ORIGINAL ARTICLE

Drug Utilization Pattern in Cardiovascular Diseases in a Community Cardiac Hospital

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ABSTRACT

Introduction: Drug utilization research is the powerful exploratory tool to ascertain the role of drug in determining the therapeutic efficacy, cost effective and minimizing the adverse effects. Cardiovascular diseases are major health problem and a common cause of premature morbidity and mortality.

Methods: A prospective cross-sectional study was carried out among in-patients diagnosed with cardiovascular diseases at acommunity cardiac hospital for a period of two months. Patients' records forms and the medical cardexwere reviewed. The descriptive statistics were calculatedusing Microsoft Excel 2016.

Results: Out of 201, 101 (50.25%) patients were females. Seventy four (36.82%) patients were from age group of 61-80 years and 56(27.86%) had systemic hypertension. A total of 2677 drugs were prescribed in 201 patients. The average number of drug per prescription was 13.49. Out of 201, 105 (52.24%) patients were prescribed four or more drugs. Cardiovascular drugs were the most commonly prescribed (898, 33.54%) out of which diuretic drugs were the most common (189, 21.04%) followed by antiplatelet drugs (145, 16.14%) and anticoagulants (116, 12.91%). The highest percentage of cost of medication for patient were less than 1000 NPR (27.86%). The number of encounter of Aluminium hydroxide plus Aspirin was the highest (25).

Conclusion: Diuretics were the most common prescribed cardiovascular drugs in our study. Polypharmacy was practiced in majority of the patients. The highest probability of causing of drug-drug interaction was encountered with aspirin.

Keywords: Cardiovascular diseases, Cardiovascular medication, Drug utilization, Prescribing patterns

INTRODUCTION

Drug Utilization Research (DUR) is the marketing, distribution, prescription and use of drug in society with special emphasis on the resulting medical, social and economic consequences.[1]DUR employs several of information that focus on drug. It is the powerful exploratory tool to ascertain the role of drug in determining the therapeutic efficacy, cost effectiveness and minimizing the adverse effects. Its principal aim is to facilitate rational use of drug in population.[2]It is an important part of pharmacoepidemiology as it describes the prescribing style, extent and exposure of drug.

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Cardiovascular Diseases(CVD) are a group of disorders of the heart and blood vessels which include coronary heart diseases, peripheral arterial diseases, rheumatic heart disease, congenital heart diseases, deep vein thrombosis and pulmonary embolism.[3]It is a major health problem throughout the world and a common cause of premature morbidity and mortality.[4]CVD are associated with a variety of other co-morbid conditions, in particular, diabetes mellitus.

Rational drug use means patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period time and to the lowest cost to them and their community.[5]The five important criteria for rational drug use are accurate diagnosis, proper prescribing, correct dispensing, suitable packing and patient adherence.[6]Polypharmacy is a major problem with cardiovascular inpatients admitted for a prolonged period of time.[7]Medication quality and patient safety requires a rational prescription of medication and avoidance of inappropriate/irrational prescribing patterns.[8]The present study was conducted tostudy the prescribing pattern, cost medication per prescription and possible drug-drug interaction among cardiac in-patients.

MATERIALS AND METHODS

A prospective cross-sectional study was conducted at a Community Cardiac Hospital in Nepal for a period of two months (November 2018 to December 2018). A total of 201 patients admitted to High Dependent Unit and General Ward were enrolled in the study.All the in-patients diagnosed with cardiovascular disease, patient of all age and both the sexes and patients able to swallow study medication were included in the study. Patients who were not prescribed with cardiovascular drugs and not giving consent to participate were excluded. Simple random sampling method was used. A self-designed proforma was used for data collection that consisted of age, gender, occupation, residence, diagnosis andmedication prescribed (name and route of administration). Permission for research was granted by Institutional Research Committee and the hospital authority.

The study objectives were explained to the patients and written informed consent were taken. Patients' record formsand the medical cardex of the patients were reviewed and the relevant data were recorded directly in the proforma. The data were entered into Microsoft Excel 2016 and checked for its completeness and consistency. Polypharmacy was defined as the use of 4 or more drugs per prescription.[9]Prescribing pattern was defined as the extent and profile of drug use and trends. The descriptive statistics like mean, frequency and percentages were calculated and the findings were presented as graphs and tables.The medications prescribed to the patientswere also analyzed for potential drug interactions as listed byKatzung BG.[10]Cost of the drugs were calculated in the Nepalese currency (NPR) based on the purchased bills of the drugs.

RESULTS

Out of 201 patients, 101 (50.25%) were females. Most of the patient were from age group of 61-80 years (36.82%) followed by 41-60 years age group (32.34%). Sixty nine (34.33%) patients were Brahmin and 87 (43.28%) patients were housewives (**Table 1**).

Table 1. Socio-demographic details of patients (n=201)

Variables		Frequency	Percentage
Gender	Male	100	49.75
	Female	101	50.25
Age groups	18 – 20	10	4.98
	21 – 40	30	14.93
	41 – 60	65	32.34
	61 – 80	74	36.82
	>80	22	10.95
Ethnic groups	Brahman	69	34.33
	Chhetri	23	11.44
	Mongolian*	55	27.36
	Others$	54	26.87
Residence	Urban	72	35.82
	Rural	129	64.18

Occupation	Housewife	87	43.28
	Business	15	7.46
	Service	25	12.44
	Farmer	20	9.95
	Teacher	3	1.49
	Others	51	25.37

**Mongolian: Magar, Gurung, Tamang, Newar; $Others:Yadav, Tharu, Pariyar, Thakuri, Muslim*

Majority of the patients (56, 27.86%) had systemic hypertension followed by Ischemic heart disease (33, 16.42%) (**Figure 1**).

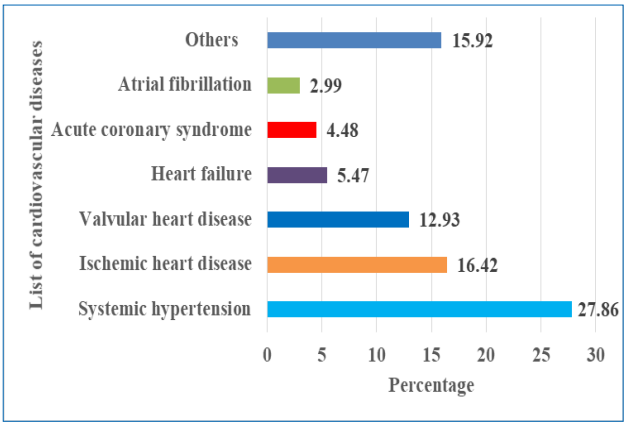

Figure 1. Diagnosis of the patients with cardiovascular diseases (n=201).

A total of 2678 drugs were prescribed in 201 patients. The average number of drug per prescription was foundto be 13.49. The categories of most of the commonly prescribed drug were CVS drugs (33.54%), followed by gastrointestinal drugs (21.29%) and antimicrobial drugs (12.55%) (**Table 2**).

Table 2. Therapeutic classification of prescribed drugs (n=2677)

Therapeutic category of drugs	Frequency	Percentage
Drug acting on cardiovascular system	898	33.54
Antimicrobial Agents	336	12.55
Drug acting on gastrointestinal system	570	21.29
Hormonal drugs	158	5.90
Drug acting on central nervous system	116	4.33
Non-steroidal anti-inflammatory drugs	60	2.24
Drug acting on autonomic nervous system	89	3.32
Drugs acting on respiratory system	211	7.88
Anti-histamines	50	1.86
Drugs acting on musculoskeletal system	23	0.85
Miscellaneous drugs	166	6.20

Out of 898cardiovascular drugs, diuretic drugs were the most common prescribed drugs (189, 21.04%) followed by antiplatelet drugs (145, 16.14%) and anticoagulants (116, 12.91%). A total of 750 (83.51%) and 148 (16.48%) drugs were prescribed through oral and injection routes respectively (**Table 3**).

Table 3. List of Cardiovascular prescribed medication (n=898)

List of drug	Routes		Frequency	Percentage
	Oral	Injection		
Diuretics	114	75	189	21.04
Antiplatelets	145	0	145	16.14
Anticoagulants	84	32	116	12.91
Hypolipidemics	94	3	97	10.80
Calcium Channel Blocker	74	1	75	8.35
Antianginal drugs	60	12	72	8.01
Angiotensin Receptor Blockers	58	0	58	6.45
Beta-Blockers	41	6	47	5.23
Inotropic agents	26	17	43	4.78
Cardiac glycosides	38	1	39	4.34
Angiotensin Converting Enzyme Inhibitors	16	1	17	1.89

Out of 201, 105 (52.24%) patients were prescribed four or more drugs (**Figure 2**).

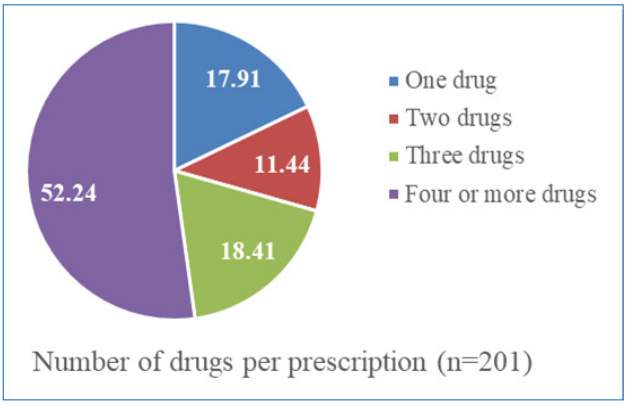

Figure 2. Numbers of cardiovascular drugs per prescription (n=201)

Medication cost per prescription is given in Figure 3.Overall, the study found that the highest percentage of cost of medication for patient were less than 1000 NPR (27.86%), followed by more than 5000 NPR (26.37%) and 1000-2000 NPR (19.30%).

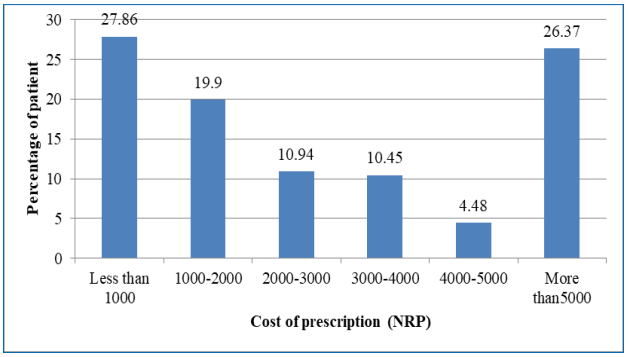

Figure 3. Pricing of medications (n=201)

Interacting pair of drug with the potentially hazardous effect and clinically documented: In the study, the number of encounter of Aluminium hydroxide plus Aspirin has the highest (25) followed by Enoxaparin Sodium plus Aspirin (22) and Aspirin plus Furosemide (21).

Table 4. Interacting pair of drug with the potentially hazardous effect (n=80).

Ranking	Drug combination	Properties Promoting Drug Interaction	No. of encounter	Clinically Documented Interactions*
1.	Aluminium Hydroxide + Aspirin	• Antacids may adsorb drugs in GIT, thus reducing absorption. • Aluminum hydroxide alkalinize the urine somewhat, thus altering excretion of drugs sensitive to urinary pH.	25	Aspirin [P]: • Increased renal clearance of aspirin due to increase urine pH. • Occurs only with large doses of aspirins.
2.	Enoxaparin + Aspirin	• Aspirin (but not other salicylates) interferes with platelet function. • Large doses of salicylates have intrinsic hypoglycemic activity	22	Heparin [NE]: • Increased bleeding tendency with aspirin, but probably not with other salicylates
3.	Aspirin + Furosemide	• Prostaglandin inhibition may result in reduced renal sodium excretion, impaired resistance to hypertensive stimuli, and reduced renal lithium excretion.	21	Furosemide [P]: • Decreaseddiuretic, natriuretic andantihyperten-sive response to furosemide.
4.	Aluminium hydroxide + Digoxin	• Antacids may adsorb drugs in gastrointestinal tract, thus reducing absorption. • Antacids tend to speed gastric emptying, thus delivering drugs to absorbing sites in the intestine more quickly.	5	Digoxin [NP]: • Decreased gastrointestinal absorption of digoxin.
5.	Aspirin + Enalapril, Ramipril	• Prostaglandin inhibition may result in reduced renal sodium excretion, impaired resistance to hypertensive stimuli.	4	ACE inhibitors [P]: • Decreased antihypertensive response.

6.	Digoxin + Amiodarone	• Digoxin susceptible to alteration of gastrointestinal absorption. • Digitalis toxicity may be increased by drug-induced electrolyte imbalance (e.g., hypokalemia). • Renal and nonrenal excretion of digoxin susceptible to inhibition.	3	Amiodarone [P]: • Increased plasma digoxin concentrations.

**P: Predictable; HP: Highly predictable; NE: Not established, NP:Not predictable*

DISCUSSION

In the present study, numbers of male and female patients were almost equal. In contrast, 64.7% patients were male and 35.3% female in an Indian study.[11] Majority of the patients (36.82%) were in the age group of 60-80 years. The similar finding was also reported in another study (24%).[12]The diuretics drugs (21.04%) were more used in majority of the patients followed by anti-platelet drugs. A similar study conducted in the Karnataka (India) found that the diuretics drugs (29.80%) were commonly used in the patient followed by anti-hypertensives (29.44%) and anti-platelets (16.87%).[12] Diuretics remain the first line of treatment of edema or volume overload particularly in patients withcongestive heart failure. Diuretics reduce pulmonary edema and venous congestion.[14]

Majority of the patients were diagnosed with systemic hypertension (26.86%) followed by Ischemic Heart Diseases (IHD) (16.42%) than other diagnosis of diseases, which was in accordance with the study conducted in Maharashtra, India in which more patient were diagnosed with hypertension (33%%) followed by Diabetes mellitus (16%) and IHD (10%). Hypertension and diabetes mellitus are the most commonly associated comorbidities in cardiovascular patients.[15] The average number of drug per prescription was 13.49 and more than half of the patients (52.44%) were prescribed four or more drugs which highlights the prevalence of polypharmacy in the present study. This might lead to increased mortality, morbidity and other costs, low adherence and side effects.[16]

In the study, it was found that aspirin was the most common drug with a high probability of causing drug-drug interaction followed by enoxaparin and aluminum hydroxide. The possible reason behind high risk of drug-drug interaction in cardiovascular diseases may include elder age, multiple drug regimen and pharmacokinetic and pharmacodynamics nature of the drugs used. Poly-pharmacy and longer hospital stay also influences the incidence rate of potential drug-drug interaction. The similar study was conducted in India found that Aspirin (44.45%) was the most common drug causing possible drug-drug interaction followed by Heparin (42.78%) and Clopidogrel (22.16%).[17] The present study has some limitations. The study duration was small. Being a single center study, the study findings could not be generalized.

CONCLUSION

Diuretics were the most common prescribed cardiovascular drugs.Oral route was mostly preferred than intravenous route. Polypharmacy was practiced in more than half of the patients. The highest probability of causing of drug-drug interaction was encounteredwith Aspirin.Cost of the medicines was more than 5000 NPR in more than one fourth of the patients. The drug-drug interactions and prescribing pattern can be improved by reducing the number of drugs per prescription. Practice of generic drug prescription would reduce the economic burden of the patients.

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Conflicts of Interest: None

Source of support: None

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