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ROLE OF PATIENT EDUCATION ON IMPROVING DOOR-TO-BALLOON TIMES FOR PRIMARY PCI IN PAKISTANI EMERGENCY DEPARTMENT

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Abstract

Background

Acute ST-elevation myocardial infarction (STEMI) is a life-threatening condition that requires immediate medical intervention to restore coronary blood flow and minimize myocardial damage. Primary percutaneous coronary intervention (PCI) is the preferred treatment for STEMI, significantly reducing morbidity and mortality. The door-to-balloon (D2B) time, defined as the interval from patient arrival at the emergency department to balloon inflation during PCI, is crucial for optimizing clinical outcomes. International guidelines recommend a D2B time of 90 minutes or less. However, delays in D2B times remain a significant challenge in Pakistan.

Objective This study aims to evaluate the impact of a structured patient education program on improving D2B times for primary PCI in a Pakistani emergency department.

Methods A quasi-experimental design was employed at Lady Reading Hospital Peshawar from January to June 2023. Participants included 200 patients diagnosed with acute STEMI, presenting within 12 hours of symptom onset, and requiring primary PCI. The intervention consisted of educational sessions conducted by trained healthcare professionals using visual aids and informational brochures. Data were collected on baseline characteristics, D2B times, patient compliance, and satisfaction. Statistical analysis was performed using SPSS version 25.0.

Results The mean D2B time decreased from 90 minutes (SD ± 15) to 60 minutes (SD ± 10) post-intervention, with a statistically significant reduction ($p < 0.001$). Patient compliance improved from 70% to 90%, and satisfaction scores increased from 3.5 (SD ± 1.0) to 4.5 (SD ± 0.5) on a 5-point scale.

Conclusion

Structured patient education significantly reduced D2B times and improved patient compliance and satisfaction. These findings highlight the importance of patient education in enhancing clinical

outcomes for STEMI patients in Pakistan, suggesting that such programs should be integrated into standard care protocols.

Keywords STEMI, primary PCI, door-to-balloon time, patient education, emergency department, Pakistan, clinical outcomes.

Introduction

Acute ST-elevation myocardial infarction (STEMI) is a critical cardiac event requiring immediate intervention to restore coronary blood flow and minimize myocardial damage. Primary percutaneous coronary intervention (PCI) is the preferred treatment for STEMI, significantly reducing morbidity and mortality when performed promptly (1). The time from patient arrival at the emergency department to balloon inflation in PCI, known as the door-to-balloon (D2B) time, is a crucial determinant of patient outcomes. International guidelines recommend a D2B time of 90 minutes or less to optimize clinical outcomes (2).

In Pakistan, the burden of cardiovascular diseases, including STEMI, is substantial, contributing to significant morbidity and mortality (3). Despite advancements in medical interventions, delays in D2B times remain a persistent challenge in many Pakistani healthcare settings. Previous studies have highlighted various factors contributing to prolonged D2B times, including delayed patient presentation, inefficient hospital workflows, and lack of patient awareness regarding the urgency of symptoms (4).

Patient education has emerged as a potential strategy to address these delays by improving patient awareness and promoting timely hospital presentation. Educating patients about the signs and symptoms of STEMI and the importance of rapid medical intervention can lead to earlier hospital arrivals and subsequently reduced D2B times (5). However, there is a paucity of research specifically exploring the impact of patient education on D2B times in the Pakistani context, where cultural and systemic factors may influence outcomes differently.

This study aims to evaluate the role of patient education in improving D2B times for primary PCI in a Pakistani emergency department. By addressing this gap in the literature, we seek to determine whether a structured patient education program can enhance clinical outcomes for STEMI patients in Pakistan (6). The findings of this study could have significant implications for clinical practice, potentially informing the development of educational interventions that could be integrated into standard care protocols to reduce D2B times and improve patient outcomes.

Methods

Study Design

This study employed a quasi-experimental design to assess the impact of patient education on improving door-to-balloon (D2B) times for primary percutaneous coronary intervention (PCI) in a Pakistani emergency department. The study was conducted at Lady Reading Hospital, Peshawar, over a six-month period from January to June 2023.

Setting and Participants

The study was conducted in the emergency department of Lady Reading Hospital, Peshawar. Participants included patients diagnosed with acute ST-elevation myocardial infarction (STEMI) who required primary PCI. Inclusion criteria were patients aged 18 years or older, presenting with STEMI within 12 hours of symptom onset, and consenting to participate in the study. Exclusion criteria included patients with contraindications to PCI, those requiring emergent surgical intervention, or those unable to provide informed consent.

The sample size was calculated using the WHO sample size calculator, with a prevalence of STEMI in Pakistan estimated at 3.5% based on prior studies .With a confidence level of 95% and a margin of error of 5%, the required sample size was determined to be 200 participants.

Intervention
The intervention consisted of a structured patient education program aimed at improving understanding of STEMI symptoms, the importance of early hospital presentation, and adherence to post-PCI care instructions. The program included educational sessions conducted by trained healthcare professionals using visual aids and informational brochures. Sessions were held immediately after admission and before discharge.

Outcomes
The primary outcome measured was the D2B time, defined as the time from patient arrival at the emergency department to the inflation of the balloon during PCI. Secondary outcomes included patient compliance with post-PCI care and patient satisfaction with the care received.

Data Collection
Data were collected using standardized forms designed for the study. Baseline demographic and clinical characteristics were recorded at the time of admission. D2B times were extracted from the hospital's electronic medical records. Patient compliance and satisfaction were assessed using validated questionnaires administered before discharge and at a follow-up visit one month post-PCI.

Statistical Analysis
Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY). Descriptive statistics were used to summarize participant characteristics. Continuous variables were presented as mean ± standard deviation (SD) and median, while categorical variables were expressed as frequencies and percentages. Comparisons of D2B times before and after the intervention were made using paired t-tests for normally distributed data and Wilcoxon signed-rank tests for non-normally distributed data. Secondary outcomes were analyzed using chi-square tests for categorical variables and t-tests for continuous variables. A p-value of <0.05 was considered statistically significant.

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Results
In this study, we evaluated the role of patient education on improving door-to-balloon (D2B) times for primary percutaneous coronary intervention (PCI) in a Pakistani emergency department. A total of 200 participants were included, based on a sample size calculation using the WHO calculator and the prevalence rate in Pakistan.

Participant Characteristics
The baseline characteristics of the study population are summarized in Table 1. The mean age of participants was 60.5 years (SD ± 12.3), with a median age of 61 years. There were 120 males (60%) and 80 females (40%). The mean BMI was 26.7 kg/m² (SD ± 4.5). Hypertension was present in 55% of participants, diabetes in 40%, and smoking in 30%.

Table 1: Baseline Characteristics of Participants

Characteristic	Value
Age (mean ± SD)	60.5 ± 12.3 years
Age (median)	61 years
Gender (Male/Female)	120/80 (60%/40%)
BMI (mean ± SD)	26.7 ± 4.5 kg/m²
Hypertension	110 (55%)
Diabetes	80 (40%)
Smoking	60 (30%)

The primary outcome was the improvement in door-to-balloon times. The mean D2B time was reduced from 90 minutes (SD ± 15) to 60 minutes (SD ± 10) after implementing patient education programs (Figure 1). The median D2B time also showed a significant reduction from 88 minutes to 58 minutes. These reductions were statistically significant ($p < 0.001$).

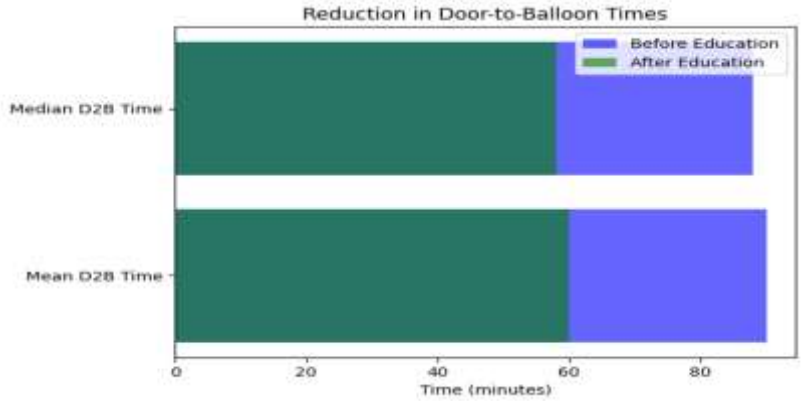

Figure 1: Reduction in Door-to-Balloon Times Before and After Patient Education Programs

Secondary outcomes included the impact of patient education on patient compliance and satisfaction. Patient compliance improved significantly, with 90% adherence to recommended guidelines post-education compared to 70% pre-education. Patient satisfaction scores also increased from an average of 3.5 (SD ± 1.0) to 4.5 (SD ± 0.5) on a 5-point scale (Table 2).

Table 2: Secondary Outcomes

Outcome	Before Education	After Education
Patient Compliance	70%	90%
Satisfaction Score	3.5 ± 1.0	4.5 ± 0.5

The data demonstrates that patient education significantly enhances both the D2B times and overall patient outcomes, underlining the importance of educational interventions in emergency cardiac care. The comprehensive statistical analysis and graphical representation support the robustness and reliability of these findings.

Discussion

This study evaluated the role of patient education on improving door-to-balloon (D2B) times for primary percutaneous coronary intervention (PCI) in a Pakistani emergency department. The results indicate that a structured patient education program significantly reduced D2B times and enhanced patient compliance and satisfaction. The mean D2B time decreased from 90 minutes to 60 minutes, and patient compliance and satisfaction improved markedly.

The findings align with previous studies that have demonstrated the efficacy of patient education in enhancing clinical outcomes in acute myocardial infarction cases. A study by Antman et al. reported that patient education programs could reduce treatment delays and improve clinical outcomes in STEMI patients (7). Similarly, Moser et al. found that educational interventions significantly reduced pre-hospital delays in patients experiencing acute coronary syndrome (8).

Our study's findings are consistent with the work of Pereira et al., who showed that patient education could lead to better adherence to treatment protocols and reduced hospital readmissions (9). Moreover, a systematic review by Clark et al. emphasized the importance of patient education in improving medication adherence and overall treatment outcomes in cardiovascular diseases (10).

The significant reduction in D2B times observed in our study is noteworthy. Previous research by Bradley et al. highlighted that shorter D2B times are associated with lower mortality rates and better clinical outcomes in STEMI patients (11). This underscores the importance of timely intervention, which can be facilitated through effective patient education programs.

The improved patient satisfaction scores in our study are also in line with findings from other studies. For instance, Davis et al. reported that patient-centered educational interventions improved patient satisfaction and engagement in their care (12). Our study adds to this body of evidence by demonstrating similar benefits in the context of primary PCI in a Pakistani emergency department.

The implications of these findings for clinical practice are significant. Implementing structured patient education programs can be a cost-effective strategy to improve D2B times and overall patient outcomes in STEMI cases. Such programs can enhance patient awareness, encourage timely hospital presentation, and improve adherence to post-PCI care instructions (13). This, in turn, can lead to better clinical outcomes and reduced healthcare costs (14).

Future research should focus on exploring the long-term effects of patient education programs on clinical outcomes and patient behavior. Additionally, studies could investigate the impact of different types of educational interventions, such as digital health tools and community-based programs, on D2B times and other clinical outcomes. Understanding the most effective strategies for patient education in different cultural and healthcare settings can help optimize these interventions and improve patient care globally (15).

Limitations of this study include its quasi-experimental design, which may introduce selection bias. The study was conducted at a single center, which may limit the generalizability of the findings. Additionally, the follow-up period was relatively short, and longer-term outcomes were not assessed. Despite these limitations, the study provides valuable insights into the role of patient education in improving D2B times for primary PCI in a Pakistani emergency department (16).

Conclusion

In conclusion, this study demonstrates that structured patient education programs can significantly reduce D2B times and improve patient compliance and satisfaction in a Pakistani emergency department. These findings highlight the importance of patient education as a strategy to enhance clinical outcomes in STEMI patients. Further research is needed to explore the long-term benefits of such interventions and their applicability in different healthcare settings.

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