Original Research Article

Study of utilisation trends of drugs in patients admitted with cardiovascular diseases at a tertiary care hospital in Goa

Shantadurga S. Kerkar*, Padma N. Bhandare

Department of Pharmacology, Goa Medical College, Bambolim, Goa, India

*Correspondence:
Dr. Shantadurga S. Kerkar,
E-mail: kerkarshantadurga@gmail.com

ABSTRACT

Background: CVDs have emerged as a leading cause of mortality and morbidity in the world as well as in India. Drug usage is life saving and at times many drugs may be needed. Drug utilization studies aid to find the appropriateness of treatment, identify shortcomings if any, and provide a feedback to the healthcare providers to improve their management with drugs. So such types of studies are of vital importance in every hospital.
Methods: This was a prospective, observational study of 180 patients with CVDs admitted in medicine and cardiology wards of a tertiary care hospital, conducted through case records and patients' interviews. Data was represented as mean±SD, number and frequency.
Results: Incidence of cardiovascular diseases was more in males (56.67%) than the females (43.33%). Average number of drugs prescribed per patient was 9.16 and that of cardiovascular drugs was 5.08 ± 2.15. Antiplatelets (88.88%) were the most commonly prescribed cardiovascular drugs followed by hypolipidemics (82.22%). About 15.06% of injectables and 1.2% of fixed dose combinations (FDCs) were prescribed. Drugs prescribed by generic names were 1.6% and those from the National List of Essential Medicines were 92.79%.
Conclusions: The results of this study suggested: polypharmacy, overuse of injections and low prescribing habits from essential drug list. Though antiplatelet, hypolipidemic use was higher, these are an essential part of treatment of certain CVDs.

Keywords: Case records, Prescription screening, Inappropriate drug use, Diseases of heart and blood vessels

INTRODUCTION

Globally around 70% of deaths occur due to non-communicable diseases (NCDs) such as cardiovascular diseases, cancer, diabetes and chronic respiratory diseases.[1] An estimated 17.7 million people died due to CVDs in 2015, representing 31% of the deaths worldwide. Cardiovascular diseases are a group of disorders of heart and blood vessels and include: congenital heart diseases, cardiomyopathies, rheumatic heart diseases (RHD), heart failures, coronary heart diseases, and hypertension, cerebrovascular accidents (CVA) and peripheral vascular diseases.[2]

Unprecedented transformations in the factors contributing to morbidity and mortality have caused an epidemiological transition.[3] Lifestyle changes, rapid urbanization, industrialization, poverty, globalization of pharmaceutical products being some of the contributing factors.[1-3]

Individuals with already established CVDs or who are at high risk of cardiovascular diseases (due to presence of one or more risk factors such as: hypertension, diabetes mellitus, hyperlipidemia) need early detection and management with appropriate medications and counselling.[2]

Drugs used in treatment of CVDs not only act on cardiovascular structures directly but also through regulators of cardiovascular functions like autonomic nervous system (ANS), central nervous system (CNS), kidney, autocoids and hormones.[4] Drug therapies should be safe, efficacious and prescribed for appropriate therapeutic indications in correct dosage forms to obtain better patient outcomes.[5] Polypharmacy and inappropriate prescribing can be a major health problem leading to adverse events and cost inflation.[6]

Periodic evaluation of drug usage patterns in each hospital setting can be of great help to monitor and supervise the drug use behaviours for which WHO core drug use indicators may be referred as guidelines.[7]

Drug utilisation studies thus provide a favourable feedback to treating physicians and help to modify treatment strategies, identify, and correct the shortcomings if any, thus providing the patients a rational and cost effective therapy.[8,9] Owing to vulnerability of patients with CVDs to various complications, drug interactions and adverse events, these are a must in each hospital.

Considering the above facts this study was conducted in patients admitted with CVDs in medicine and cardiology wards of Goa Medical College - a tertiary care teaching hospital in Goa, with an aim to analyze the prescribing trends of drugs used in the treatment of CVDs, and give a feedback to the treating physicians which may help them to make any modifications in the treatment strategies, if needed.

METHODS

A prospective, observational study was conducted on 180 patients diagnosed with cardiovascular diseases (CVDs) admitted in medicine and cardiology wards of Goa Medical College and Hospital -a tertiary care teaching hospital in Goa.

It was carried out over a period of 3 months (April 2017 – June 2017). Approval from the Institutional Ethics Committee was taken. After obtaining written informed consent from the patients, case records of enrolled patients were analysed for patient details and details of drugs prescribed during the hospital stay.

Details of prescibed drug: name of the drug, dosage form, prescribing frequency, duration of treatment, and brand/ generic name were noted.

Based on "WHO prescribing indicators" the collected data was analysed as follows:[10]

- Average number of drugs prescribed per patient encounter.
- Percentage of drugs prescribed by generic names

- Percentage of encounters of injectable drugs prescribed
- Percentage of drugs prescribed from list of essential medicines

All patients diagnosed with CVDs and admitted for >24 hrs were included in the study. Patients who denied consent and those discharged within 24 hrs were excluded.

Statistical analysis

The values were represented as mean±SD for quantitative data and for qualitative data they were expressed as number and frequency.

RESULTS

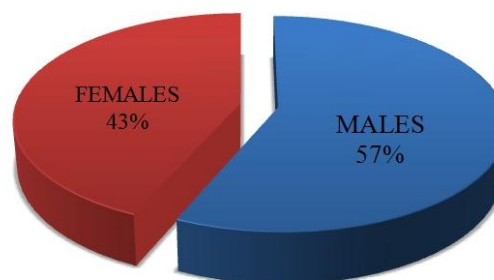Out of the 180 enrolled patients 102 (57%) were males and 78 (43%) were females (Figure 1).

Figure 1: Gender wise distribution.

56 (31.11%) patients belonged to the age group of 61-70 yrs followed by 41 (22.77%) in the age group of 51-60 yrs. 33 (18.33%), 29 (16.11%), 9 (5%), 7 (3.89%), 5 (2.78%) patients were in the age groups of 41-50 yrs, 71-80yrs, 31-40 yrs, 81-90 yrs and <30 yrs respectively.
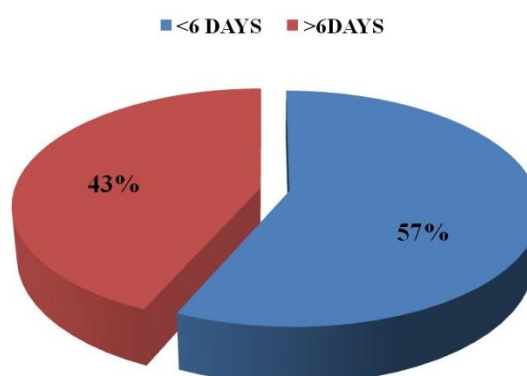

Figure 2: Duration of hospital stay.

Figure 2 illustrates the duration of hospital stay of patients.

Table 1: Age group wise distribution of various co-morbidities.

Co- morbidities	<30 yrs	31-40 yrs	41-50 yrs	51-60 yrs	61-70 yrs	71-80 yrs	81-90 yrs
HTN + DM	0	3	4	13	29	13	3
HTN	0	2	8	14	10	7	4
No co-morbidities	5	3	13	5	11	4	0
DM + HTN + CKD	0	0	3	2	2	2	0
DM+ HTN+ hypothyroidism	0	1	3	1	0	0	0
HTN+ CVA	0	0	1	1	1	0	0
HTN + COPD	0	0	0	2	1	1	0
DM	0	0	1	3	2	2	0

HTN- Hypertension, DM – Diabetes mellitus, CKD – Chronic kidney disease, COPD – Chronic obstructive pulmonary disease.

Table 2: Details of cardiovascular drugs prescribed.

Details of drugs prescribed	
Total no of case records analysed	180
Total no of drugs prescribed	1650
Total no of injectables prescribed	410 (24.85%)
Average no of drugs per patient	9.16
Total no of cardiovascular drugs	916 (55.51%)
Average no of cardiovascular drugs per patient	5.08±2.15
Total no of cardiovascular drugs prescribed orally	778 (84.9%)
Total no of cardiovascular drugs as injectables	138 (15.06%)
Total no. of single drugs prescribed	906 (98.79%)
Total no. of fixed dose combinations (FDCS) prescribed	11 (1.2%)
Cardiovascular drugs prescribed in generic names	15 (1.6%)
Cardiovascular drugs prescribed from national list of essential medicines	850 (92.79%)

Table 3: Prescribing frequency of more than 5 drugs in all age groups.

Age group	Number	Percentage (%)
<30	2	2.04
31-40	3	3.06
41-50	23	23.47
51-60	22	22.45
61-70	30	30.61
71-80	17	17.35
80-89	1	1.02

Our study observed a variety of co-morbidities (Table 1). Hypertension and type 2 diabetes mellitus were the most commonly noted co-morbidities.

Ischaemic heart disease 73 (41%) was the most common CVD. Other CVDs observed were 44 (24%) CVA, 22 (10%) arrhythmias, 15 (8%) hypertension, 14 (8%) left ventricular failure, 7 (3%) RHD, 4 (2%) cardiomyopathies, 3 (2%) coronary heart blocks, 1 (1%) peripheral vascular disease and 1 (1%) infective endocarditis.

A total of 1650 drugs were prescribed to the study patients, out of which 916 (55.51%) were cardiovascular drugs. The most common route of administration of these drugs was oral 778 (84.9%) and 138 (15.06%) drugs were prescribed in parenteral dosage forms. Only 15 (1.6%) drugs were prescribed by generic names. 92.79% (850) were prescribed from the National list of Essential medicines (Table 2). An average of 5.08±2.15 cardiovascular drugs was prescribed per patient. Prescribing frequency of ≥5 drugs was seen in 98 (54.44%) patients, of which maximum i.e. 30 (30.61%) patients belonged to the age group of 61-70 years (Table 3).

Among the cardiovascular drugs, antiplatelets were the most commonly prescribed drugs in the patients followed by hypolipidemics and the rest as shown in (Table 4 and 5).

Table 4: Various classes of cardiovascular drugs prescribed.

Drug class	No of prescriptions	Percentage (%)
Antiplatelets	160	88.88
Hypolipidemics	148	82.22
Anticoagulants	91	50.55
Fibrinolytics	17	9.44
ACE inhibitors	77	42.77
ARBs	18	10
ß Blockers	72	40
Calcium channel blockers	35	19.44
Anti anginals	66	36.66
Diuretics	102	56.66
Cardiac glycosides	2	1.11
Anti arrythmics	12	6.66
Ionotropes	16	8.88
Alpha blocker	4	2.22
Vasodilator	3	1.66

Table 5: Distribution of cardiovascular drugs prescribed from various classes.

Drug classes	Drugs	No of prescriptions	Percentage (%)
Antiplatelets	Aspirin	58	36.25
	Clopidogrel	9	5.63
	Aspirin and clopidogrel	93	58.10
Hypolipidemics	Atorvastatin	145	97.97
	Rosuvastatin	3	2.03
Anticoagulants	Enoxaparin	71	78.02
	Dalteparin	2	2.19
	Warfarin	10	10.98
	Acenocoumarol	8	8.79
Fibrinolytics	Streptokinase	16	94.12
	Reteplase	1	5.88
ACE inhibitors	Enalapril	6	7.79
	Ramipril	71	92.20
ARBs	Telmisartan	9	50.00
	Losartan	4	22.22
	Irbesartan	1	5.56
	Olmesartan	4	22.22
ß Blockers	Atenolol	1	1.39
	Metoprolol	57	79.16
	Nebivolol	7	9.72
	Carvedilol	5	6.94
	Bisoprolol	2	2.78
Calcium channel blockers	Amlodipine	31	88.57
	Cilnidipine	4	11.42
Anti anginals	Nitroglycerine	30	45.45
	Isosorbide mono nitrate	26	39.39
	Isosorbide di nitrate	5	7.58
	Ranolazine	4	6.06
	Ivabradine	1	1.51
Diuretics	Furosemide	61	59.80
	Spironolactone	10	9.80
	Torsemide	16	15.68
	Mannitol	9	8.82
	Hydrochlorothiazide	6	5.88

Cardiac glycosides	Digoxin	2	100
Anti arrythmics	Amiodarone	3	25.00
	Sotalol	5	41.66
	Adenosine	4	33.33
Ionotropes	Dopamine	3	18.75
	Dobutamine	7	43.75
	Noradrenaline	6	37.50
Alpha blocker	Prazosin	4	100
Vasodilator	Hydralazine	3	100

Table 6: Parameters of present study compared with other studies.

Parameters	Present study	Other studies	Reference No
Age (61-70 yrs)	56 (31.11%)	Aswani et al. 53 (29.44%)	9
		Chandana et al. 15 (24.55%)	12
Gender	M= 57% ; F=43%	Saranya et al. (M=74% F=26%	8
		Kamath et al.(M=81% F=19%)	11
Duration of hospital stay	5.83±3.25 days	Vakade et al. (5.85 days)	14
		Aswani et al. (5.33days)	9
Average no of cardiovascular drugs prescribed	5.08±2.5	Aswani et al. (5.58)	9
		Kaur et al. (4.9)	13
		Al junid et al. (7.56±3.37)	17
Total no of cardiovascular drugs prescribed as injectables	15.06%	Ravi et al. (7.89%)	18
		Aswani et al. (34.99%)	9
Antiplatelet prescribing frequency	88.89%	Christian et al. (86.5%),	19
		Kamath et al.(95.13%).	11
Fixed dose combinations (FDC)	1.2%	Aswani et al. (7.65%),	9
		Barot et al (8%)	20
Drugs prescribed by	Generic-1.6% Brand -98.4%	Christian et al. generic-19.5%; brand-80.5%	19
		Choudhary generic–16.28% ; brand–83.12%	21
Drugs from National List of Essential Medicines	92.79%	Christian et al. (75.7%)	19
		Al Junid et al. (28%)	17

DISCUSSION

About 15 million people die each year prematurely due to NCDs which include CVDs. Low income and low middle income groups are mostly affected. In India too, CVDs are a rapidly growing health problem.[1] With the ongoing research, rapid globalization of pharmaceutical products and advancement in the therapy of CVDs, it is important to study periodically the drug utilisation patterns to impart safe health care. In this study we made an effort to analyze the prescribing trends of the treating doctors in in-patients in the medicine and cardiology wards of a tertiary care hospital.

Our study showed higher incidences of CVDs in males than the females and this trend was seen increasing with age. These observations are similar to those of Saranya et al (males 74% females, 26%) Kamath et al (81% males and 19% females).[8,11]

Majority i.e. 56 (31.11%) patients ranged from 61 to 70 yrs of age, which is comparable to previous studies by Aswani et al showing 53 (29.44%) and Chandana et al.

15 (24.55%).[9,12] One of the reasons for this may be associated co-morbidities and various risk factors at these ages. In this study it was also observed that hypertension and type 2 diabetes mellitus were the most frequently observed co- morbidities in 65 (36.11%) patients. A study by Kaur et al also reported hypertension and diabetes mellitus in 546 (49.69%) patients.[13]

Average length of hospital stay noted was 5.83±3.25 days which is usually required for management of these patients. This shows similarity with study by Vakade et al (5.85 days) and Aswani et al (5.33days).[9,14]

Ischaemic heart disease accounted for 41% of the patients while 24% of patients had CVA, this is comparable to study conducted by Hannan et al (96.75%) and Rathod et al. (41.59%).[15,16]

In this study we also found that the average number of drugs prescribed per patient was 5.08 ±2.5, indicating polypharmacy, similar results were seen in the study of Aswani et al (5.58) and Kaur et al (4.9) but studies by Al junid et al showed a higher incidence (7.56±3.37).[9,13,17]

CVDs, many a times, require emergency and or aggressive therapies which could be the reason for polypharmacy noted.

Drugs given parenterally were 15.06% which is higher than noted by Ravi et al (7.89%) and much lower than a study by Aswani et al (34.99%).[9,18] This data is important since drugs prescribed parenterally add to the cost of medications and resultant adverse effects due to parenteral administration.

Antiplatelets, being important components of treatment strategies in CVDs, our study also showed 88.89% of prescribing frequency, this was followed by hypolipidemics 82.22%. These results are in accordance with the studies conducted by Christian et al (86.5%), Kamath et al (95.13%).[11,19] Use of both drugs is justifiable as the incidence of IHD was higher in this study group.

98.7% drugs were prescribed as single drugs and is an appreciable finding as compared to that noted by Aswani et al (92.34%).[9] 1.2% of fixed dose combinations (FDCs) were prescribed which were much lower than that documented by Aswani et al (7.65%), Barot et al (8%) respectively.[9,20] Fewer prescriptions with FDCs decrease overall cost of treatment and prevent adverse drug events.

Our study showed 1.6% of prescribing habits by generic names. 98.3% drugs were prescribed by brand names and which was higher than results reported by Christian et al (19.5%, 80.5% - generic names and brand names respectively) and Choudhary et al (16.88% drugs prescribed by generic names and 83.12% drugs by brand names).[19,21] Low instances of prescription of drug by generic names should be addressed appropriately as prescribing drugs by brand names not only inflates the cost but also evokes an adverse drug response due to confusing drug nomenclature.[22]

Use of drugs from the National List of Essential Medicines was 92.79% which was higher than the findings of Christian et al (75.7%) and Al Junid et al (28%).[17,19,23] This is a very good practice which provides effective health care and safety to community. Table 6 shows the comparison of findings of present study with other studies.

Thus, this study indicated trend towards polypharmacy especially in older age groups (61-70 yrs), a low frequency of drug prescribing by generic name and higher frequency of drug deliveries by injectable routes.

Limitations

- The present study was conducted on a small sample size of (180) patients and was for a short duration (3months), hence it may not represent the total population.

- Since this study was in a single tertiary care hospital (as Goa has only one), extrapolation of results would be better if also conducted in OPD patients and multicentric set ups.

CONCLUSION

This study showed higher incidences of drug use: as single agents and from essential drug list which are appreciable but prescribing habits of drugs by brand names were higher and a trend for polypharmacy in older patients was noted. Drugs used parenterally were higher but their use may be justified in these study patients with CVDs since some drugs have to be necessarily given parenterally in emergencies, and some are available in parenteral dosage forms only (eg. adrenaline, dopamine). Regular reviews of prescribed medications, tapering or withdrawing if the potential risk outweighs the benefit of their continuation, must be considered by health care providers.[24] Several criterias for eg. Beers criteria – 2015, STOPP/START criteria, may be referred for safe prescribing in the geriatric age groups.[25,26] Finally each hospital should compare their drug usage with standard treatment guidelines or frame the guidelines if not existent. All these will help to bring better clinical outcomes.

REFERENCES

1. Noncommunicable Diseases Progress Monitor, 2017. Geneva: World Health Organization; 2017. Available at: http://apps.who.int/iris/bitstream/10665/258940/1/9789241513029-eng.pdf?ua=1. Accessed on 24 September 2017.
2. Cardiovascular diseases (CVDs). World Health Organization. 2017. Available at: http://www.who.int/mediacentre/factsheets/fs317/en/. Accessed on 24 September 2017.
3. Gaziano TA, Gaziano JM. Epidemiology of cardiovascular disease. In: Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J, editors. Harrison's Principles of Internal Medicine. 18th Edition. New York: McGraw-Hill; 2012: 1998-2014.
4. Tripathi K. Essentials of Medical Pharmacology. 7th ed. Jaypee Brothers Medical Publishers; 2013.
5. Patil SB, Raikar SR, Patil S, Raikar DR. Prescription pattern of cardiovascular drugs in intensive cardiac care unit patients in a tertiary care hospital. Int J Basic Clin Pharmacol. 2015;4:1100-3.

6. Cahir C, Fahey T, Teeling M, Teljeur C, Feely J, Bennett K. Potentially inappropriate prescribing and cost outcomes for older people: a national population study. Br J Clinical Pharmacol. 2010;69(5):543-52.
7. How to Investigate Drug Use in Health Facilities: Selected Drug Use Indicators - EDM Research Series No. 007: Introduction: Objectives of a drug use study. Apps.who.int. 1993. Available at: http://apps.who.int/medicinedocs/en/d/Js2289e/1.2.html. Accessed on 24 September 2017.
8. Saranya KL, Gowda HN, Sadananda KS. A study of drug utilization trends in acute coronary syndrome in intensive cardiac care unit at a tertiary care hospital, Mysore. Int J Basic Clin Pharmacol. 2017;6:344-8.
9. Bandla A, Reddy K. A Study On Prescribing Pattern Of Cardiovascular Drugs & Potential Drug - Drug Interactions In An Inpatient Cardiology Unit Of A Cardiac - Care Hospital At Tirupathi. Eur J Pharma Med Res. 2016;3(8):294-305.
10. Drug and Therapeutics Committees - A Practical Guide: 6.Tools to investigate the use of medicines: 6.4 Qualitative methods to investigate causes of problems of medicine use. Apps.who.int. 2003. Available at: http://apps.who.int/medicinedocs/en/d/Js4882e/8.4.html#Js4882e.8.4. Accessed on 24 August 2017.
11. Kamath A, Shanbhag T, Shenoy S. A Descriptive Study of the Influence of Age and Gender on Drug Utilization in Acute Myocardial Infarction. J Clin Diagnos Res. 2010;(4):2041-6.
12. Chandana N, Subash V, Kumar VG. A prospective study on drug utilization of cardiac unit in acute myocardial infarction of hosptalized patients. Inter J Pharmacotherapy. 2013;3(1):6-11.
13. Kaur S, Rajagopalan S, Kaur N, Shafiq N, Bhalla A, Pandhi P, et al. Drug utilization study in medical emergency unit of a tertiary care hospital in North India. Emerg Med Int. 2014;2014:973578.
14. Vakade KP, Thorat VM, Khanwelkar CC, Jadhav SA, Sanghishetti VM. A study of prescribing pattern of drugs in patients of cardiovascular emergencies at a tertiary care hospital of Western Maharashtra. Int J Res Med Sci. 2016;4:556-61.
15. Hannan A, Sinha S, Jamadar P. Drug utilisation study of cardiac emergency patients in a tertiary care hospital. J. Evolution Med Dent Sci. 2017;6(27):2217-24.
16. Rathod PS, Patil PT, Lohar RP, Patil AW. Prescription pattern in indoor patients of cardiovascular diseases: a descriptive study in a tertiary care hospital attached to a government medical college. Int J Basic Clin Pharmacol. 2016;5:491-5.
17. Al-Junid SM, Ezat WP, Surianti S. Prescribing patterns and drug cost among cardiovascular patients in Hospital Universiti Kebangsaan Malaysia. Med J Malaysia. 2007;62:59-65.
18. Shankar R, Partha P, Shenoy N. Prescribing patterns of drugs among patients admitted with cardiovascular disorders in the internal medicine ward prescribing patterns in inpatients. The Internet J Internal Med. 2000;3(1):1-5.
19. Christian R, Rana D, Malhotra S, Patel V. Evaluation of rationality in prescribing, adherence to treatment guidelines, and direct cost of treatment in intensive cardiac care unit: A prospective observational study. Indian J Crit Care Med. 2014;18(5):278-84.
20. Barot PA, Malhotra SD, Rana DA, Patel VJ, Patel KP. Drug utilization in emergency medicine department at a tertiary care teaching hospital: A prospective study. J Basic Clin Pharma. 2013;4:78-81.
21. Choudhary P, Agrawal JM, Malhotra SD, Patel VJ. Drug utilization pattern in acute coronary syndrome at tertiary care hospital: a prospective cross-sectional observational study. Int J Basic Clin Pharmacol. 2016;5:513-6.
22. Steinman M, Chren M, Landefeld C. What's in a Name? Use of Brand versus Generic Drug Names in United States Outpatient Practice. J Gen Intern Med. 2007;22(5):645-8.
23. National List of Essential Medicines (NLEM) 2015 -India. Apps.who.int. 2017. Available at: http://apps.who.int/medicinedocs/en/d/Js23088en. Accessed on 24 September 2017.
24. Wallis KA, Andrews A, Henderson M. Swimming against the tide: primary care physicians' views on deprescribing in everyday practice. Ann Fam Med. 2017;15(4):341–6.
25. American Geriatrics Society 2015 Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. J Am Geriatr Soc. 2015;63(11):2227-46.
26. O'Mahony D, O'Sullivan D, Byrne S, O'Connor M, Ryan C, Gallagher P. STOPP/START criteria for potentially inappropriate prescribing in older people: version 2. Age and Ageing. 2014;44(2):213-8.