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EXAMINATION OF PRESCRIPTIONS ORDERED DURING HOSPITALIZATION FOR PATIENTS WHO HAVE HAD A STENT INSERTED

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ABSTRACT

Objective: This study examines the prescription patterns for patients hospitalized following stent implantation for cardiovascular diseases, evaluating these patterns against clinical guidelines and exploring patient demographics, diagnoses, and comorbidities.
Materials and Methods: A cross-sectional study was conducted on 111 patients aged 18-85 years who received stents at a private hospital between January 8, 2021, and October 4, 2021. Data on demographics, diagnoses, and prescriptions were collected retrospectively and analyzed using SPSS software. Diagnoses were categorized according to ICD-10 codes, and medications were classified using the ATC system.
Results: The study included 111 patients, 65% of whom were male, with a mean age of 63.0±10.5 years. Atherosclerotic heart disease (87.4%) and essential hypertension (85.6%) were the most common diagnoses. The most frequently prescribed medications were nitrates (100.0%), dual antiplatelet therapy (99.1%), anticoagulants (97.3%), and statins (87.4%). According to the ATC classification, the most common drug groups were those affecting blood and blood-forming organs (51.0%), the cardiovascular system (23.0%), and the nervous system (13.0%).
Conclusion: The prescribing patterns for stent patients in this study largely adhered to clinical guidelines, particularly regarding the use of dual antiplatelet therapy, nitrates, and anticoagulants. However, variability in some prescription practices indicates a need for ongoing education and review to ensure optimal patient outcomes. This study underscores the importance of guideline-based therapy in the management of coronary artery disease and highlights the complex clinical profiles of patients requiring stent implantation.
Keywords: Coronary artery diseases, stent, prescribing patterns, drug utilization, cardiovascular treatment.

STENT TAKILAN HASTALARA HASTANEDE YATIŞ SIRASINDA YAZILAN REÇETELERİN İNCELENMESİ

ÖZET

Amaç: Bu çalışmada, kardiyovasküler hastalıkları nedeniyle stent takılan hastalara hastanede yatışları sırasında yazılan reçetelerin incelenmesi, bu reçetelerin klinik kılavuzlarla karşılaştırılması ve hastaların demografik özellikleri, teşhisleri ve ek hastalıklarının araştırılması amaçlanmaktadır.
Materyal ve Yöntem: Bu kesitsel çalışmada, 8 Ocak 2021 ile 4 Ekim 2021 tarihleri arasında İstanbuldaki özel bir hastanede stent takılan 18-85 yaşları arasındaki 111 hastanın reçetesi incelenmiştir. Hastaların demografik özellikleri, teşhisleri ve diğer ilgili reçete verileri retrospektif olarak incelenmiş ve SPSS yazılımı kullanılarak analiz edilmiştir. Hastaların tanıları ICD-10 kodlarına göre, ilaçları ise ATC sistemine göre sınıflandırılmıştır.
Bulgular: Çalışmaya dahil edilen 111 hastanın %65'inin erkek olduğu ve genel yaş ortalamasının 63.0±10.5 olduğu belirlendi. En sık karşılaşılan tanıların aterosklerotik kalp hastalığı (%87,4) ve esansiyel hipertansiyon (%85,6) olduğu saptandı. En sık reçete edilen ilaçların nitratlar (%100,0), çift antiplatelet tedavi (%99,1), antikoagülanlar (%97,3) ve statinler (%87,4) olduğu belirlendi. ATC sınıflandırmasına göre, en yaygın ilaç grupları kan ve kan yapıcı organları etkileyen ilaçlar (%51,0), kardiyovasküler sistem ilaçları (%23,0) ve sinir sistemi ilaçları (%13,0) idi.
Sonuç: Bu çalışmada stent takılan hastalar için düzenlenen reçetelerin, özellikle çift antiplatelet tedavi, nitratlar ve antikoagülanların kullanımı konusunda büyük ölçüde klinik kılavuzlara uyum gösterdiği anlaşılmaktadır. Ancak, bazı reçete uygulamalarındaki değişkenlik, optimal hasta sonuçlarını sağlamak için sürekli eğitim ve inceleme ihtiyacını ortaya koymaktadır. Bu çalışma, koroner arter hastalığının yönetiminde kılavuzlara dayalı tedavinin önemini vurgulamakta ve stent yerleştirilmesi gereken hastaların karmaşık klinik profillerine dikkat çekmektedir.
Anahtar Kelimeler: Koroner arter hastalıkları, stent, reçete düzenleri, ilaç kullanımı, kardiyovasküler tedavi.

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INTRODUCTION

Cardiovascular diseases (CVD) are currently among the leading causes of mortality and morbidity globally. According to the World Health Organization (WHO), cardiovascular diseases accounted for an estimated 17.9 million deaths worldwide in 2019, representing 32% of all global deaths (1). In Turkey, circulatory system diseases are the leading cause of death, accounting for 36.8% of all mortalities (2).

Atherosclerosis is a primary mechanism leading to CVD, causing the occlusion of arteries by plaques that can narrow and harden the coronary arteries over time. This process often results in significant health issues, including myocardial infarction and ischemic heart disease (3). Chest pain is the most common symptom of coronary artery disease (CAD), necessitating effective treatment strategies to prevent heart attacks and reduce mortality (4). Current treatment modalities for CAD include pharmacotherapy, percutaneous coronary interventions (PCI), and surgical interventions such as coronary artery bypass grafting (CABG). PCI is an invasive procedure utilized for diagnosing and treating coronary artery disease. During PCI, a stent is placed in the narrowed coronary artery to restore blood flow and prevent further ischemic events (5).

Dual-antiplatelet therapy (DAPT), comprising acetylsalicylic acid (ASA) and a P2Y12 receptor inhibitor, is the standard treatment for patients undergoing PCI. This combination is critical in preventing stent thrombosis and ensuring long-term patency of the coronary arteries (6). Additionally, anticoagulants like unfractionated heparin and enoxaparin, the latter being the most widely studied low molecular weight heparin in the PCI setting, are frequently used to further reduce thrombotic risks (7). Other medications commonly prescribed include nitrates, such as isosorbide mononitrate and glyceryl trinitrate, to alleviate chest pain and myocardial ischemia. Beta-blockers like metoprolol reduce myocardial oxygen demand by lowering heart rate and blood pressure, while statins decrease low-density lipoprotein (LDL) cholesterol levels, thereby mitigating atherosclerosis progression (8). Proton pump inhibitors (PPIs) are often co-prescribed with antiplatelet agents to minimize the risk of gastrointestinal bleeding, a common side effect of long-term antiplatelet therapy (9).

This study aims to examine the prescribing patterns for patients with stent placement at a private hospital in Turkey. It evaluates the prescriptions in terms of demographic characteristics, diagnoses, and comorbidities, providing valuable insights into the adherence to guidelines and identifying areas for potential improvement in clinical practice.

MATERIALS AND METHODS

This cross-sectional study was conducted at a private hospital in Turkey. The study included patients who underwent stent implantation between January 8, 2021, and October 4, 2021. Ethical approval was obtained from the Acıbadem University Ethics Committee (Decision No: 2021/21 Date: November 04, 2021).

A total of 111 patients aged 18 to 85 years who had stents implanted were included in the study. Patient data, including demographic characteristics, diagnoses, and comorbidities, were retrospectively reviewed. All patient information was anonymized to protect privacy, in accordance with the Declaration of Helsinki.

Data Collection

Prescription data were obtained from the hospital pharmacy following a data request protocol signed with the hospital's chief physician. Demographic characteristics (age, gender), diagnoses, and comorbid conditions were collected from the hospital's information system.

Classification of Diagnoses and Medications

Diagnoses were categorized using the International Classification of Diseases, 10th Revision (ICD-10) codes. The medications were classified according to the Anatomical Therapeutic Chemical (ATC) classification system.

Statistical Analysis

Descriptive statistics, including means, standard deviations, and percentages, were calculated using SPSS software version 23 (SPSS Inc., Chicago, IL, USA). The number of drugs per prescription (NDPP), the frequency of each medication, and the monthly distribution of prescriptions were analyzed. The data are presented as mean ± standard deviation for continuous variables and as frequencies and percentages for categorical variables. A 5% type-1 error level was assumed for statistical significance.

RESULTS

A total of 2497 medication was prescribed between in 111 prescriptions for patients who had stent implanted. Number of drugs per prescription (NDPP) was 13.3±4.8. In the gender-specific evaluation, it was determined that the NDPP is similar in both groups. 65.0% of the patients who had the prescriptions were male. The mean age of the patients was 63.0±10.5 (oldest age: 85, youngest age: 32). It was determined that the number of male patients was in the majority in all age groups (Figure 1). The number of prescriptions recorded lowest in January (5.0%) and the highest numbers were recorded in March (19.0%) and September (19.0%).

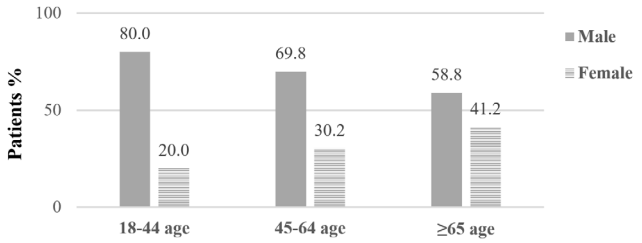

Figure 1. Gender distribution according to age groups

In the diagnosis-specific examination, there were 45 different diagnoses prescribed in total. Among the common diagnosis, "atherosclerotic heart disease (I25.1)" (87.4%) and "essential hypertension (I10)" (85.6%) were in the first two place. Following this, "hyperlipidemia mixed (E78.2)" (74.8%) and "chest pain (R07.4)" (20.7%) were in the third and fourth ranks (Table 1).

Table 1. Distribution of the diagnosis

Rank	ICD code	Diagnosis	n (%)
1	I25.1	Atherosclerotic heart disease	97 (87.4)
2	I10	Essential (primary) hypertension	95 (85.6)
3	E78.2	Mixed hyperlipidaemia	83 (74.8)
4	R07.4	Chest pain, unspecified	23 (20.7)
5	R07.3	Other chest pain	19 (17.1)
6	E11.9	Type 2 diabetes mellitus without complications	18 (16.2)
7	K27	Peptic ulcer, site unspecified	14 (12.6)
8	I50.9	Heart failure, unspecified	12 (10.8)
9	J18.9	Pneumonia, unspecified	12 (10.8)
10	I73.9	Peripheral vascular disease, unspecified	12 (10.8)
11	I70.2	Atherosclerosis of arteries of extremities	11 (9.9)
12	I48	Atrial fibrillation and flutter	11 (9.9)
13	I25.0	Atherosclerotic cardiovascular disease	10 (9.0)
14	E11	Type 2 Diabetes Mellitus	9 (8.1)
15	I25.9	Chronic ischaemic heart disease, unspecified	9 (8.1)
Other Diagnosis			**73 (65.7)**

According to ATC-1 classification, the first three most common anatomical groups were; B (blood and blood forming organs), (51.0%), C (cardiovascular system), (23.0%) and N (nervous system), (13.0%) respectively. On ATC-3 level, "antithrombotic agents" (B01A), (29.8%) was the most common prescribed therapeutic/pharmacological subgroup in prescriptions. The second subgroup was "IV solutions and additives" (B05X), (20.4%). "Vasodilators used in cardiac disease" (12.4%) was in the third place. These are followed by "anxiolytics" (6.0%) and "drugs for peptic ulcer and gastro-oesophageal reflux disease" (5.3%), respectively.

The percentage of prescriptions containing sodium chloride (20.3%) was found to be highest; glyceryl trinitrate (12.1%) and clopidogrel (12.1%) were followed. Followed by acetylsalicylic acid (ASA), (7.6%), enoxaparin (5.8%), alprazolam (5.2%), atorvastatin (4.6%), prilocaine (3.9%), heparin (3.8%), and pantoprazole (3.2%) respectively (Table 2).

Table 2. The most common 20 drugs in the prescriptions of patients with stent implants

Rank	ATC-5 Code	ATC-5 Name	Drug n(%)
1	B05XA03	Sodium chloride	506 (20.3)
2	C01DA02	Glyceryl trinitrate	302 (12.1)
3	B01AC04	Clopidogrel	302 (12.1)
4	B01AC06	Acetylsalicylic acid	189 (7.6)
5	B01AB05	Enoxaparin	146 (5.8)
6	N05BA12	Alprazolam	129 (5.2)
7	C10AA05	Atorvastatin	115 (4.6)
8	N01BB04	Prilocaine	97 (3.9)
9	B01AB01	Heparin	96 (3.8)
10	A02BC02	Pantoprazole	80 (3.2)
11	V08AB02	Iohexol	80 (3.2)
12	A02BC05	Esomeprazole	52 (2.1)
13	C03CA01	Furosemide	27 (1.1)
14	C07AB02	Metoprolol	26 (1.0)
15	N05BA01	Diazepam	21 (0.8)
16	N02AB02	Pethidine	19 (0.8)
17	V08AB11	Iobitridol	17 (0.7)
18	N02BE01	Paracetamol	16 (0.6)
19	C01BD01	Amiodarone	15 (0.6)
20	R05CB01	Acetylcysteine	12 (0.5)

Among 111 prescriptions analysed, 99.1% were prescribed with antiplatelet therapy. 92.8% were received dual antiplatelet therapy. Of these prescriptions, 88.3% were ASA combined with clopidogrel, while 4.5% were combined with ASA and ticagrelor and one of them (0.9%) ASA combined with both clopidogrel and ticagrelor. On the other hand, six patients (5.4%) received single antiplatelet therapy (SAPT) while 1 patient did not receive any antiplatelet therapy (Table 3).

Table 3. Distribution of antiplatelet drugs prescribed to patients with stents

Classes of Antiplatelet Therapy	Patient n (%)
DAPT (ASA + Clopidogrel)	98 (88.3)
DAPT (ASA + Ticagrelor)	5 (4.5)
DAPT (ASA + Both Clopidogrel and Ticagrelor)	1 (0.9)
SAPT	6 (5.4)
Not receiving any antiplatelet therapy	1 (0.9)
Total	111 (100.0)

DAPT: dual antiplatelet therapy, ASA: Acetylsalicylic acid, SAPT: single antiplatelet therapy

Among prescriptions analyzed, 52.2% of prescriptions contained pantoprazole, 37.8% contained esomeprazol and 10.0% does not contain PPI. Most of the prescriptions include antiplatelets (99.1%), anticoagulants (97.3%), statins (87.4%) and nitrates (100.0%), while beta-blockers (18.9%), ACEIs (5.4%), CCBs (5.4%) and ARBs (3.0%) were prescribed less frequently. Heparin and enoxaparin are prescribed together in 81.9% of the prescriptions. Statins were prescribed to 87.4% in total, majority of them were atorvastatin and 1 of them was rosuvastatin. Among the beta-blockers, the most prescribed drug was metoprolol (18.1%), followed by nebivolol (0.9%) and 81.1% of the patients were not taken beta-blockers. ACEIs were given to 5.4% and ARBs were given to 2.7% of the patients. It is observed that all patients were treated with nitrates, most of them are glyceryl trinitrate (Table 4).

Table 4. Most frequently prescribed individual drugs in stent insertion

Clases of drug	Drug name	Number of Patients
Anticoagulants	Only enoxaparin	12
	Only heparin	5
	Enoxaparin + heparin	90
	Enoxaparin + heparin + warfarin	1
	No receive anticoagulant	3
Statins	Atorvastatin	96
	Rosuvastain	1
	No receive statin	14
Betablockers	Metoprolol	20
	Nebivolol	1
	No receive betablocker	90
Angiotensin Converting Enzyme Inhibitors (ACEIs)	Captopril	2
	Perindopril	2
	Ramipril	2
	No receive ACEIs	105
Nitrates	Isosorbide dinitrate+ glyceryl trinitrate	3
	Glyceryl trinitrate	108
Calcium Channel Blockers (CCBs)	Diltiazem	3
	Amlodipine	3
	No receive CCBs	105
Angiotensin II Receptor Blockers (ARBs)	Candesartan	1
	Olmesartan medoxomil	1
	Valsartan	1
	No receive ARBs	108

DISCUSSION

Drug utilization studies of drug use in inpatients are effective tools for help to evaluate hospital prescribing trends and efficiency. There are occasional differences in drug use, possibly due to disease trends that differ between different countries, and even between healthcare institutions in a country, and sometimes within the same institution at different time points. Our aim was to analyze and compare with other studies whether the fundamental treatments recommended to patients were prescribed according to national practice guidelines. This study provides a comprehensive analysis of the prescribing patterns for patients undergoing stent insertion at a private hospital in Turkey. The findings underscore the standardization and variability in prescription practices, revealing significant insights into the treatment regimens for cardiovascular diseases.

The results indicate a strong adherence to guideline-recommended therapies, with nearly all patients receiving dual antiplatelet therapy (DAPT), primarily comprising acetylsalicylic acid (ASA) and clopidogrel. This aligns with the European Society of Cardiology (ESC) guidelines, which advocate for DAPT in patients undergoing percutaneous coronary intervention (PCI) to prevent stent thrombosis and subsequent cardiac events (6,10). The high prescription rates of nitrates, anticoagulants, and statins further reflect adherence to best practice guidelines for managing coronary artery disease (CAD).

The demographic data reveals a predominance of male patients (65%) with an average age of 63.0±10.5 years, which is consistent with the known higher incidence of CAD in men compared to women (3). The age distribution underscores the prevalence of CAD in older populations, necessitating targeted interventions in these age groups.

Atherosclerotic heart disease and essential hypertension were the most common diagnoses, affecting 87.4% and 85.6% of patients, respectively. These findings are consistent with the literature, highlighting the critical role of hypertension and hyperlipidemia in the pathogenesis of CAD (4). The significant presence of comorbid conditions such as diabetes mellitus, peptic ulcers, and heart failure underscores the complex clinical profiles of these patients, necessitating comprehensive management strategies (11).

The Anatomical Therapeutic Chemical (ATC) classification analysis showed that blood and blood-forming organs (51%), cardiovascular system (23%), and nervous system (13%) were the most common anatomical groups prescribed. The high utilization of antithrombotic agents (B01A) and IV solutions (B05X) indicates the critical role of these medications in managing stent-related complications and ensuring patient stability post-procedure (7). The frequent use of proton pump inhibitors (PPIs) alongside antiplatelet therapy to mitigate gastrointestinal risks associated with DAPT is also notable. This practice aligns with guidelines recommending PPIs for patients at risk of gastrointestinal bleeding (9).

The study's findings highlight the importance of adherence to clinical guidelines in improving patient outcomes in stent implantation procedures. However, the variability observed in some prescription practices suggests a need for continuous education and review of current practices against emerging evidence and updated guidelines. Further studies are warranted to explore the long-term outcomes of these prescribing patterns and to evaluate the potential benefits of personalized medicine approaches in this patient population. Additionally, expanding the research to include multiple centers and a larger sample size could provide more generalized insights and help in developing robust, evidence-based treatment protocols.

Study Limitations

The study has several limitations. Firstly, the sample size of 111 patients from a single private hospital may limit the generalizability of the findings to other settings or populations. The study also lacks long-term follow-up data, which would be essential to assess the outcomes and efficacy of the prescribed treatments comprehensively. Finally, variations in individual physician prescribing practices and potential unmeasured confounding factors, such as socioeconomic status and lifestyle choices, were not accounted for, which could influence the observed prescription patterns and their adherence to clinical guidelines.

CONCLUSION

This study provides valuable insights into the prescribing patterns for patients undergoing stent implantation in Turkey. The adherence to guideline-recommended therapies is commendable, yet continuous efforts are needed to address the variability in practice and to enhance the overall quality of care. Future research should focus on longitudinal outcomes and the potential benefits of individualized treatment strategies to further improve patient outcomes in coronary artery disease management.

DECLARATIONS

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Conflict of interest

None.

Ethical Standards

Approval for the study was obtained from the Acıbadem University Medical Research Ethics Committee (Decision No: 2021-21/02).

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