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# INPATIENT ANTITHROMBOTIC THERAPY FOR MYOCARDIAL INFARCTION : RETROSPECTIVE STUDY

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***Abstract**: Myocardial infarction (MI), a subtype of coronary heart disease (CHD), is still a major cause of morbidity and mortality around the world. Non-ST-segment elevation MI (NSTEMI) is more common than ST-segment elevation MI (STEMI). Antithrombotic therapy, including antiplatelet and anticoagulant agents, is essential in MI management to prevent thrombus formation and reduce ischemic complications. Although international and national clinical guidelines (PERKI and ACC/AHA) provide recommendations tailored to MI type and patient factors, discrepancies in clinical practice, especially in developing countries, may impact treatment outcomes. This retrospective descriptive study aimed to evaluate the use and appropriateness of antithrombotic therapy in NSTEMI and STEMI patients at Hospital X, Kediri City, in 2018. Data were collected from medical records of hospitalized acute myocardial infarction (AMI) patients. Aspirin combined with clopidogrel was the most commonly used regimen for NSTEMI, whereas STEMI patients frequently received aspirin, clopidogrel, and enoxaparin; fibrinolytics were administered in nine STEMI cases. Dosage evaluation showed compliance with guidelines in NSTEMI patients, while 36.84% of STEMI patients, particularly those receiving enoxaparin, were given incorrect dosages. These findings highlight the need for improved adherence to clinical guidelines to optimize antithrombotic therapy outcomes in MI management.*

***Keywords**: antithrombotic; STEMI; NSTEMI*

**Abstrak**. Penyakit jantung koroner (PJK), khususnya infark miokard (MI), masih menjadi penyebab utama morbiditas dan mortalitas global, dengan MI non-elevasi segmen ST (NSTEMI) terjadi lebih sering daripada MI elevasi segmen ST (STEMI). Terapi antitrombotik, termasuk agen antiplatelet dan antikoagulan, dimana sangat penting dalam manajemen MI untuk mencegah pembentukan trombus dan mengurangi komplikasi iskemik. Meskipun pedoman klinis internasional dan nasional (PERKI dan ACC/AHA) memberikan rekomendasi yang disesuaikan dengan jenis MI dan faktor pasien, perbedaan dalam praktik klinis, terutama di negara-negara berkembang, dapat memengaruhi hasil pengobatan. Studi deskriptif retrospektif ini bertujuan untuk mengevaluasi penggunaan dan kesesuaian terapi antitrombotik pada pasien NSTEMI dan STEMI di Rumah Sakit X, Kota Kediri, pada tahun 2018. Data dikumpulkan dari rekam medis pasien infark miokard akut (AMI) yang dirawat di rumah sakit. Aspirin yang dikombinasikan dengan clopidogrel merupakan regimen yang paling umum digunakan untuk NSTEMI, sedangkan pasien STEMI sering menerima aspirin, clopidogrel, dan enoxaparin; fibrinolitik diberikan pada sembilan kasus STEMI. Evaluasi dosis menunjukkan kepatuhan terhadap pedoman pada pasien NSTEMI, sementara 36,84% pasien STEMI, khususnya yang menerima enoxaparin, diberikan dosis yang salah. Temuan ini menyoroti perlunya peningkatan kepatuhan terhadap pedoman klinis untuk mengoptimalkan hasil terapi antitrombotik dalam manajemen MI.
**Kata kunci**: Antitrombotik; NSTEMI; STEMI

## 1. BACKGROUND

Coronary heart disease (CHD) represents a significant cause of both morbidity and mortality on a global scale. Myocardial infarction (MI) represents the most common form of CHD. This condition accounts for more than 15% of annual mortality, with the

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majority of cases involving NSTEMI rather than STEMI. The incidence of myocardial infarction has declined in industrialised countries. This decline can be partly attributed to the implementation of improved healthcare systems and effective public health policies.. Nevertheless, a contrasting scenario has emerged in developing regions, notably South Asia, certain Latin American territories, and select European countries (Jayaraj et al., 2018). A meta-analysis study has revealed that the prevalence of myocardial infarction (MI) is 3.8% in individuals under 60 years of age and 9.5% in individuals over 60 years of age. In consideration of the findings, the elevated incidence of myocardial infarction (MI) among individuals over the age of 60 is a matter of concern for health authorities, underscoring the necessity for effective diagnostic procedures and screening protocols for MI in this population (Salari et al., 2023). In 2022, the global incidence of Coronary Artery Disease (CAD) was estimated to be 315 million reported cases. (Benjamin et al., 2024)

Antithrombotic therapy, incorporating the utilisation of antiplatelet and anticoagulant agents, occupies a pivotal function in the management of myocardial infarction by hindering thrombus formation and diminishing the likelihood of subsequent ischemic incidents. Current clinical guidelines recommend a combination of antithrombotic drugs tailored to the type of MI and patient-specific factors, such as bleeding risk and comorbidities (Ibanez et al., 2018). Aspirin reduces vascular mortality by about 23% in AMI patients by inhibiting platelet aggregation (Layne & Ferro, 2017; Toyota et al., 2025). In a number of studies, the addition of clopidogrel to aspirin has been shown to result in a further reduction in major adverse cardiovascular events (MACCEs), including mortality, recurrent myocardial infarction and stroke, without causing a significant increase in major bleeding (e.g., CLARITY, COMMIT trials) (Toyota et al., 2025; Vogel et al., 2022). Higher doses or combinations of antithrombotics can reduce the risk of ischaemic events (such as re-infarction), but can also increase the risk of bleeding, including major bleeding, which can be life-threatening. Many recent clinical trials have shown that the benefits of reducing cardiovascular events are often offset by increased bleeding complications when antithrombotic therapy is intensified or prolonged. It has been demonstrated that an excessive duration of therapy is associated with an augmented risk of bleeding, a phenomenon that is especially prevalent in elderly patients or those with other comorbidities. Dose selection and duration strategies should

be personalized. This should be based on patient risk stratification, laboratory monitoring, and periodic evaluation of benefits and risks. Good monitoring can help prevent serious complications from inappropriate use of antithrombotics, which is why it is important to carefully monitor patients. (Alquwaizani et al., 2013; Yamazaki, 2020)

A study of antithrombotic medications administered to patients suffering from acute myocardial infarction at Mohammad Hoesin Central General Hospital, Palembang, revealed that the antithrombotic medications prescribed to AMI patients at Mohammad Hoesin Hospital, Palembang, in 2012 included aspirin, heparin, clopidogrel and fondaparinux. (Pandani et al., 2018). A study at XYZ Hospital Jakarta (2019) found that Acetyl Salicylic Acid (ASA) was the most frequently used antithrombotic drug with ISDN. However, only 35.4% of drug use was in accordance with the hospital formulary and Acute Myocardial Infarction guidelines. (Ginanjar et al., 2022). The management of antithrombotic therapeutic interventions in patients with myocardial infarction (MI) necessitates a judicious balancing act between the benefits of thrombosis prevention and the risks associated with bleeding complications. This is further compounded by the selection of appropriate drugs, which must be tailored to the specific clinical condition of the patient. For instance, several studies have associated the use of oral anticoagulants that directly inhibit thrombin (direct thrombin inhibitors) with an increased risk of myocardial infarction, so the type of antithrombotic selected must be adjusted according to the patient's risk profile. (Fragasso et al., 2015).

However, despite established protocols, variations in drug selection, dosing, and duration of therapy still occur in clinical practice, especially in developing countries where resource limitations and lack of adherence to guidelines may affect treatment outcomes. Therefore, understanding the patterns of antithrombotic drug use among MI patients is crucial to identify gaps in therapy and improve patient care. This study aims to evaluate the use of antithrombotic drugs in patients with NSTEMI and STEMI, with the goal of supporting evidence-based improvements in clinical practice.

## 2. THEORETICAL REVIEW

Myocardial infarction (MI) occurs when blood flow to a part of the heart is obstructed, typically by a thrombus, leading to ischemia and myocardial cell death. MI is commonly classified into two types based on electrocardiographic findings: STEMI and NSTEMI. STEMI is usually caused by complete occlusion of a coronary artery, while NSTEMI results from a partial blockage. Although both conditions are considered acute coronary syndromes (ACS), they differ in pathophysiology, treatment strategies, and prognosis (Thygesen et al., 2018). The formation of a thrombus plays a pivotal role in the pathogenesis of MI. Atherosclerotic plaque rupture or erosion in the coronary arteries leads to platelet activation, adhesion, and aggregation, triggering the coagulation cascade and resulting in thrombus formation. This occludes the vessel, reducing myocardial oxygen supply. The degree and location of the thrombus determine whether the patient presents with STEMI or NSTEMI (Badimon et al., 2012). Understanding the thrombotic process has been critical in guiding the development of targeted pharmacological interventions.

Antithrombotic therapy is a cornerstone of MI management. It includes two major classes of drugs: antiplatelet agents (e.g., aspirin, clopidogrel, ticagrelor) and anticoagulants (e.g., unfractionated heparin, low-molecular-weight heparin, fondaparinux). In STEMI, rapid reperfusion is prioritized, often with percutaneous coronary intervention (PCI), and antithrombotic therapy supports this intervention. In NSTEMI, therapy focuses on stabilizing the thrombus and preventing progression to occlusion. Clinical guidelines recommend dual antiplatelet therapy (DAPT) combined with appropriate anticoagulants during the acute phase of MI (Valgimigli et al., 2018).

Anticoagulation therapy is critical in managing both STEMI and NSTEMI, with treatment strategies tailored to each condition's pathophysiology and clinical guidelines. In the context of STEMI management, unfractionated heparin (UFH) continues to be the anticoagulant of choice during primary percutaneous coronary intervention (PPCI). This preference can be attributed to the rapid onset of action, the ease of monitoring, and the capacity for reversal that characterise UFH (Hermanides et al., 2018; Vogel et al., 2022). For NSTEMI patients with atrial fibrillation, triple antithrombotic therapy (oral anticoagulant + DAPT) is often initiated post-PCI but shortened to 1 month in high-bleeding-risk cases (de Veer et al., 2021; Huisman, 2021). Fondaparinux (an anti-Xa

agent) is recommended for high-bleeding-risk patients managed conservatively, but it is avoided in early invasive approaches due to catheter thrombosis risks (Huisman, 2021; Sobieszczyk, 2008)

Thrombolytic therapy, also known as fibrinolytic therapy, is a critical treatment option for STEMI when PPCI is not available within the recommended timeframe. This therapy involves the administration of agents such as alteplase, tenecteplase, or streptokinase to dissolve the thrombus and restore blood flow in the occluded coronary artery. It is most effective when given within the first 12 hours of symptom onset, with the greatest benefit occurring within the first 2–3 hours. Despite being less effective than PCI in terms of long-term outcomes and associated with a higher risk of bleeding, thrombolytics remain essential, particularly in rural or resource-limited settings where access to cath labs is delayed (O'Gara et al., 2013). Current guidelines recommend thrombolytic therapy in STEMI patients when PCI cannot be performed within 120 minutes of first medical contact.

Antiplatelet and antithrombin strategies in ACS have evolved with various available therapeutic agent options. Antiplatelet drugs such as abciximab are particularly beneficial for patients with a large intracoronary thrombus burden undergoing PPCI. Meanwhile, bivalirudin, as a thrombin inhibitor, shows superiority compared to the combination of heparin and GPI in NSTEMI and STEMI patients undergoing PCI, and its use is becoming more widespread. Fondaparinux, as a subcutaneous factor Xa inhibitor, is effective in NSTEMI ACS patients who are not planned for early invasive treatment. However, the use of oral factor Xa inhibitors is not yet ready for widespread application in the management of ACS (Showkathali & Natarajan, 2012).

DAPT which is a combination of aspirin and P2Y12 inhibitors, is the main therapeutic strategy recommended in guidelines to reduce thrombotic events after MI. Prasugrel and ticagrelor have been proven to be superior to clopidogrel in reducing ischemic events, although with an increased risk of bleeding. (Saito et al., 2023).

## 3. METHODE

This study is an observational study with a retrospective descriptive design. This observational study was carried out by making observations and documenting the information gathered. The purpose of the descriptive study is to gather information about drug use among patients diagnosed with Acute Myocardial Infarction (AMI) at the X Hospital, Kediri City during the year 2018. Patients who had AMI, both STEMI and NSTEMI, and were admitted to the inpatient unit of X Hospital in Kediri City during 2018 with or without comorbidities—as well as those who had complete medical records and were taking one or more antithrombotic medications (antiplatelet, anticoagulant, and thrombolytic) met the study's inclusion criteria.. The exclusion criteria in this study were patients who left the hospital because of their own wishes (forced discharge) or ran away before being declared cured.

The sampling technique used in this study was purposive sampling. Purposive sampling is a method of data collection whereby the investigator purposefully selects cases or variables based on specific considerations. These considerations are derived from previously established characteristics or properties of the target population. The results of the study showed that there were 38 STEMI patients and 13 NSTEMI patients.

## 4. RESULTS AND DISCUSSION

The results of this study include demographic and clinical characteristics of patients, patterns of drug utilization, and an evaluation of the appropriateness of antiplatelet, anticoagulant, and thrombolytic drug dosages. The analysis was based on a sample of 51 patients diagnosed with acute myocardial infarction who were treated in the inpatient unit of X Hospital, located in Kediri City, in 2018. This study utilized secondary data obtained from X Hospital's medical records for the year 2018.

### Patient Characteristics

Based on the research data collected, the majority of patients with acute myocardial infarction (AMI) were male, accounting for 60.78% (31 patients) of the 51 total AMI cases. The distribution of AMI patients by sex is presented in Table 1. The most common age group was the late elderly (56–65 years), representing 37.26% (19 patients) of the total. The most common type of AMI was STEMI, which accounted for 74.5% of all AMI cases (38 patients). The distribution type of AMI is also shown in Table 1.

**Table 1. Patient Characteristics**

| Patient Characteristics | NSTEMI | | STEMI | | Total | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| **Sex** | | | | | | |
| Male | 5 | 38,46% | 26 | 68,42% | 31 | 60,78% |
| Female | 8 | 61,54% | 12 | 31,58% | 20 | 39,22% |
| **Total** | **13** | **100%** | **38** | **100%** | **51** | **100%** |
| **Age (years)** | | | | | | |
| 36-45 | 1 | 7,70% | 4 | 10,53% | 5 | 9,80% |
| 46-55 | 3 | 23,07% | 9 | 23,68% | 12 | 23,53% |
| 56-65 | 5 | 38,46% | 14 | 36,84% | 19 | 37,26% |
| >65 | 4 | 30,77% | 11 | 28,95% | 15 | 29,41% |
| **Total** | **13** | **100%** | **38** | **100%** | **51** | **100%** |

Sex is a well-established risk factor influencing the incidence, presentation, and outcomes of AMI. Epidemiological data consistently show that men have a higher overall risk of developing AMI at a younger age compared to women. However, the risk in women significantly increases after menopause, likely due to the decline in endogenous estrogen, which is believed to have a protective cardiovascular effect. Furthermore, women frequently present with atypical symptoms, including malaise, dyspnoea, and nausea, which can result in delayed diagnosis and treatment, consequently leading to suboptimal clinical outcomes. (L. S. Mehta et al., 2016).

Age is one of the most significant non-modifiable risk factors for AMI, with the risk increasing substantially as individuals grow older. Aging is associated with progressive endothelial dysfunction, increased arterial stiffness, and a higher prevalence of comorbidities such as hypertension, diabetes, and dyslipidemia—all of which contribute to atherosclerosis and coronary artery disease. Older adults are also more likely to experience silent or atypical presentations of AMI, which can complicate timely diagnosis and treatment. Studies have shown that individuals over the age of 60 are at notably higher risk of AMI, with a greater likelihood of adverse outcomes compared to younger patients (Mozaffarian et al., 2016).

**Antithrombotic Teraphy in NSTEMI patients**

**1. A Profile and A Pattern of Antithrombotic Treatment in Patients with NSTEMI**

The antiplatelet treatment received by patients with NSTEMI was predominantly a combination of aspirin and clopidogrel, as shown in Table 2. This combination was administered to 11 patients, while single treatments, aspirin or also clopidogrel, were

given to one patient each. The profile of anticoagulant treatment in STEMI patients was as follows: eight patients did not receive anticoagulant drugs, four patients received fondaparinux (Arixtra) anticoagulant, and one patient received enoxaparin (Lovenox).

**Tabel 2. Antithrombotic in NSTEMI Patients**

| Antithrombotic | Number of patient | Percentage |
|---|---|---|
| **Antiplatelet** | | |
| Aspirin | 1 | 7,69 |
| Clopidogrel | 1 | 7,69 |
| Aspirin + Clopidogrel | 11 | 84,62 |
| **Total** | **13** | **100** |
| **Anticoagulant** | | |
| Did not received anticoagulant | 8 | 61,54 |
| Fondapurinux (Arixtra) | 4 | 30,77 |
| Enoxaparin (Lovenox) | 1 | 7,69 |
| **Total** | **13** | **100** |
| **Pattern of Antithrombotic** | | |
| Aspirin | 1 | 7,69 |
| CPG | 1 | 7,69 |
| Aspirin + CPG | 6 | 46,15 |
| Aspirin + CPG + Enoxaparin | 1 | 7,69 |
| Aspirin + CPG + Fondaparinux | 4 | 30,77 |
| **Total** | **13** | **100%** |

Management of NSTEMI patients requires antiplatelet therapy. Antiplatelet drugs, both aspirin and ADP receptor inhibitors will achieve inhibitory effects on platelets more quickly after oral loading dose administration. Initial therapy in NSTEMI patients is given loading dose aspirin. In the case of patients suffering from STEMI who are scheduled to have early invasive management within 24 hours, the routine administration of adenosine diphosphate (ADP) receptor inhibitors prior to treatment is not recommended. In patients STEMI who are not planned to receive early invasive strategies within the next 24 hours, or who are planned to receive conservative therapy and do not have a high risk of bleeding, pre-treatment with ADP receptor inhibitors (ticagrelor, prasugrel or clopidogrel) can be considered (PERKI, 2024)

According to table 2, 84.62% of patients received a combination of antiplatelet aspirin and clopidrogel. The combination of aspirin and clopidogrel remains a foundational component of DAPT in the treatment of patients with NSTEMI. This strategy is recommended for reducing the risk of recurrent ischemic events, particularly in patients undergoing PCI or those managed conservatively with high thrombotic risk (Collet et al., 2021). Aspirin, by irreversibly inhibiting COX-1 and thromboxane A2 production, and clopidogrel, by blocking the P2Y12 ADP receptor, exert complementary

antiplatelet effects that enhance the prevention of atherothrombotic events (Ibanez et al., 2018). According to the 2020 ESC Guidelines, clopidogrel is the preferred P2Y12 inhibitor in patients with NSTEMI who are unsuitable for newer agents like ticagrelor or prasugrel due to increased bleeding risk or contraindications (Collet et al., 2021). Recent data continue to support the safety and efficacy of the aspirin–clopidogrel combination, especially in elderly populations or those with comorbidities where more potent agents may be poorly tolerated (Valgimigli et al., 2021). While DAPT is typically recommended for 12 months, emerging evidence also supports shorter durations in patients at high bleeding risk, with subsequent de-escalation strategies tailored to individual risk profiles.

The utilisation of monotherapy antiplatelet agents, specifically aspirin or clopidogel, amounted to 7.69% of the study sample.The use of single antiplatelet therapy, such as aspirin or clopidogrel, remains an important consideration in the management of patients with NSTEMI, particularly in individuals at high bleeding risk or those ineligible for DAPT. Aspirin, an irreversible cyclooxygenase-1 (COX-1) inhibitor, has long been established as the cornerstone of antithrombotic therapy in acute coronary syndromes due to its ability to reduce recurrent ischemic events (Antman et al., 2008). In patients who cannot tolerate aspirin due to hypersensitivity or gastrointestinal intolerance, clopidogrel a P2Y12 receptor antagonist can be used as monotherapy. Although DAPT is generally superior in reducing major adverse cardiovascular events, studies have shown that clopidogrel monotherapy still offers significant benefit over placebo and may be a reasonable alternative when aspirin is contraindicated (S. R. Mehta et al., 2001; Yusuf et al., 2001). However, clinical guidelines recommend monotherapy only when DAPT is not feasible, and the decision should be individualized based on the patient's ischemic and bleeding risk profile (Collet et al., 2021).

Parenteral anticoagulation is recommended for all patients with AMI at the time of diagnosis. In general, crossover of UFH and LWMH should be avoided. Anticoagulation should be stopped immediately after PCI, except in special clinical circumstances such as left ventricular aneurysm with thrombus or atrial fibrillation that require anticoagulation. The use of UFH and enoxaparin (UFH is more recommended than enoxaparin) can be given if angiography is performed within <24 hours of symptom onset. Meanwhile, fondaparinux is more recommended for STEMI patients who do not plan early

angiography (within 24 hours of onset). However, to prevent thrombus in the catheter, patients who receive fondaparinux must be given a bolus of UFH (full dose) when intervention is performed (PERKI, 2024).

According to the findings presented in Table 2, 30.77% of patients received Fodaparinux, while 7.69% were administered Enoxaparin. The use of anticoagulant therapy in patients with NSTEMI is considered essential during the acute phase of management to prevent thrombus propagation and reduce ischemic complications. Current guidelines from the European Society of Cardiology (ESC) recommend initiating parenteral anticoagulation such as UFH, enoxaparin, or fondaparinux in all NSTEMI patients at the time of diagnosis, especially prior to invasive procedures like coronary angiography or PCI (Collet et al., 2021). Fondaparinux is generally preferred due to its favorable safety profile, showing a lower risk of major bleeding compared to enoxaparin without compromising efficacy (Yusuf et al., 2006; Ibanez et al., 2023). However, if fondaparinux is used and PCI is planned, an additional dose of UFH is recommended to reduce the risk of catheter thrombosis. The choice of anticoagulant should be guided by the patient's bleeding risk, renal function, and institutional protocols. Although anticoagulation is crucial during hospitalization, prolonged use beyond the acute phase is not routinely recommended unless other indications such as atrial fibrillation or venous thromboembolism are present (Ibanez et al., 2023).

Patients who did not receive anticoagulants was found to be 61.54%. NSTEMI patients who do not receive anticoagulants face distinct risks and challenges, as anticoagulation is a cornerstone of acute management to prevent thrombotic complications. While guidelines recommend anticoagulant therapy for most NSTEMI cases, exceptions exist due to bleeding risks or specific comorbidities. Conditions like immune thrombocytopenia (ITP) or prior major bleeding episodes may contraindicate anticoagulant use. A 2024 study of NSTEMI patients with ITP found these individuals had higher inpatient mortality and bleeding complications, reflecting the challenges of balancing thrombosis and hemorrhage risks (Baig & Chaliki, 2024). Patients with advanced renal impairment, uncontrolled hypertension, or active bleeding may avoid anticoagulants to prevent exacerbating these conditions (Felix et al., 2024). withholding anticoagulants in NSTEMI is reserved for high-bleeding-risk scenarios and requires

careful individualized assessment. These patients often experience worse ischemic outcomes despite reduced bleeding, underscoring the need for alternative strategies like intensified antiplatelet therapy or early revascularization when feasible.

**2. Evaluation of antithrombotic dose appropriateness in patients with NSTEMI.**

The dose of antiplatelet treatment in NSTEMI patients obtained at X Hospital Kediri City in this study was 1 patient received single aspirin (aspilet) loading dose of 4 tablets (320mg) followed by a maintenance dose of 1x80 mg; 1 patient received clopidogrel loading dose of 4 tablets (300mg) followed by a maintenance dose of 1x75 mg. In the combination treatment of aspirin + clopidogrel, 1 patient received aspirin loading dose of 4 tablets (320mg) followed by a maintenance dose of 1x100mg and clopidogrel loading dose of 4 tablets (300mg) followed by a maintenance dose of 1x75mg; while 7 patients received aspirin loading dose of 4 tablets (320mg) followed by a maintenance dose of 1x80mg and clopidogrel loading dose of 4 tablets (300mg) followed by a maintenance dose of 1x75mg; and 3 patients received a loading dose of 2 tablets (160mg) of aspirin followed by a maintenance dose of 1x80mg and a loading dose of 4 tablets (300mg) of clopidogrel followed by a maintenance dose of 1x75mg.

Based on ACC/AHA/ACEP/NAEMSP/SCAI Guideline 2025, In the treatment of patients with NSTEMI, the administration of aspirin is a crucial aspect of the management plan. The recommended loading dose for this patient group is 162–325 mg, which should be taken orally and, if possible, chewed to facilitate the rapid onset of its antiplatelet effects. The loading dose should be administered to patients who have been prescribed aspirin therapy. The recommended maintenance dosage is 75 to 100 mg, to be taken orally once per day (in a non-enteric coating formulation). Dosing consideration clopidrogel for NSTE-ACS patient are loading dose 300 or 600 mg orally and maintenance 75 mg orally daily (Rao et al., 2025). Based on recent PERKI guideline, the loading dose of aspirin is 160-320 orally, followed by a maintenance dose of 80-100 mg once a day and no dose adjustment in patients with chronic kidney failure. While the loading dose of clopidrogel is 300-600 mg orally followed by a maintenance dose of 75 mg once a day and no dose adjustment in patients with chronic kidney failure. (PERKI, 2024). The dosage of aspirin and clopidrogel used by NSTEMI patients in this study was appropriate according to the ACC AHA 2025 and PERKI 2024 Guidelines.

**Table 3. Evaluation of Antithrombotic Dosage in NSTEMI Patients**

| No | Antithrombotic | Number | Appropriate | Inappropriate | Percentage |
|---|---|---|---|---|---|
| **A** | **Antiplatelet** | | | | **100%** |
| 1 | Aspirin | 1 | 1 | - | |
| 2 | CPG | 1 | 1 | - | |
| 3 | Aspirin + CPG | 11 | 11 | - | |
| **B** | **Anticoagulant** | | | | **100%** |
| 1 | Fondaparinux | 4 | 4 | - | |
| 2 | Enoxaparin | 1 | 1 | - | |

The present study examined the dosage of anticoagulant treatment administered to patients with NSTEMI at X Hospital in Kediri City. The study revealed that four patients received fondaparinux (Arixtra®), with a dosage of 1 x 2.5 mg administered subcutaneously. One patient, with a body weight of 60 kg, received a subcutaneous injection of enoxaparin (Lovenox®) at a dose of 60 mg twice daily.

Based on ACC/AHA/ACEP/NAEMSP/SCAI Guideline 2025, dosing consideration aspirin for NSTE-ACS patient as initial therapy 1 mg/kg subcutaneous every 12 h and reduce dose to 1 mg/kg per d subcutaneous if CrCl <30 mL/min. Dosing Fondaparinux as nitial therapy: 2.5 mg subcutaneous daily (Rao et al., 2025). According to the PERKI 2024 guidelines, the dose of enoxaparin as initial therapy for NSTEMI patients is 1 mg/kg twice a day subcutaneously for at least 2 days and continued until the patient's clinical condition is stable. If creatinine clearance <30 ml/min, the dose of enoxaparin should be reduced to 1 mg/kgBW once a day. Meanwhile, the initial dose for Fondaparinux is 2.5 mg/day given subcutaneously (PERKI, 2024). The dosage of Enoxaparin and Fondaparinux used by NSTEMI patients in this study was appropriate according to the 2025 AHA ACC Guidelines and the 2024 PERKI guidelines.

**Antithrombotic Teraphy in STEMI patients**

**1. A Profile and A Pattern of Antithrombotic Treatment in Patients with STEMI**

The most common use of antiplatelets in STEMI patients is a combination of aspirin and clopidogrel in 33 patients and those who received single antiplatelets were aspirin in 1 patient, clopidogrel in 1 patient, while those who did not receive antiplatelets were 1 patient. The use of anticoagulants in STEMI patients was fondaparinux (Arixtra®) in 11 patients, and enoxaparin (lovenox®) in 16 patients and 11 patients did not receive anticoagulants. The use of thrombolytics in STEMI patients was the thrombolytic drug streptokinase (fibrion®) in 9 patients and 29 patients did not receive thrombolytic drugs.

**Table 4. Antithrombotic in STEMI Patients**

| Antithrombotic | Number of patient | Percentage |
|---|---|---|
| **Antiplatelet** | | |
| Did not received antiplatelet | 1 | 2,63 |
| Aspirin | 1 | 2,63 |
| Clopidogrel | 3 | 7,90 |
| Aspirin + Clopidogrel | 33 | 86,84 |
| **Total** | **38** | **100** |
| **Anticoagulant** | | |
| Did not received anticoagulant | 11 | 28,95 |
| Fondapurinux (Arixtra) | 11 | 28,95 |
| Enoxaparin (Lovenox) | 16 | 42,10 |
| **Total** | **38** | **100** |
| **Thrombolytic agent** | | |
| Did not received thrombolytic agent | 29 | 76,32 |
| Streptokinase (Fibrion) | 9 | 23,68 |
| **Total** | **38** | **100** |
| **Pattern of Antithrombotic** | | |
| CPG | 3 | 7,90 |
| Aspirin + Clopidrogel | 5 | 13,16 |
| Aspirin + Clopidrogel + Enoxaparin | 13 | 34,21 |
| Aspirin + Clopidrogel + Fondaparinux | 8 | 21,05 |
| Aspirin + Clopidrogel + Enoxaparin + Streptokinase | 3 | 7,90 |
| Aspirin + Clopidrogel + Fondaparinux + Streptokinase | 2 | 5,26 |
| Aspirin + Streptokinase | 1 | 2,63 |
| Aspirin + Clopidrogel + Streptokinase | 2 | 5,26 |
| Fondaparinux + Streptokinase | 1 | 2,63 |
| **Total** | **38** | **100** |

In this study, the antiplatelet combination of aspirin and clopidogrel was the most prevalent, accounting for 86.84% of cases. Antiplatelet therapy is a critical component in managing STEMI patients, particularly those undergoing PCI. Current strategies focus on balancing ischemic risk reduction with bleeding complications, guided by recent clinical evidence. The cornerstone treatment combines aspirin with a $P2Y_{12}$ inhibitor (clopidogrel, prasugrel, or ticagrelor) (Hermanides et al., 2018; Tran et al., 2006). The combination of aspirin and clopidogrel (DAPT) for STEMI patients, particularly in reducing ischemic complications and improving outcomes. A 2018 randomized trial demonstrated that adding clopidogrel to aspirin significantly reduced severe ischemia (32% vs. 10%) and recurrent angina (42% vs. 20%) compared to aspirin alone (Patra & Ulchala, 2018). Early studies established that clopidogrel + aspirin reduces major ischemic events by up to one-third in STEMI patients undergoing fibrinolysis or PCI, with no significant increase in bleeding (Tran et al., 2006). A 2024 meta-analysis found ticagrelor + aspirin reduced mortality, reinfarction, and MACE more effectively than

clopidogrel + aspirin, though bleeding rates (BARC ≥3) and TIMI flow improvements were comparable (Geravandi et al., 2024).

Furthermore, monotherapy antiplatelet agents, including aspirin (2.63%) and clopidogrel (2.63%), were utilised in this investigative study. The role of aspirin or clopidogrel monotherapy in STEMI management is generally limited to specific clinical scenarios, as DAPT remains the standard of care. After 1 month of DAPT in complex PCI cases, aspirin monotherapy showed lower cardiovascular events (3.3% vs. 5.2%) compared to clopidogrel monotherapy in a 2025 study, though this was not STEMI-specific. Aspirin alone may reduce bleeding complications in high-risk patients after initial DAPT. Clopidogrel monotherapy after short DAPT had higher net adverse events (7.2% vs. 4.8%) in complex PCI cases compared to aspirin (Domei et al., 2025). In ACS patients unable to tolerate aspirin, clopidogrel monotherapy was associated with higher 12-month cardiovascular events (15.4%) vs. ticagrelor (11.2%) but similar bleeding rates (Geravandi et al., 2024).

In this study, there was one patient with STEMI who did not receive antiplatelets. Omitting antiplatelet therapy in STEMI management is highly unusual and generally only considered in exceptional clinical circumstances due to the central role antiplatelets play in reducing mortality, reinfarction, and stent thrombosis. Patients with ongoing life-threatening bleeding (such as gastrointestinal or intracranial hemorrhage) are at extreme risk if given antiplatelets. In such cases, the immediate priority is to control bleeding, and antiplatelets may be withheld until hemostasis is achieved. In rare instances, logistical delays or system failures may result in patients not receiving antiplatelet therapy, though this is not a clinical decision and is associated with worse outcomes (Danchin et al., 2009; Nozewski et al., 2021)

In this study, 71.05% of patients with STEMI received anticoagulants, specifically Enoxaparin (42.10%) and Fondaparinux (28.95%). Anticoagulant therapy is a key component in the management of STEMI, particularly during reperfusion strategies such as PCI or fibrinolysis. The primary goal is to prevent thrombus propagation and support reperfusion, while minimizing bleeding risk. Enoxaparin, a low molecular weight heparin (LMWH), is widely used in the management of STEMI as an anticoagulant. Its role is well established in both PPCI and in patients receiving thrombolytic therapy. Enoxaparin

is generally preferred over other LMWHs when an LMWH is indicated for ACS, which includes STEMI, due to strong support from clinical trials and guidelines. Enoxaparin inhibits clot formation by acting on factor Xa and, to a lesser extent, factor IIa (thrombin). It provides a predictable anticoagulant effect, requires less frequent monitoring compared to UFH, and is associated with a lower risk of heparin-induced thrombocytopenia (Nguyen et al., 2011). Major guidelines, including those from the American College of Cardiology (ACC) and the American Heart Association (AHA), recommend enoxaparin as an effective anticoagulant option in the management of STEMI, particularly in circumstances where unfractionated heparin (UFH) is not available or contraindicated. Enoxaparin is used across the continuum of STEMI care, including during initial hospital management, in the emergency department, and as an adjunct to reperfusion therapy (Cohen et al., 2007; Hoekstra, 2009). While fondaparinux has shown lower bleeding rates in NSTEMI and unstable angina, enoxaparin remains a standard anticoagulant for STEMI, with robust evidence supporting its efficacy and safety in this setting (Rahman et al., 2024).

Fondaparinux, a synthetic pentasaccharide, may be considered in selected cases, particularly for patients at high bleeding risk. However, it is not recommended for patients undergoing early invasive strategies due to the risk of catheter thrombosis (Sobieszczyk, 2008). Fondaparinux is not routinely recommended as the primary anticoagulant in STEMI, especially for patients undergoing PPCI, due to an increased risk of catheter thrombosis if used alone during PCI. Fondaparinux may be considered in STEMI patients treated with fibrinolysis (thrombolytic therapy) who are not undergoing immediate PCI. In this context, it can reduce the risk of bleeding compared to other anticoagulants, but an additional dose of UFH is required during PCI to prevent catheter thrombosis (Association & Forum, 2015).

Meanwhile, in this study, 28.95% of STEMI patients did not receive anticoagulants. Anticoagulants are critical during primary PCI to prevent clot propagation and stent thrombosis. Without them, the risk of recurrent ischemic events rises, particularly in patients with multivessel disease or severe left ventricular dysfunction (LVEF ≤40%). A 2023 study of 300 AMI patients with LV dysfunction found that those not receiving post-PCI anticoagulants had elevated rates of thromboembolism and mortality compared to

anticoagulated patients (Piccolo et al., 2023; Ullah et al., 2023). Anticoagulants (e.g., UFH, enoxaparin) remain standard in STEMI reperfusion. Omission is not routinely advised, even in high-bleeding-risk patients, without compelling contraindications (Streiff, 2023).

In this study, 23.68% of STEMI patients received streptokinase as a thrombolytic agent. Streptokinase is a non-fibrin-specific thrombolytic agent historically used in the management of STEMI, particularly in settings where PCI is not available or cannot be performed within guideline-recommended timeframes. Early randomized trials demonstrated that intravenous streptokinase administered within 12 hours of STEMI onset significantly reduced early mortality by as much as 50% in initial studies compared to control or placebo, primarily through early reperfusion and reduction of infarct size (Verheugt, 2009). While streptokinase and other thrombolytics improve outcomes compared to no reperfusion, PPCI is now preferred when available, as it offers superior restoration of coronary flow, better preservation of left ventricular function, and lower rates of recurrent ischemia and arrhythmias (Valizadeh et al., 2020).

Furthermore, it was observed that 76.32% of patients diagnosed with STEMI did not receive thrombolytics. Thrombolytic therapy is contraindicated in patients with certain conditions due to the high risk of life-threatening bleeding or other complications. Common absolute contraindications include: history of hemorrhagic stroke or stroke of unknown origin at any time; ischemic stroke within the past 3 months, active internal bleeding (excluding menses); known intracranial neoplasm; arteriovenous malformation, or aneurysm; recent major surgery or significant trauma (especially to head or face) within the past 3 weeks and severe uncontrolled hypertension in large registries, a significant proportion of STEMI patients not receiving thrombolytics had at least one standard contraindication for fibrinolysis. Thrombolytics are most effective when administered within 12 hours of symptom onset. Patients presenting beyond this window, or with resolved symptoms and no ongoing ischemia, are typically not given thrombolytics (Cannon et al., 2002).

**2. Evaluation of antithrombotic dose appropriateness in patients with STEMI.**

Research data (table.5) shows that the use of antiplatelet monotheraphy is aspirin with a loading dose of 4 tablets (320g) followed by a maintenance dose of 80 mg once a

day. There were three patients who received clopidogrel treatment with a loading dose of 4 tablets (300mg) followed by a maintenance dose of 75 mg once a day. In 33 patients who received combination treatment of Aspirin + Clopidogrel received the following doses; 24 patients received aspirin loading dose of 4 tablets (320mg) followed by a maintenance dose of 80 mg once a day and clopidogrel loading dose of 4 tablets (300mg) followed by a maintenance dose of 75 mg once a day; 2 patients received aspirin loading dose of 3 tablets (240mg) followed by a maintenance dose of 80mg once a day and clopidogrel loading dose of 4 tablets (300mg) followed by a maintenance dose of 75mg once a day; and 7 patients received a loading dose of 2 tablets (160 mg) of aspirin followed by a maintenance dose of 80 mg once daily and a loading dose of 4 tablets (300 mg) of clopidogrel followed by a maintenance dose of 75 mg once daily.

Based on PERKI 2024 guideline, aspirin is recommended for all STEMI patients without contraindications, with an initial oral loading dose of 160-320 mg and a maintenance dose of 80-100 mg once daily for long-term therapy. Clopidrogel is also recommended with a loading dose of 300-600 mg and a maintenance dose of 90 mg twice daily (PERKI, 2024). Based on ACC/AHA/ACEP/NAEMSP/SCAI Guideline 2025, the recommended loading dose for STEMI patient is 162–325 mg, which should be administered orally and, when feasible, chewed to facilitate the rapid onset of its antiplatelet effects.. In the case of patients already undergoing aspirin therapy, the loading dose should be administered with caution. The recommended daily maintenance dose of the non-enteric-coated medication is 75–100 mg, to be taken orally.. Dosing consideration clopidrogel for STEMI patient are loading dose 300 or 600 mg orally and maintenance 75 mg orally daily (Rao et al., 2025). The results of the study showed that the use of antiplatelet drugs in STEMI patients at Hospital X Kediri City was appropriate according to the PERKI 2024 and ACC/AHA/ACEP/NAEMSP/SCAI Guidelines 2025.

The results of the study (table 5) showed that the use of anticoagulants in STEMI patients at X Hospital in Kediri City consisted of fondaparinux and enoxaparin. A total of 11 patients received fondaparinux (arixtra) with a bolus dose of 1.5 mg iv followed by 2.5 mg once a day given subcutaneously. Based on ACC / AHA / ACEP / NAEMSP / SCAI Guideline 2025, initial therapy fondaparinux is 2.5 mg subcutaneous daily. If fondaparinux is used with fibrinolytic therapy, the dose used is 2.5 mg IV, then 2.5 mg

subcutaneously once a day. Fondaparinux is contraindicated if CrCl <30 ml / minute (Rao et al., 2025). The PERKI 2024 guidelines also state that the dose of fondaparinux is a bolus of 2.5 mg iv followed by 2.5 mg / day subcutaneously for up to 8 days or until discharged (PERKI, 2024). Meanwhile, according to the 2018 PERKI guidelines, the fondaparinux dose for STEMI patients is a bolus of 1.5 mg iv followed by 2.5 mg/day subcutaneously for up to 8 days or until discharged (PERKI, 2018). The fondaparinux dose received by STEMI patients at Hospital X, Kediri City is in accordance with the 2018 PERKI guidelines.

**Table 3. Evaluation of Antithrombotic Dosage in STEMI Patients**

| No | | Antithrombotic | Number | Appropriate | Inappropriate | Percentage Inappropriate |
|---|---|---|---|---|---|---|
| **A** | | **Antiplatelet** | | | | |
| | 1 | Aspirin | 1 | 1 | - | 0 |
| | 2 | Clopidrogel | 3 | 3 | - | 0 |
| | 3 | Aspirin + Clopidrogel | 33 | 33 | - | 0 |
| **B** | | **Anticoagulant** | | | | |
| | 1 | Fondaparinux | 11 | 11 | - | 0 |
| | 2 | Enoxaparin | 16 | 2 | 14 | 36,84 |
| **C** | | **Trombolitik** | | | | |
| | 1 | Streptokinase | 9 | 9 | - | 0 |

Table 5 shows that 16 patients received the anticoagulant drug enoxaparin (lovenox). In accordance with the ACC/AHA/ACEP/NAEMSP/SCAI Guideline 2025 and the PERKI Guidelines 2018 and 2024, the following dosing guidelines are recommended for enoxaparin:For patients under 75 years of age, a 30 mg intravenous bolus of enoxaparin is administered, followed 15 minutes later by 1 mg/kg subcutaneously every 12 hours until the completion of revascularization or discharge from hospital care for a maximum period of 8 days. It is imperative the initial two subcutaneous doses do not exceed 100 mg per injection.. If the patient is over 75 years old, enoxaparin is given without an intravenous bolus, starting with the first subcutaneous dose of 0.75 mg/kg with a maximum of 75 mg per injection for the first two subcutaneous doses. Patients with GFR < 30 mL/min/1.73 $m^2$ should receive enoxaparin at a dose of 1 mg/kg every 24 hours subcutaneously, and this dosage is not age-dependent.

There are 2 patients with a body weight of 60 kg who received a 30 mg intravenous bolus of enoxaparin followed by a dose of 60 mg every 12 hours, which is correct according to PERKI and ACC/AHA guidelines. There are 14 patients who received enoxaparin doses that did not comply with the guidelines (1 overdose and 13 underdoses).

One patient who received an overdose of enoxaparin was a patient with a GFR value of <30mL/min/1.73m², who should have received a dose of 60mg every 24 hours, but the dose the patient received was 60mg every 12 hours. Thirteen patients received an underdose of lovenox, namely 2 patients with a GFR value of <30mL/min/1.73m², and the dose was insufficient because it did not match the patients' body weight. Meanwhile, 11 patients had a GFR value of >30mL/min/1.73m², and the enoxaparin dose was insufficient because it did not match the patients' body weight. So, the results of this study indicate that the use of enoxaparin doses did not comply with the guidelines for 14 patients (36.84%).

the thrombolytic treatment administered to patients with STEMI at X Hospital in Kediri City consisted of intravenous administration of streptokinase (fibrin) at a dose of 1.5 million units.. This is in accordance with the PERKI 2018 and 2024 guidelines where the dose of streptokinase is 1.5 million units intravenously over 30-60 minutes. The results of this study indicate that the dose of streptokinase used was appropriate and in line with the PERKI guidelines.

## CONCLUSION AND SUGGESTIONS

The most common antithrombotic regimen for NSTEMI patients is aspirin + clopidogrel, while for STEMI patients it is aspirin + clopidogrel + enoxaparin. .Fibrinolytics were used in 9 STEMI patients. The evaluation of antithrombotic drug dosages for NSTEMI patients was appropriate according to PERKI and ACC/AHA guidelines. The evaluation of antithrombotic drug dosages for STEMI patients showed a 36.84% discrepancy in dosages based on PERKI and ACC/AHA guidelines, specifically in the use of the anticoagulant enoxaparin. This study is a retrospective study, so it cannot confirm the relationship between treatment and the clinical condition of patients to other medical professionals. Future research is expected to be prospective in order to provide more complete and comprehensive data.

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