Original Article

Prescribing Pattern of Cardiovascular Drugs - A Prospective Observational Study

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ABSTRACT

Cardiovascular diseases are the most endangering illness prevalent in India. Compared to the past, cardiovascular diseases are showing an escalated trend due to the changes in lifestyle and social habits. Drugs are the bedrock of treatment and prevention of cardiovascular diseases. Factors like low utilization rates of evidence based therapies, high drug cost and long duration of therapy hinder the rational usage of cardiovascular drugs. The aim of the study is to assess the prescribing pattern of drugs in cardiovascular disease. A prospective observational study conducted in a tertiary care hospital for a period of 3 months from April 2017 to June 2017. In the study, 123 patients were enrolled and assessed with their demographic data, medical history and drugs prescribed. In this study, among 123 cases of cardiovascular diseases assessed, the incidence of cardiovascular diseases was common in males (84%) and more prevalent in age group 51-60 years. While assessing the prescribing pattern of cardiovascular drugs, antiplatelets (90.24%), anticoagulants (55.28%), thrombolytics (4.87%), antianginals (68.29%), antihyperlipidemics (81.3%), antihypertensives (87.80%) and ionotropes (22.76%) were the drugs prescribed. Increasing age, random changes in lifestyle, lack of physical activities, increased stress, work load, smoking like habits have been providing a path to more morbidity and mortality. Drug-drug interaction is a trouble maker in management of cardiovascular diseases as it requires multiple therapies. Effective strategies, regular monitoring has to be implemented to improve the patient compliance and achieve a better outcome.

Key words: Cardiovascular diseases, Prescribing pattern, Cardiovascular drugs, Rational drug use, Compliance.

INTRODUCTION

Cardiovascular diseases (CVDs) are the major cause of morbidity and mortality in India.[1] As per WHO reports an estimated 17.7 million people died from cardiovascular diseases in 2015.[2] Cardiovascular diseases are a group of disorders of heart and blood vessels which includes coronary artery disease, cerebrovascular disease, peripheral artery disease, congenital heart disease, rheumatic heart disease, deep vein thrombosis and pulmonary embolism. Cardiovascular disease is mainly caused by high blood pressure, smoking, diabetes, lack of exercise, obesity, poor diet, high blood cholesterol and excessive alcohol consumption. Coronary artery disease is mainly due to atherosclerotic changes in the inner walls of the blood vessel that supply blood to the heart. Atherosclerotic process leads to the build-up of fatty deposits, plaque formation and thickening of vessel walls. These changes eventually lead to narrowing of the lumen, which restrict blood flow to the myocardium.[3] Decreased blood flow to heart causes ischemia which leads to chest pain and cardiac dysfunction. Coronary artery disease is associated with increased risk of myocardial Infarction (MI) and stroke.[4] Myocardial infarction occurs due to imbalance between myocardial blood

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supply and oxygen demand.[5] Plague formed due to coronary artery disease causes flow limiting stenosis which eventually leads to myocardial necrosis.[6] Inadequate perfusion of the myocardium of left ventricle due to necrosis results in further dilation of left ventricle, development of mitral regurgitation and finally leads to cardiac failure.[7] A range of thrombotic coronary artery diseases which include unstable angina, ST segment elevated and non ST segment elevated MI encompasses acute coronary syndrome.[8]

Management of cardiovascular disease relies upon relieving the symptoms and reducing risk of future events.[9] Both pharmacological and non-pharmacological therapies are important in management of cardiovascular diseases. Medication used to treat angina and coronary artery diseases includes antiplatelet agents, anticoagulants, beta blockers, Angiotensin Converting Enzyme (ACE) inhibitors, nitrates, statins and Calcium Channel Blockers (CCB).[10] Besides the medical therapy, surgical revascularization procedures namely, Percutaneous Transluminal Coronary Angioplasty (PTCA) and Coronary Artery Bypass Grafting (CABG) play a crucial role in symptom amelioration.[11] Primary goal in myocardial infarction is the restoration of perfusion and to decrease the myocardial necrosis.[12] Definitive therapy for Non-ST segment Elevation Myocardial Infarction (NSTEMI) and ST segment Elevation Myocardial Infarction (STEMI) differs from each other. Management of STEMI aims at timely perfusion of myocardium. Early mechanical intervention of Percutaneous Coronary Intervention (PCI) is performed in patients who are presented within 12 h of symptoms and fibrinolysis for those patients who does not meet the recommended timeline. Anticoagulants and antiplatelets are adjunctive treatment for the reperfusion therapy. NSTEMI is treated with blood thinners like anticoagulants, antiplatelet and thrombolytics. Fibrinolysis is contraindicated in NSTEMI.[13]

The Rational Use of Medicines (RUM) is defined as "Patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period, and at the lowest cost to them and their community". Medicines are integral part of health and weapons of mankind to fight disease and illness.[14] The quality of medical care requires prescribing to be judicious, appropriate, safe, effective and economic.[10] Inappropriate prescribing habits lead to ineffective and unsafe treatment, prolongation of illness, distress and unnecessary economic burden to the patient.[15] There is a much larger burden and overall medical costs on cardiovascular diseases. The knowledge of prescribing pattern can lead us towards the rational drug use and help to take measures to improve prescribing habits. Identification and assessment of the prescribing pattern are one of the very first steps towards improving both medication quality and patient safety.[15]

Cardiovascular diseases need to be prescribed with a bundle of essential drugs. These drugs together can cause drug interactions. But none of these drugs can be omitted. These drug interactions can be managed by adjusting dose or time of administration. The relevant lab parameters need to be checked routinely for adverse drug reactions and managed accordingly. The present study is conducted to assess the prescribing pattern of drugs in cardiovascular disease.

MATERIALS AND METHODS

Study location and duration: A prospective observational study was carried out in the cardiology department of a 1000 bedded multi-speciality hospital over a period of 3 months from April 2017 to June 2017.

Data collection: Patients who met the inclusion criteria were enrolled in the study. All information relevant to the study was collected from case records. The demographic characters, co-morbid conditions, cardiology investigation results, drug dose frequency, drug interactions, adverse drug reactions were documented in the proforma.

Inclusion criteria: Patients above 18 years of age presenting with coronary artery disease, myocardial infarction, acute coronary syndrome was included.

Exclusion criteria: Patients below 18 years and pregnant women were excluded.

RESULTS

This study had provided a picture of cardiovascular drug prescribing patterns. A total of 123 patients were evaluated. From Figure 1 it was found out that 84% were male and 16% were female. The male to female ratio among the patients was 5:1. The incidence of cardiovascular disease was more common in males compared to females. Age wise distribution shows that, cardiovascular disease is more prevalent in age group of 51-60. Most common cardiovascular diseases were coronary artery disease (60%) followed by myocardial infarction (21%). Various co-morbid conditions like diabetes mellitus, hypertension, hypothyroidism, hyperlipidemia were seen among the patients and many of these were found to be risk factors of cardiovascular

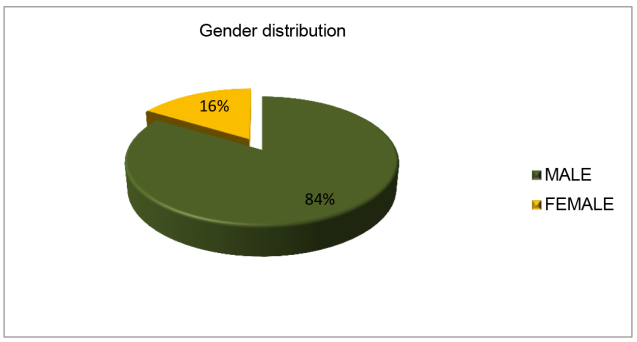

Figure 1: Distribution of patients based on gender.

disease. Hypertension (28.8%) and diabetes (23.80%) were the two most common co-morbid conditions found in majority of the patients which increase the risk of cardiovascular disease (Table 1). Smoking was also found to be a strong contributing factor which comprises of 49% of the population. Treatment of cardiovascular disease involves various categories of drugs namely antiplatelet drugs, anticoagulants, fibrinolytics, antianginals, antihypertensives, antihyperlipidemic agents along with the supportive therapy as shown in Table 2. Among the total cases, majority were managed only with medical interventions (48%) and in others surgical interventions like PTCA (15%) and CABG (37%) were performed. Antiplatelet drugs such as aspirin and clopidogrel are the inevitable drugs in cardiovascular diseases, to reduce the risk of further clot formation and helps in increasing the survival rate. Among the antiplatelet agents prescribed 46.03% were on aspirin, 41.4% on clopidogrel, 6.01% on combination therapy of aspirin and clopidogrel, 4.04% on ticagrelor and 1.02% on prasugrel respectively depicted in Table 3.Utiliization of Heparin in the study population was found to be 43.9% as in Table 4. Dalteparin(29.3%) was the second most used anticoagulant among the patients. Of the thrombolytics, 3 patients were prescribed streptokinase, 2 with tenecteplase and 1 with reteplase. Among the thrombolytics, streptokinase was commonly prescribed (Table 5). Antianginal drugs prescribed include nitrates (44.8%), trimetazidine (17.6%), ranolazine (10.8%), ivabradine (5.4%), nicorandil (14.9%), isolazine (0.6%) and hydralazine (5.4) (Table 6). The nitrates used were isosorbide mononitrate (34.6%), isosorbide dinitrate (16%) and glyceryl trinitrate (49.3%), in which glyceryl trinitrate was the most prescribed. Among the antihyperlipidemics prescribed, 83.16% of patients were prescribed atorvastatin, 13.8% were prescribed with rosuvastatin, 0.9% were prescribed with fenofibrates and simvastatin 1.9% (Table 7). Antihypertensives prescribed in this study were assessed and found that diuretics (39.7%) were most prescribed followed by beta blockers (35.1%) (Table 8). Ionotropes are the life-saving drugs in cardiovascular disease. In this study, noradrenaline

Table 1: Distribution of patients based on comorbidities.

Comorbidities	Number of cases	Percentage (%)
Diabetes mellitus	62	23.80
Hypertension	75	28.80
Diabetes and hypertension	20	7.98
Hypothyroidism	17	6.80
Diabetes, hypertension and hypothyroidism	3	1.15
Respiratory disorder	16	6.70
Hyperlipidemia	15	6.05
Other CVDs	22	8.80
Urological disorders	6	2.30
Nephrology disorders	10	3.80
Neurology disorders	5	1.90
Skeletal disorders	3	1.15
Anemia	1	0.38
Liver disorders	4	0.01
Retinopathy	1	0.38
Total	260	100

Table 2: Different categories of drugs prescribed to the patients.

Drug categories	No. of patients	Percentage (%)
Antiplatelets	111	90.24
Anticoagulants	68	55.28
Thrombolytics	6	4.87
Antianginals	84	68.29
Antihyperlipidemics	100	81.30
Antihypertensives	108	87.80
Ionotropes	28	22.76
Antibiotics	70	56.91
Miscellaneous	108	87.80

Table 3: Antiplatelet drugs prescribed to the patients.

Antiplatelets	No. of cases	Percentage (%)
Aspirin	93	46.03
Clopidogrel	83	41.40
Aspirin+clopidogrel	13	6.02
Ticagrelor	8	5.2
Prasugrel	2	1.35
Total	199	100

was the mainly prescribed drug (29.3%) (Table 9). 57% of antibiotic usage was recorded in the present study, of which majority of antibiotics were given after surgery whereas others were used to treat the comorbid infective condition. Out of 123 cases, 111 cases were found to have drug interactions. Major drug interactions were found

Table 4: Anticoagulant drugs prescribed to the patients.

Anticoagulants	No of cases	Percentage (%)
Unfractioned heparin	36	44
Enoxaparin	14	17.13
Abciximab	3	3.60
Dalteparin	24	29.3
Warfarin	4	4.77
Fondaparinux	1	1.20
Total	82	100

Table 5: Thrombolytic drugs prescribed to the patients.

Thrombolytics	No. of cases	Percentage (%)
Reteplase	1	16.6
Tenecteplase	2	33.4
Streptokinase	3	50
Total	6	100

Table 6: Antianginal drugs prescribed to the patients.

Antianginal drugs	No. of cases	Percentage (%)
Nitrates	66	44.8
Trimetazidine	26	17.6
Ranolazine	16	10.8
Ivabradine	8	5.4
Nicorandil	22	15
Isolazine	1	1
Hydralazine	8	5.4
Total	147	100

Table 7: Antihyperlipidemic drugs prescribed to the patients.

Antihyperlipidemics	No. of cases	Percentage (%)
Atorvastatin	84	83.1
Rosuvastatin	14	14
Fenofibrates	1	1
Simvastatin	2	1.9
Total	101	100

Table 8: Antihypertensive drugs prescribed to the patients.

Antihypertensives	No.of cases	Percentage (%)
ACE inhibitor	22	7.8
Angiotensin Receptor Blockers	20	7
CCB	12	4
Centrally acting alpha agonist	4	1.4
Alpha 1 antagonist	1	0.3
Beta blocker	101	35
Diuretics	114	40
Alpha + beta blocker	13	4.5
Total	287	100

Table 9: Ionotropes prescribed to the patients.

Ionotropes	No.of cases	Percentage (%)
Dobutamine	11	15
Dopamine	6	8
Noradrenaline	22	29.3
Levosimendan	5	7.8
Amiodarone	20	27.3
Digoxin	7	10
Atropine	1	1.3
Vasopressin	1	1.3
Total	73	100

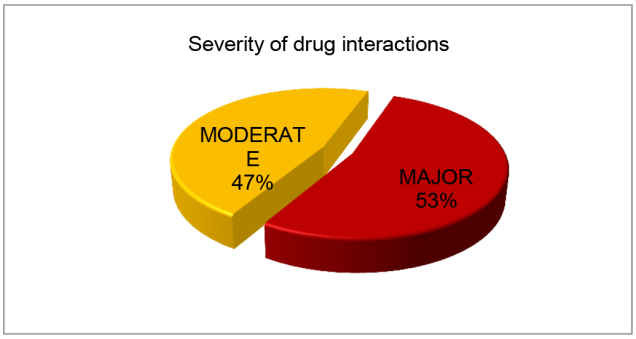

Figure 2: Severity of drug interactions.

to be 53% and moderate 47% as depicted in Figure 2. Among the total cases, 25 adverse drug reactions were found.

DISCUSSION

CVDs is one of the leading causes of death in India. Changing food habits, sedentary lifestyle and urbanization have been contributing to this. The most common gender affected is men than women and is found to be markedly increasing. The risk of CVDs is seen cumulative with age. In the present study, CVDs was seen more commonly in males (61%) and age above 40 years (Figure 1) Similar trend was cited in study conducted by Shabnam Narayanan *et al* and Deepa Shokeen *et al.* CVDs is mainly triggered by many risk factors such as high blood pressure, high cholesterol, obesity, or diabetes, which can be controlled through the consumption of a healthy diet, regular exercise and avoiding tobacco. This study states that hypertension and diabetes were the most common co-morbid conditions associated with coronary artery disease. Battu Rakesh *et al* conducted a similar study which concluded that hypertension and diabetes mellitus were the most common risk factors associated with the cardiovascular system. Aspirin was the most commonly prescribed antiplatelet drug in the study. This in accordance with a study conducted by Pranay Wal *et al.*,

where aspirin and clopidogrel were the most prescribed antiplatelet drugs for the therapeutic management of cardiovascular disease. In a study conducted by Shruthi Dawalji *et al*, drug prescribing rate for unfractioned heparin was more than low molecular weight heparin. The present study showed a similar result where drug prescribing rate for unfractioned heparin was found to be 44% and in low molecular heparin, dalteparin was mostly prescribed. In the present study, use of atorvastatin was found to be more among antihyperlipidemic drugs. Rosuvastatin was found to be the next common drug to be used in CVD patients. This found similar with the study conducted by Dr. SP Narwane *et al*. This concludes that Atorvastatin is the most commonly prescribed among lipid lowering drugs. Nitrates constitute about 44.8% and trimetazidine of 17.6 % of antianginals prescribed. Nitrates pattern of prescribing was found to be like a study conducted by Rajkumar Venisetty *et al*. Diuretics (40%) were found to be preferable choice of antihypertensives prescribed. This finding was found like a study conducted by Supratim Datta *et al*. streptokinase was the most used fibrinolytics for management of STEMI. Rohan P Christian *et al* conducted a study sharing a similar conclusion.

Management of cardiovascular disease involves complex therapeutic regimens. As a result, drug interactions are a major concern in these patients. Drug-drug interaction was analysed using Medscape drug interaction checker. In this study, out of 123 cases 97 drug interactions were noted. Severity of drug interaction were classified as major and moderate where, major drug interaction of 54% and moderate interactions of 47%were found. Only way to manage ADR is timely monitoring by regular assessment of patient condition and laboratory parameters.

Limitations: The study also underwent some limitations: small sample size, single centered. Therefore, from this it is clear that, more sample size and multicentered study can give out a better outcome.

CONCLUSION

Today in the evolving world we can clearly observe a crowning phenomenon of increased health risks. There is a similar growth in the case of cardiovascular related diseases. Increasing age, random changes in lifestyle, lack of physical activities, increased stress, work load, smoking like habits have been providing a path to more morbidity and mortality due to cardiovascular disorders. In the present study, the prescribing pattern of drugs in cardiovascular system were assessed. Drug-drug interaction is a trouble maker in management of CVDs as it requires multiple therapy. Out of 123 cases, 97 drug interactions were found. Effective strategies, regular monitoring must be implemented to improve the patient compliance and achieve a better outcome.

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CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

ABBREVIATION USED

WHO: World Health Organisation; **MI:** Myocardial Infarction; **STEMI:** ST segment Elevation Myocardial Infarction; **NSTEMI:** Non-ST segment Elevation Myocardial Infarction; **PTCA :** Percutaneous Transluminal Coronary Angioplasty; **CABG :** Coronary Artery Bypass Grafting; **CCB :** Calcium Channel Blockers; **CVD's :** Cardiovascular diseases; **ADR :** Adverse Drug Reaction.

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