Frequency of Myocardial Infarction and Comparison of Streptokinase Therapy Success Rate Based on Gender and Diabetes Status

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LINK MEDICAL INTERFACE

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Disclaimers

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ABSTRACT

Background: Acute ST-elevation myocardial infarction (STEMI) is a major cause of morbidity and mortality. Streptokinase is a widely used thrombolytic agent, but its efficacy may vary based on diabetic status and gender.

Objective: To compare the success rate of streptokinase therapy in STEMI patients based on diabetic status and gender.

Methods: A prospective cohort study was conducted in the Emergency Department of MTI Lady Reading Hospital, Peshawar, involving 310 STEMI patients treated with streptokinase. Patients were grouped by diabetic status (diabetic: 208; non-diabetic: 102) and gender (male: 183; female: 127). The success of therapy was defined as ≥70% ST-segment resolution on an ECG taken 90 minutes post-therapy. Data were analyzed using SPSS version 25 with Chi-square tests for categorical variables.

Results: Streptokinase success rates were higher in non-diabetic patients (76.5%) compared to diabetic patients (49.5%). Male patients showed a higher success rate (74.9%) than females (66.1%). Among non-diabetics, males had the highest success rate (92.9%), while diabetic females had the lowest (40.4%).

Conclusion: Streptokinase is more effective in non-diabetic and male STEMI patients. Gender and diabetic status should guide therapy decisions.

INTRODUCTION

Cardiovascular diseases, particularly myocardial infarction (MI), remain a significant cause of morbidity and mortality worldwide, including in developing countries like Pakistan. Myocardial infarction occurs when blood flow to the myocardium is reduced or completely blocked, leading to necrosis of heart muscle tissue due to a lack of oxygen and nutrients. The predominant cause of myocardial infarction is atherosclerosis, a condition characterized by the buildup of plaques in the coronary arteries, which can lead to plaque rupture and subsequent thrombosis (3). Thrombolytic therapy, which involves the administration of agents such as streptokinase to dissolve the thrombus and restore blood flow, is a cornerstone in the management of acute ST-elevation myocardial infarction (STEMI) (4). Streptokinase, introduced in 1958, remains a widely used thrombolytic agent due to its ability to induce reperfusion in a significant number of cases of acute myocardial infarction; however, its efficacy varies based on several factors, including gender and the presence of comorbid conditions such as diabetes mellitus (12).

Diabetes mellitus is a well-established risk factor for coronary artery disease (CAD) and myocardial infarction. It is associated with an increased risk of adverse outcomes in MI patients, including a higher likelihood of failed thrombolysis and higher mortality rates (5). The adverse effects of diabetes on thrombolysis outcomes are attributed to various factors, such as impaired endothelial function, increased platelet aggregation, and a pro-thrombotic state, all of which contribute to reduced efficacy of streptokinase in diabetic patients compared to non-diabetic patients (6). The difference in thrombolytic efficacy between diabetic and non-diabetic patients has been documented in multiple studies. For instance, Chowdhury et al. reported a significantly lower success rate of streptokinase therapy in diabetic patients compared to non-diabetics (5). In contrast, non-diabetic patients tend to have better outcomes with thrombolytic therapy, achieving more complete ST-segment resolution and lower rates of adverse events (7).

Gender differences also play a significant role in the outcomes of thrombolytic therapy for acute myocardial infarction. Several studies have highlighted that men generally respond better to thrombolytic therapy compared to women. This difference is partly due to physiological variations, such as hormonal differences and different vascular responses to ischemic injury and therapy, as well as a higher prevalence of comorbid conditions like hypertension and diabetes in females post-menopause (8). The underlying pathophysiological mechanisms contributing to these gender-based differences in response to thrombolytic therapy are complex and multifactorial. Women tend to present with atypical symptoms, have smaller coronary arteries, and are more prone to bleeding complications with thrombolytic therapy, which may reduce the overall efficacy and increase the risk of adverse outcomes compared to men (8). This variability underscores the importance of individualized treatment strategies and the potential need for alternative reperfusion modalities, such as primary percutaneous coronary intervention (PCI),

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particularly in patient subgroups less likely to benefit from standard thrombolytic therapy (9).

The efficacy of streptokinase therapy in treating myocardial infarction is influenced by various factors, including the time of drug administration, dosage, type of myocardial infarction, and presence of collateral circulation. Studies indicate that early administration of thrombolytic agents like streptokinase significantly improves outcomes by limiting myocardial damage and preserving left ventricular function (10). However, the overall success rate of streptokinase varies, with some studies reporting success rates of up to 70-80% in patients with acute myocardial infarction (11), while others report lower success rates depending on patient characteristics and comorbidities (12). The administration of streptokinase is associated with both benefits and risks, including the potential for serious side effects such as hemorrhagic stroke, hypotension, and allergic reactions, which may affect its use, particularly in high-risk groups such as elderly patients and those with diabetes or prior stroke history (13).

Given the significant impact of gender and diabetic status on the efficacy of thrombolytic therapy in acute myocardial infarction, this study aims to assess the success rates of streptokinase therapy in these subgroups. By understanding the differences in outcomes based on these variables, clinicians can better tailor treatment strategies to optimize care and improve prognosis in patients presenting with STEMI (5, 6). Further research into these differential responses and the mechanisms underlying them is crucial to developing more effective, individualized therapies for acute myocardial infarction in diverse patient populations (14).

MATERIAL AND METHODS

This study was a prospective cohort study conducted in the Emergency Department of the Medical Teaching Institution (MTI) Lady Reading Hospital, Peshawar. The research was carried out over a period of 4 to 6 months, following approval from the Institutional Review Board (IRB). The study aimed to evaluate the success rate of streptokinase therapy in patients presenting with acute ST-elevation myocardial infarction (STEMI), with a focus on differences in outcomes based on gender and diabetic status.

The sample size was calculated using the WHO calculator, targeting a 95% confidence interval and a 5% margin of error, resulting in a recommended sample size of 385 participants. However, the final sample size included 310 patients due to the constraints of the study period and the availability of eligible participants. The study included patients who presented with acute myocardial infarction and received streptokinase therapy as a thrombolytic treatment. Inclusion criteria were patients with confirmed acute STEMI who received streptokinase within 12 hours of symptom onset. Exclusion criteria included patients with a history of stroke, those with intracranial hemorrhage, and suspected aortic dissection.

Data collection was carried out using a structured data collection form, which included demographic details, clinical presentation, history of diabetes, timing of streptokinase administration, and outcomes post-therapy. The outcome of streptokinase therapy was assessed using electrocardiographic criteria, specifically ST-segment resolution on a 12-lead ECG, performed before and 90 minutes after the administration of streptokinase. Successful reperfusion was defined as a resolution of the ST-segment elevation by 70% or more, while incomplete reperfusion was categorized by less than 70% resolution. Any adverse events or complications during or after thrombolytic therapy were also documented and categorized according to their severity and clinical significance.

All patients provided informed consent for participation in the study, and ethical approval was obtained from the Institutional Review Board (IRB) of Lady Reading Hospital, Peshawar, in accordance with the Declaration of Helsinki guidelines. The confidentiality of patient data was maintained throughout the study, and no personal identifiers were used in the data analysis or reporting of results.

Data were entered, coded, and analyzed using the Statistical Package for Social Sciences (SPSS), version 25. Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Categorical variables, such as the presence of diabetes, gender, and the success or failure of streptokinase therapy, were presented as frequencies and percentages. Chi-square tests were applied to evaluate the association between categorical variables, such as the success rate of streptokinase therapy and patient characteristics like gender and diabetic status. A p-value of less than 0.05 was considered statistically significant.

In summary, this study employed a rigorous methodology to assess the efficacy of streptokinase therapy in acute STEMI patients, focusing on potential differences in outcomes based on gender and diabetic status. The findings aim to provide insights into the optimization of thrombolytic therapy in diverse patient subgroups, potentially guiding future clinical practices and improving patient outcomes.

RESULTS

The outcomes of streptokinase therapy were analyzed in a cohort of 310 patients with acute ST-elevation myocardial infarction (STEMI) based on diabetic status and gender. The success of therapy was defined as significant ST-segment resolution on electrocardiography. The results are summarized in tables below, providing a comparative overview of success and failure rates.

The effectiveness of streptokinase therapy was assessed among diabetic and non-diabetic patients and further stratified by gender. The summarized data is presented in Table 1.

Diabetic Status Analysis: Among diabetic patients, the success rate of streptokinase therapy was 49.5%, with 103 out of 208 patients achieving successful reperfusion

Table 1: Streptokinase Therapy Outcomes by Diabetic Status and Gender

Category	Successful (n)	Unsuccessful (n)	Total (n)	Success Rate (%)
Diabetic Patients	103	105	208	49.5%
Non-Diabetic Patients	78	24	102	76.5%
Male Patients (Overall)	137	46	183	74.9%
Female Patients (Overall)	84	43	127	66.1%
Diabetic Male Patients	59	40	99	59.6%
Diabetic Female Patients	44	65	109	40.4%
Non-Diabetic Male Patients	78	6	84	92.9%
Non-Diabetic Female Patients	28	18	46	60.9%

In contrast, non-diabetic patients had a significantly higher success rate of 76.5%, with 78 out of 102 patients showing successful outcomes.

Gender-Based Analysis: The overall success rate of streptokinase therapy was higher in male patients (74.9%) compared to female patients (66.1%). Among males, 137 out of 183 patients experienced successful outcomes, while 84 out of 127 female patients achieved successful reperfusion. Combined Effect of Diabetic Status and Gender: The highest success rate was observed among non-diabetic male patients (92.9%), where 78 out of 84 patients showed successful outcomes. Non-diabetic female patients had a success rate of 60.9%. Among diabetic patients, males had a higher success rate (59.6%) compared to females (40.4%). To further understand the effectiveness of streptokinase therapy, a comparative analysis was conducted based on the combination of diabetic status and gender. Table 2 summarizes these findings.

Table 2: Comparative Analysis of Streptokinase Therapy Success by Diabetic Status and Gender

Group	Successful (n)	Unsuccessful (n)	Success Rate (%)
Diabetic Males	59	40	59.6%
Diabetic Females	44	65	40.4%
Non-Diabetic Males	78	6	92.9%
Non-Diabetic Females	28	18	60.9%

The results demonstrate that streptokinase therapy is more effective in non-diabetic patients compared to diabetic patients, with a notable difference in success rates based on gender. Non-diabetic males had the highest success rate at 92.9%, whereas diabetic females exhibited the lowest success rate at 40.4%. These findings suggest that both diabetic status and gender significantly influence the efficacy of thrombolytic therapy in STEMI patients. Further research into the underlying clinical and physiological factors contributing to these differences may help optimize treatment strategies for diverse patient populations.

DISCUSSION

The present study examined the effectiveness of streptokinase therapy in patients with acute ST-elevation myocardial infarction (STEMI), focusing on differences in outcomes based on diabetic status and gender. The results indicated that streptokinase therapy was more effective in non-diabetic patients compared to diabetic patients, with a success rate of 76.5% in non-diabetics versus 49.5% in diabetics. Additionally, a higher success rate was observed in male patients (74.9%) compared to female patients (66.1%). These findings align with previous studies that have reported reduced efficacy of thrombolytic therapy in diabetic patients due to a higher prevalence of comorbid conditions and a pro-thrombotic state, which impair the success of reperfusion strategies (6, 7).

The observed lower success rates of streptokinase therapy in diabetic patients could be attributed to several factors. Diabetes is associated with endothelial dysfunction, increased platelet aggregation, and a tendency towards thrombosis, which collectively reduce the effectiveness of thrombolytic agents like streptokinase (5). Prior research has consistently demonstrated that the presence of diabetes is linked with poorer outcomes following thrombolytic therapy, as seen in the reduced ST-segment resolution rates and increased mortality among diabetic patients with myocardial infarction (Gill et al., 2014). The findings of this study support these observations, suggesting that diabetes significantly impacts the efficacy of streptokinase therapy in STEMI patients. Furthermore, the success rate among diabetic females was particularly low (40.4%), which could be related to hormonal differences, smaller coronary artery sizes, and increased susceptibility to adverse reactions, such as bleeding complications (8).

Gender differences in the effectiveness of streptokinase therapy also emerged as a significant finding in this study. Male patients showed a higher success rate compared to female patients. This difference could be attributed to variations in clinical presentation, coronary anatomy, and response to thrombolytic therapy between men and women. Previous studies have indicated that women with ischemic heart disease tend to have a worse prognosis and are less responsive to thrombolytic therapy compared to men, possibly due to delayed presentation, atypical symptoms, and differences in drug metabolism (9; 10). Additionally, females are more prone to thrombolytic therapy-related complications, such as hypotension and arrhythmias, which could further reduce the net benefit of such treatments (Rentrop et al., 1979). The results from this

study align with these observations, emphasizing the need for gender-specific approaches in managing STEMI patients. The strength of this study lies in its focus on both diabetic status and gender as independent factors influencing the success of streptokinase therapy in a cohort of STEMI patients. The large sample size allowed for a detailed stratification of patients and provided robust data on the comparative efficacy of streptokinase across different subgroups. However, there are several limitations to consider. The study was conducted in a single center, which may limit the generalizability of the findings to other settings. Additionally, the study relied on the resolution of the ST-segment as the sole criterion for successful reperfusion, which, while commonly used, may not capture all aspects of myocardial recovery or clinical outcomes. Future studies could benefit from incorporating additional endpoints, such as long-term mortality, cardiac function, and quality of life assessments, to provide a more comprehensive understanding of thrombolytic therapy outcomes.

Moreover, while the study provides valuable insights into the impact of diabetic status and gender on thrombolytic therapy success, it did not explore the underlying biological mechanisms in depth. The pathophysiological processes contributing to the observed differences in therapy outcomes between diabetic and non-diabetic patients, and between males and females, warrant further investigation. For example, the role of insulin resistance, inflammatory markers, and genetic predisposition could be areas of future research. Additionally, alternative reperfusion strategies, such as primary percutaneous coronary intervention (PCI), which has shown superior outcomes in diabetic patients, should be considered, especially in settings where thrombolytic therapy is less effective (12).

CONCLUSION

In conclusion, this study underscores the importance of considering both diabetic status and gender when evaluating the effectiveness of streptokinase therapy in STEMI patients. The findings suggest that non-diabetic male patients benefit most from streptokinase therapy, while diabetic females are at the greatest disadvantage. Clinicians should be aware of these differences and may need to adopt alternative therapeutic strategies or tailored approaches to optimize outcomes for all patient subgroups. Further research is needed to better understand the mechanisms underlying these disparities and to explore potential interventions that can enhance the efficacy of thrombolytic therapy in diverse populations.

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