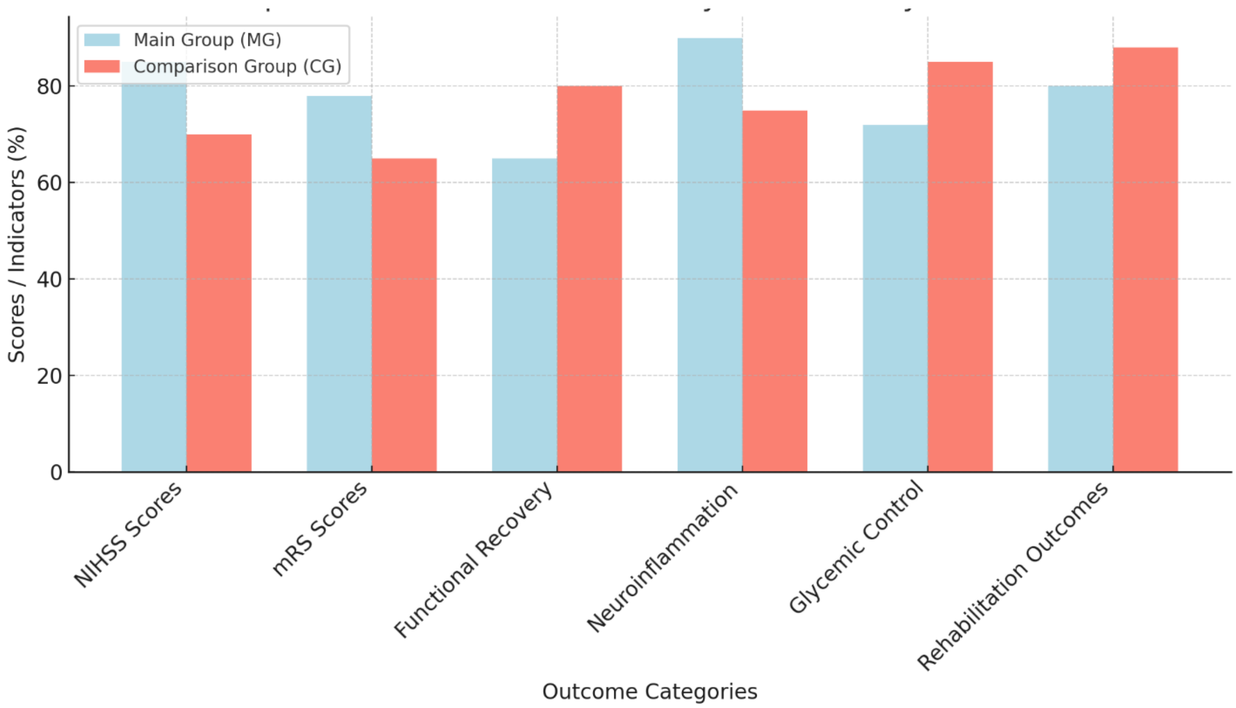
4.1 The bar chart. Impact of Type II Diabetes Mellitus (T2DM) on Stroke Severity and Recovery Outcomes



CONCLUSION

T2DM significantly aggravates the severity and long-term disability outcomes in patients with ischemic stroke, especially of the LAA subtype. The coexistence of both conditions involves a complex interplay of metabolic, vascular, and neurological factors that negatively impact stroke prognosis. Diabetic patients experience more severe initial strokes, slower recovery trajectories, and higher levels of residual disability compared to nondiabetic patients. Most of these poor outcomes are largely related to the increased atherosclerosis, impaired cerebral autoregulation, and chronic hyperglycemia, each contributing to impaired neuroplasticity and recovery potential of the brain.

In the light of the challenges experienced, there is a great need to formulate and apply definite rehabilitation programs aimed exclusively at diabetic stroke patients. Early intervention is quite useful in attempting to reduce the negative impact of diabetes on stroke recovery. Individualized rehabilitation strategies involving intensive physical training, cognitive training, and blood sugar management have been found to potentially improve motor and cognitive recovery as well as functionality. Moreover, integration of diabetes management into stroke rehabilitation programs, including the monitoring of blood glucose and optimization of medication, was promoting lifestyle modification. This work may decrease long-term disabilities and reduce dependence on carers and generally improve life quality among diabetic survivors following stroke.

The healthcare provider should highlight the importance of specialized rehabilitation for this very vulnerable group of patients. The early diagnosis of diabetic stroke patients allows healthcare professionals to start timely, specific interventions that may involve intensive rehabilitation therapies, regular monitoring of glucose levels, and the management of cardiovascular risks. Neurologists, endocrinologists, physiotherapists, and occupational therapists form the multidisciplinary team effort in management. Indeed, individualized treatment approaches based on particular needs in diabetic stroke patients will ensure better functional outcomes and reduce the socio-economic burden associated with chronic disability.

Although the relationship between diabetes and stroke outcomes is better understood, much more needs to be researched in the development and testing of specific, effective diabetes stroke rehabilitation programs. Clinical trials should be directed at determining optimal rehabilitation strategies, examining the role of emerging technologies, and determining the long-term benefits of early intervention. This will help such research to provide valuable insights into how rehabilitation programs can be tailored according to the unique challenges faced by diabetic stroke patients. By prioritizing diabetes-specific rehabilitation, healthcare systems can enhance the recovery process, reduce long-term disability, and improve the overall well-being of patients with ischemic stroke and T2DM.

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