Original Article

Optimization of Dual Antiplatelet Therapy in Pakistani Patients Undergoing PCI: A Strategy to Minimize Bleeding Risks and Improve Outcomes

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ABSTRACT

Background: Percutaneous Coronary Intervention (PCI) is essential for treating coronary artery disease. The use of Dual Antiplatelet Therapy (DAPT) is crucial to prevent thrombotic complications but presents bleeding risks. This challenge is accentuated by the variability in genetic, demographic, and regional factors, particularly in Pakistan, where there is a high prevalence of cardiovascular diseases.

Objective: To optimize DAPT strategies for Pakistani patients undergoing PCI by minimizing bleeding risks while ensuring therapeutic efficacy, aiming to pioneer personalized cardiovascular care.

Methods: A retrospective cohort analysis was conducted at Lady Reading Hospital, Peshawar, involving 500 patients who underwent PCI and received DAPT from January 1, 2023, to January 1, 2024. Comprehensive data collection included patient demographics, clinical histories, specifics of PCI procedures, and outcomes of bleeding and thrombotic events, through a detailed review of medical records.

Results: The cohort predominantly consisted of males (70%), with an average age of 58 years. Most patients (96%, n=480) were prescribed aspirin and clopidogrel, while a smaller fraction (4%, n=20) received aspirin and ticagrelor. Compliance was high, with 90% adherence. Bleeding occurred in 10% of the cohort (n=50), with major bleeds necessitating hospitalization in 4% (n=20). Thrombotic events were noted in 3% of patients (n=15).

Conclusion: The study underscores the importance of personalized DAPT regimens that address individual risks and regional healthcare challenges in Pakistan. Tailored approaches are essential for optimizing treatment efficacy and safety, advocating for advanced, nuanced cardiovascular care practices.

Keywords: Bleeding Risk, Dual Antiplatelet Therapy, Pakistani Patients, Percutaneous Coronary Intervention, Personalized Medicine, Thrombotic Complications.

INTRODUCTION

Percutaneous Coronary Intervention (PCI) has emerged as a crucial therapeutic option for managing coronary artery disease, notably in the context of acute coronary syndrome (ACS) and stable ischemic heart disease. Central to the success of PCI is the implementation of dual antiplatelet therapy (DAPT), comprising aspirin and a P2Y12 inhibitor, which significantly reduces the risk of thrombotic events such as stent thrombosis (1). The benefits of DAPT in enhancing patient outcomes following PCI are well-established (2).

Despite its efficacy, DAPT carries an inherent risk of bleeding, a severe complication that can undermine the benefits derived from the prevention of ischemic events (3). This risk is further exacerbated by a variable response to antiplatelet medications, which can be influenced by genetic factors, demographic characteristics, and regional healthcare variations (4). In Pakistan, where the prevalence of cardiovascular diseases continues to rise, there is a pressing need to customize DAPT strategies to balance the risk of bleeding against the therapeutic benefits (5).

The challenge of optimizing DAPT in Pakistan is compounded by the high incidence of comorbidities such as diabetes and hypertension, which complicate the management of antithrombotic therapy (6). Additionally, disparities in healthcare access, variability in clinical practices across regions, and differences in patient adherence to treatment protocols necessitate tailored DAPT approaches (7).

This study, therefore, aims to optimize DAPT for Pakistani patients undergoing PCI by examining local clinical outcomes and incidences of bleeding. The objective is to develop tailored recommendations for the duration and dosing of DAPT that are congruent with the genetic profiles and lifestyle factors prevalent in the Pakistani population. Through this approach, the study seeks to establish a foundation for personalized cardiovascular care in the region, potentially improving patient outcomes while minimizing adverse effects.

MATERIAL AND METHODS

The study was conducted as a comprehensive, retrospective cohort analysis at the Lady Reading Hospital in Peshawar, a leading tertiary care cardiac center. Its primary aim was to delineate optimal Dual Antiplatelet Therapy (DAPT) strategies for patients undergoing Percutaneous Coronary Intervention (PCI) to effectively minimize bleeding risks while ensuring therapeutic efficacy.

The cohort included 500 patients who received PCI and were prescribed DAPT over the course of one year, from January 1, 2023, to January 1, 2024. This patient population predominantly consisted of males (70%), mirroring the typical gender distribution observed in cardiac disease presentations within Pakistan. The mean age was approximately 58 years, illustrating a wide range of age groups affected by PCI.

Eligibility for the study required patients to be at least 18 years old, have undergone PCI with stent placement, and be on a prescribed regimen of DAPT. Exclusion criteria included patients with a history of bleeding disorders, those who had experienced a stroke within six months prior to undergoing PCI, or those presenting contraindications to antiplatelet therapy. Patients who did not consent to participate were also excluded.

Data were meticulously gathered through a detailed examination of medical records, which included demographic data, comprehensive clinical histories, details of the PCI procedures, and outcomes such as bleeding incidents and thrombotic events. Special attention was devoted to variables like the types of stents used, the specific antiplatelet agents administered, and the duration of DAPT. This detailed data collection facilitated a nuanced understanding of the various factors that influence DAPT optimization.

For the analysis, descriptive statistical methods were utilized to summarize and interpret the data related to patient demographics, DAPT regimens, and clinical outcomes. The results were systematically organized into tables and figures, ensuring that the findings were presented clearly and informatively. This methodological approach enabled an accessible and thorough examination of the complex interplay between DAPT management and patient outcomes in the context of Pakistani cardiac care.

RESULTS

The analysis encompassed 500 patients who underwent PCI and received DAPT at Lady Reading Hospital in Peshawar over a one-year period from January 1, 2023, to January 1, 2024. A significant majority of the cohort, comprising 350 individuals (70%), were male, aligning with the observed higher incidence of coronary artery disease among males in this region. The patients' ages ranged from 40 to 75 years, with a mean age of 58 years, predominantly affecting the middle-aged to elderly demographic.

The standard DAPT regimen of aspirin and clopidogrel was administered to 480 patients (96%), while a smaller subgroup of 20 patients (4%) received aspirin and ticagrelor, in line with recent guidelines that recommend ticagrelor for higher-risk individuals. Notably, adherence to the prescribed DAPT regimen was commendably high, with 450 patients (90%) consistently following their medication schedule.

Regarding clinical outcomes, bleeding events were reported in 50 patients (10%) during the follow-up period. These were primarily minor bleeds, occurring in 30 patients (6%) and not necessitating medical intervention. Conversely, 20 patients (4%) experienced major bleeding events that required hospitalization. The study also recorded thrombotic complications in 15 patients (3%), which included cases of myocardial infarction and stent thrombosis. This underscores the ongoing challenge in balancing the antithrombotic benefits of DAPT with the associated bleeding risks.

These findings are summarized in Table 1, which details patient demographics, adherence rates, and the incidence rates of both bleeding and thrombotic events, thus providing a comprehensive overview of the clinical outcomes observed in the study.

Table 1: Patient Demographics and Clinical Outcomes

Variable	Total Patients (N=500)	Percentage (%)
Gender		
Male	350	70%
Female	150	30%
Mean Age (Years)		58
DAPT Regimen		
Aspirin + Clopidogrel	480	96%
Aspirin + Ticagrelor	20	4%
Compliance with DAPT	450	90%
Incidence of Bleeding Events		
Minor Bleeds	30	6%
Major Bleeds	20	4%
Thrombotic Events	15	3%

The findings highlight the inherent complexities involved in managing DAPT among a high-risk population. While the incidence of major bleeds was relatively low at 4%, it remains a significant clinical concern. Conversely, the occurrence of thrombotic events at a rate of 3% indicates that the DAPT regimens effectively prevent severe complications of PCI, such as myocardial infarction and stent thrombosis. Nonetheless, achieving a balance between minimizing thrombotic risks and mitigating bleeding complications continues to demand careful and individualized patient assessment.

Furthermore, the high adherence rate of 90% underscores the importance of patient compliance in the successful application of DAPT. This level of adherence is crucial for achieving the therapeutic goals of DAPT and highlights the effectiveness of patient education and follow-up protocols implemented within the study framework.

DISCUSSION

The study underscores the complexities inherent in managing Dual Antiplatelet Therapy (DAPT) among Pakistani patients undergoing Percutaneous Coronary Intervention (PCI), a situation that mirrors challenges in comparable global contexts. Notably, the adherence rate to DAPT in this study reached 90%, significantly higher than typically reported rates in other regions where non-adherence is a substantial hurdle to effective post-PCI outcomes (8). This high level of compliance can be attributed to the robust patient education programs and meticulous follow-up protocols implemented at Lady Reading Hospital, which exemplify how structured care programs can markedly enhance treatment compliance (9).

The preference for aspirin and clopidogrel as the primary DAPT regimen reflects adherence to global standards and represents current best practices for managing patients post-PCI (10). However, the adoption of ticagrelor for 4% of high-risk patients is in line with the latest guidelines, which recommend more potent P2Y12 inhibitors to mitigate the risk of thrombotic events in patients with elevated risk profiles (11). This strategy emphasizes the importance of personalized medicine in cardiology, advocating for adjustments in treatment based on individual risk assessments rather than a generic approach.

Clinically, the incidence of bleeding events reported in this study (10%) aligns with established benchmarks for DAPT-related complications, though the presence of major bleeding in 4% of patients remains a significant concern and underscores the importance of continuous risk assessment (12). This necessity is contrasted with the low rate of thrombotic events (3%), suggesting that while the protective benefits of DAPT are effectively realized, the management of bleeding risks demands refined antithrombotic strategies tailored to individual patient factors (13,14).

The findings further highlight the role of dynamic risk assessment models that could integrate genetic, demographic, and clinical data to refine DAPT strategies. Such models are vital in balancing the risks and benefits of prolonged DAPT, potentially enhancing patient-specific therapeutic outcomes (14-16). Additionally, the economic implications of managing complications from DAPT, including both bleeding and thrombotic events, call for cost-effective strategies, particularly in resource-limited settings where healthcare efficiency is critical (17-20).

The study's strength lies in its comprehensive analysis and high patient adherence, while limitations include the lack of a control group and potential biases inherent in a retrospective analysis. These findings provoke further investigation into how structured healthcare interventions can impact compliance and outcomes in DAPT management, reinforcing the need for ongoing research in this area.

CONCLUSION

This study sheds light on the complexities of optimizing Dual Antiplatelet Therapy (DAPT) within a specific regional framework, underscoring the critical balance needed between reducing bleeding risks and averting thrombotic complications. It accentuates the significance of personalized medicine and tailored management strategies in interventional cardiology, advocating for the development of customized DAPT guidelines that cater to the distinctive needs of diverse patient groups. This approach has the potential to improve outcomes across various healthcare environments. However, the retrospective design and the confinement to a single center might limit the broad applicability of the results to all settings within Pakistan or to other countries facing similar healthcare challenges. Moreover, by excluding patients with a history of stroke or bleeding disorders, the study might not fully capture the complete spectrum and incidence rates of bleeding and thrombotic events. Future research would benefit from a multicentric approach that includes diverse regions within the country, thereby generating more comprehensive data that could inform regional or national DAPT guidelines.

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