International Journal of Community Medicine and Public Health
Kenchugundu J et al. Int J Community Med Public Health. 2023 Jun;10(6):2171-2179
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040
DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20231699

Original Research Article

Prevalence of cardiovascular diseases and drug utilization review at secondary care hospital in South India

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Received: 01 April 2023
Revised: 14 May 2023
Accepted: 15 May 2023

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ABSTRACT

Background: The aim was to study the prevalence of cardiovascular diseases and drug utilization review in patients with cardiovascular diseases.
Methods: This was a cross-sectional study conducted for about 6 months from December 2021 to February 2021 in a Secondary care hospital. Prescriptions of 167 patients with cardiovascular diseases were analysed. Patient Case files were used for extracting necessary data.
Results: The collected data was analyzed by MS Excel (counts and percentages). Cardiovascular diseases were most common in the age group of 31-40 years (27.55%) followed by 51-60 years (24.49%) among male patients and in female patients, it was more common in the age group of 41-50 years (23.19%) followed by 51-60 years (21.74%). Most prevalent cardiovascular disease was found to be Hypertension (31%), followed by coronary artery disease (21%) and acute coronary syndrome (19%). Diabetes Mellitus (39%) and Hematological disorders (20%) are the most found co-morbidities along with cardiovascular diseases. Antiplatelet and antihypertensive were the most prescribed category of drugs. Of all cardiovascular drugs, aspirin (115 prescriptions) followed by clopidogrel (100 prescriptions), atorvastatin (73 prescriptions), olmesartan (54 prescriptions) and metoprolol (49 cases) were mostly prescribed. Common combinations of drugs prescribed are Aspirin + Clopidogrel + Atorvastatin (25%) followed by Aspirin + Clopidogrel (24%). Out of the total 658 drugs prescribed, 15.95% (105) were from Essential Drug List of India (2011). Of the total drugs prescribed, 15.95% (105) were from Essential Drug List of India.
Conclusions: The present study concluded that most of the drugs were prescribed rationally according to current guidelines. Combination therapy found to have an implication for the good cardiovascular outcome on long term follow-up.

Keywords: Cardiovascular diseases, Cardiovascular drugs, Drug utilization review, Prevalence

INTRODUCTION

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels and some of they include Hypertension, Atherosclerosis, Angina Pectoris, Myocardial Infarction, Coronary heart disease, Cerebrovascular disease, Peripheral arterial disease, Rheumatic heart disease, Congenital heart disease, Deep vein thrombosis and Pulmonary embolism.[1] Millions of people worldwide struggle to control the risk factors that lead to cardiovascular disease, many others remain unaware that they are at high risk.[2] CVDs are the number 1 cause of death globally: more people die annually from CVDs than from any other cause. An estimated 17.0

million people died from CVDs in 2016, representing 31% of all global deaths. Of these deaths, 85% are due to heart attack and stroke.1 One third of these deaths occur prematurely in people under 70 years of age.[2] over three quarters of CVD deaths take place in low- and middle-income countries.[1]

India has one of the highest burdens of cardiovascular disease (CVD) worldwide. The annual number of deaths from CVD in India is projected to rise from 2.26 million (1990) to 4.77 million (2020).[4] Coronary heart disease prevalence rates in India have been estimated over the past several decades and have ranged from 1.6% to 7.4% in rural populations and from 1% to 13.2% in urban populations.[2]

Medications recommended to treat CVDs include Angiotensin-converting enzyme (ACE) inhibitor, Angiotensin II receptor blocker, angiotensin receptor neprilysin inhibitors, beta-blockers, combined alpha and beta blockers, sodium channel blockers, potassium channel blockers, calcium channel blocker, diuretics, vasodilator, anticoagulant, medicines to control blood sugar, nitrates, ranolazine, statins and/or non-statin therapies, adenosine, atropine, digitalis or digoxin, anti platelet agent, cilostazol and dual antiplatelet therapy (DAPT).[3]

The prescription order is an important transaction between the doctor and the patient.[5] Cardiovascular diseases need to be prescribed with a bundle of essential drugs. These drugs together can cause drug interactions or any adverse events. But none of these drugs can be omitted.[6]

Different studies conducted in various countries revealed that over half of all medicines are prescribed, dispensed or sold inappropriately and the pattern of cardiovascular drugs used was identified as erratic. The variability and inconsistency among those studies might be reasonable due to variation in geographical location, disease pattern, patient preferences, and drug selection.[7] it also has been reported that drug treatment is likely to be effective only when patients are informed well about the therapy and that half of all patients fail to take their medicine correctly.[6]

Rational drug use is described by WHO as "Patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community".[8]

Correct diagnosis, appropriate prescribing, proper medication selection appropriate packing and good patient counselling have a positive implication on medication adherence and CVD improvement.[7]

WHO defined drug utilization study as "a structured process which is used to assess the quality of drug therapy by engaging in the evaluation of data on drug prescribing, dispensing, and patient use in a society with special emphasis on the resulting medical social and economic consequences".[9] Drug utilization research encourages rational prescribing of drug, contributes to the knowledge of current use of drugs in the society and explore whether a particular intervention affects the drug use in the population by observing the drug use pattern.[10]

Hence, this study was planned to assess the prescribing pattern of drugs in cardiovascular disease and drug utilization patterns in cardiology OPD at different secondary care hospitals in South India [using WHO/INURD Prescribing Indicators and to measure the degree of implementation of national drug policy by the practitioners as indicated as prescribing drugs in National List of Essential Medicine (NLEM) in India.

METHODS

It was a Cross-sectional study carried out in Secondary care hospital in Adoni for a period of 6 months from December 2021 to February 2021.Collected sample size was 167 subjects.

Inclusion Criteria of the study involves Patients of both genders diagnosed with cardiovascular disease along with co-morbidities, aged >18 years and Patients who gave informed consent. Exclusion criteria includes Patients with Other than cardiovascular diseases and pregnant women, incomplete data entry records and Patients who denied informed consent. Data were collected on the demographic details of age, gender, diagnosis, and the treatment prescribed which were mentioned in the prescription.

The prescribing indicators were studied in accordance with the standard guideline advocated by the WHO.[16]

Average number of drugs per encounter: Average was calculated by dividing the total number of different drug products prescribed, by the number of encounters surveyed. Whether the patient actually received the drugs was not considered relevant in calculating this indicator.

Percentage of drugs prescribed by generic name: percentage was calculated by dividing the number of drugs prescribed by generic name, by the total number of drugs prescribed and expressed as a percentage.

Percentage of encounters with an antibiotic prescribed: Percentage was calculated by dividing the number of patient encounters during which an antibiotic was prescribed, by the total number of encounters surveyed and expressed as a percentage.

Percentage of encounters with an injection prescribed: percentage was calculated by dividing the number of patient encounters during which an injection was

prescribed, by the total number of encounters surveyed, multiplied by 100.

Percentage of drugs prescribed from essential drugs list or formulary: percentage was calculated by dividing the number of products prescribed which were on the essential drugs list or local formulary, by the total number of products prescribed and multiplied by 100.

The following simple formula was used for calculating the adequate sample size in prevalence study; $n=Z2P(1-P)/d^2$ Where n is the sample size, Z is the statistic corresponding to level of confidence, P is expected prevalence (that can be obtained from same studies or a pilot study conducted by the researchers), and d is precision (corresponding to effect size). The collected data was analyzed using MS-Excel (Counts and Percentages).

RESULTS

A total of 186 patientcase sheets were analysed during six months study period. Of which, 167 were included in the study based on inclusion criteria.

Among male patients, it was found that cardiovascular diseases were most common in the age group of 31-40 years (27.55%) followed by 51-60 years (24.49%) and in female patients it was more common in the age group of 41-50 years (23.19%) followed by 51-60 years (21.74%). Also, there was no significant difference between number of male (24.49%) and female (23.19%) patients in the age group 51-60 years. (Figure 1) Results pointed out that the prevalence of cardiovascular diseases were more in male patients (58.7%) than in female patients (41.3%).

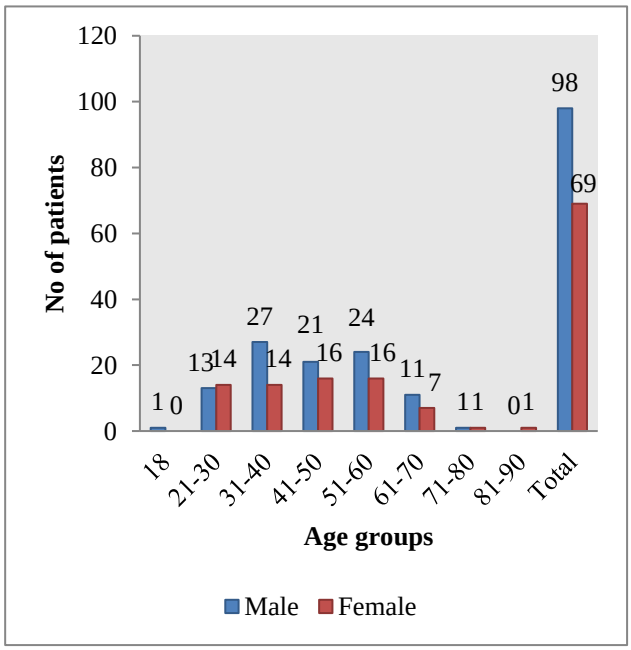

Figure 1: Age and gender wise distribution of cardiovascular disease patients (n=167).

Extensive diagnosis made by the physician revealed different cardiovascular diseases prevailing among the patients. 31% patients were reported to have Hypertension whereas 21% patients were diagnosed with coronary artery disease (CAD) (Figure 2).

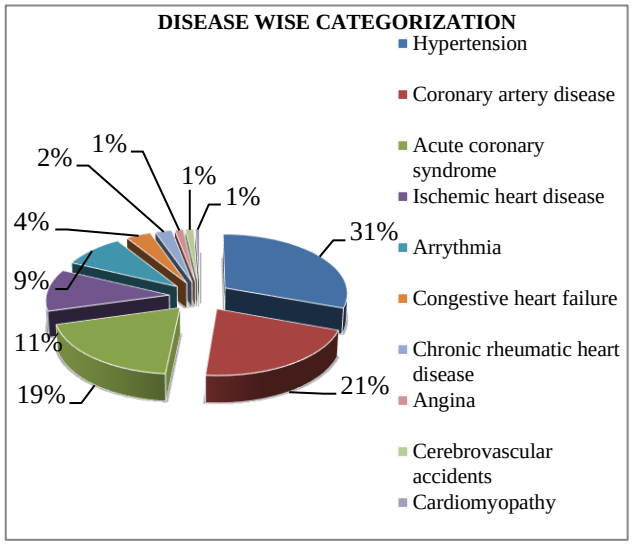

Figure 2: Pattern of cardiovascular diseases among the patients (n=167).

Other cardiovascular diseases diagnosed were acute coronary syndrome (19%), ischemic heart disease (11%), arrhythmia (9%), congestive heart failure (4%), chronic rheumatic heart disease (2%), angina (1%), cerebrovascular accidents (1%), cardiomyopathy (1%). Of all the prescriptions, diabetes mellitus (39%) was most found comorbid condition, followed by hematological disorders (20%) (Table 1).

Table 1: Co-morbid conditions among cardiovascular disease patients.

Co morbidities	Number of prescriptions	Percentage
Diabetes mellitus	26	39
Haematological disorders	13	20
Thyroid disorders	7	11
Respiratory disorders	5	8
Renal disorders	4	6
Dyslipidaemia	3	5
Orthopaedic disorders	3	5
GIT disorders	2	3
Urological disorders	2	3
Gynaecological disorders	2	3
Total	67	100

In the present study different categories of cardiovascular drugs prescribed were antiplatelet, anticoagulants, antianginal, antihyperlipidemics, antihypertensive and inotropes (Table 2).

Table 2: Different categories of cardiovascular drugs prescribed in CVD patients.

Category of Cardiovascular drugs	Drugs	No of cases prescribed	%
Antiplatelets	Aspirin	115	54
	Clopidogrel	100	47
	Prasugrel	1	1
Anticoagulants	Enoxaparin	6	47
	Heparin	2	16
	Fondaparinux	4	31
	Dabigatran	1	8
Antianginals	Nicorandil	13	65
	Flupirtine	1	5
	Nitro-glycerine	5	25
	Isosorbide dinitrate	1	5
Antihyperlipidemics	Atorvastatin	73	60
	Rosuvastatin	47	39
	Fenofibrate	2	2
Anti-hypertensives	Metoprolol	49	19
	Atenolol	3	2
	Propranolol	1	1
	Carvedilol	2	1
	Ramipril	4	2
	Hydrochlorothi-azide	52	2
	Spironolactone	18	7
	Torsemide	21	8
	Furosemide	16	6
	Olmesartan	54	20
	Telmisartan	23	9
	Valsartan	4	2
	Amlodipine	19	8
	Sacubitril	4	2
	Hydralazine	1	1
Inotropes	Dobutamine	4	25
	Dopamine	3	19
	Adrenaline	1	7
	Noradrenaline	2	13
	Digoxin	6	38

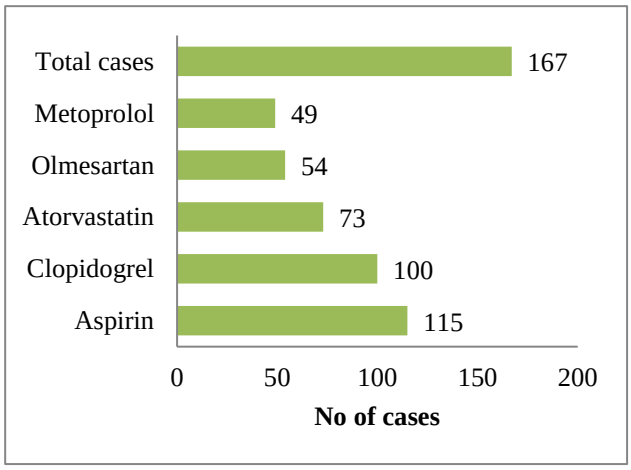

Figure 3: Most prescribed cardiovascular drugs.

In this study, the most prescribed category of drugs for cardiovascular diseases were anti-platelets (216) and anti-hypertensives (271) (Table 2). Of all Cardiovascular drugs, Aspirin (115 cases) followed by Clopidogrel (100 cases).

Atorvastatin (73 cases), olmesartan (54 cases) and Metoprolol (49 cases) were mostly prescribed (Figure 3).

In the present study the most prescribed drugs were Antiulcer drugs (Pantoprazole - 139 cases) followed by Antiemetics (Domperidone-122 cases), antiplatelet drugs (Aspirin-115 cases, clopidogrel-100 cases), non-opioid analgesics (Paracetamol-79 cases) and antihypertensive drugs (atorvastatin-73 cases) (Table 3).

Table 3: Drugs prescribed for comorbidities.

Other drugs category	Drugs	No of cases prescribed	%
Antidiabetics	Metformin	21	64
	Glimepiride	6	19
	Gliclazide	3	10
	Insulin	2	7
	Teneligliptin	1	4
Haematinics	Ferrous ascorbate	15	72
	Iron	6	29
Thyroid drugs	Thyroxine	7	88
	Carbimazole	1	13
Bronchodilators	Theophylline	1	2
	Doxophylline	1	2
	Deriphylline	1	2
	Terbutaline	3	5
	Guaifenesin	4	7
	Formoterol	1	2
	Ambroxol	4	7
	Levosalbutamol	2	4
	Montelukast	33	55
Antihistamines	Levocetrizine	33	79
	Betahistine	9	22
Non opioid analgesic	Paracetamol	79	71
	Pregabalin	33	30
Non-steroidal anti-inflammatory drugs	Aceclofenac	10	77
	Diclofenac	2	16
	Nimesulide	1	8
Corticosteroids	Prednisolone	1	25
	Fluticasone	1	25
	Beclomethasone	1	25
	Hydrocortisone	1	25
Muscle relaxants	Chlorzoxazone	30	94
	Dicyclomine	2	7
Anxiolytics	Escitalopram	5	16
	Alprazolam	9	29
	Etizolam	18	57
Anticonvulsants	Gabapentin	4	45
	Clonazepam	5	56
Laxatives and stool softeners	Sodium picosulfate, Liquid paraffin milk of magnesia	8	100
Enzymes	Pepsin and fungal diastase	14	100
	Acebrophylline	7	12
	Acetylcysteine	3	5
Antioxidant	Etophylline	1	2
	Lycopene	17	100
Antibiotics	Azithromycin	9	9
	Amoxicillin	22	21
	Piperacillin	1	1
	Penicillin G	2	2
	Ciprofloxacin	2	2
	Cefixime	20	19
	Cefpodoxime	1	1
	Ceftriaxone	5	5
	Metronidazole	7	7

Continued.

Other drugs category	Drugs	No of cases prescribed	%
	Ofloxacin	13	13
	Doxycycline	22	21
	Sulfadiazine	1	1
	Rifaximin	1	1
Antiulcer drugs	Pantoprazole	139	80
	Rabeprazole	18	11
	Esomeprazole	1	1
	Sucralfate	17	10
Antiemetics	Domperidone	122	97
	Ondansetron	2	2
	Cinitapride	2	2
Vitamins	B complex	15	12
	Vitamin C	48	37
	Vitamin D3	49	38
	Vitamin E	1	1
	B 12	5	4

Table 4: Different combinations of drugs prescribed in cardiovascular disease patients.

Cardiovascular drug combinations	No of drugs	%
Aspirin+clopidogrel	48	24
Aspirin+clopidogrel+atorvastatin	49	25
Aspirin+atorvastatin	15	8
Aspirin+clopidogrel+rosuvastatin	5	3
Rosuvastatin+clopidogrel	3	2
Rosuvastatin+fenofibrate	2	1
Atorvastatin+clopidogrel	2	1
Olmesartan+hydrochlorthiazide	36	18
Olmesartan+amlodipine+hydrochlorthiazide	1	1
Telmisartan+hydrochlorthiazide	6	3
Telmisartan+hydrochlorthiazide+amlodipine	11	6
Valsartan+sacubitril	4	2
Ramipril+hydrochlorthiazide	2	1
Amlodipine + atenolol	1	1
Furosemide+ spironolactone	12	6
Furosemide+ amiloride	1	1
Torasemide+spironolactone	5	3
Total	203	100

Table 5: Drug combinations for co-morbid diseases.

Co morbid diseases drug combinations	No of combinations prescribed	%
Gliclazide+metformin	3	3
Glimepiride+voglibose+metformin	1	1
Metformin+glimipride	5	5
Acebrophyllin+acetylcysteine	3	3
Etophylline+theophylline	1	1
Ambroxol+levosalbutamol+guaifenesin	1	1
Ambroxol+guaifenesin+terbutaline	3	3
Formoterol + Fluticasone propionate	1	1
Levosalbutamol+beclomethasone	1	1
Doxycycline + lactobacillus	13	13
Amoxicillin + Clavulanic acid	20	20
Amoxicillin + Clavulanic acid+ Lactobacillus	1	1
Cefixime+Clavulanic acid	15	15

Continued.

Co morbid diseases drug combinations	No of combinations prescribed	%
Cefixime+ofloxacin	2	2
Levocetrizine+montelukast	13	13
Ferrous Ascorbate+Folic acid	15	15
Iron+Vit B12+Folic acid	6	6
Ferrous Bisglycinate+Zinc Bisglycinate+Folic acid + Methylcobalamin	1	1
Total	105	100

Table 6: Details of drug therapy in cardiovascular disease patients.

Core Indicators	%
Prescribing indicators	
Average drugs prescribed per prescription	5.98
Generic name wise drugs prescribed	166
Antibiotics used	106
Injections used	66
Drugs listed in EDL (essential drug list)-India (2015)	105
Complementary indicators	
Total No. of Drugs prescribed	1262
Total No. of Mono drugs prescribed	642
Total No. of Two drug combinations prescribed	507
Total No. of more than two combination drugs prescribed	113
Total No. of Cardiac drugs prescribed	658
Total No. of Vitamin supplements drugs prescribed	130

In the study, we have noticed prescriptions having combination of drugs (Table 4). most commonly prescribed cardiovascular drug combinations were Aspirin + Atorvastatin +Clopidogrel (25%) followed by Aspirin + Clopidogrel (24%) (Table 4).

Among comorbid disease drug combinations, mostly prescribed were Amoxicillin+Clavulanic acid (20%) (Table 5).

Figure 4 indicates that 51% prescribed drugs were monotherapy, while 40% prescribed drugs were dual therapy and 9 % prescribed were quadruple therapies.

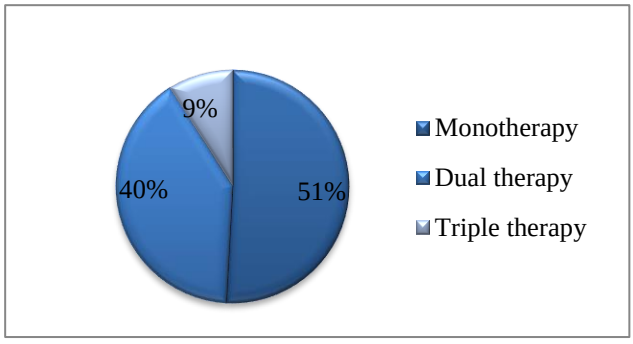

Figure 4: Percentage of drug combinations prescribed.

Out of the total number of 1262 drugs prescribed, 52.13% (658) were cardiovascular drugs. The number of parental preparations prescribed were 66. A total number of 658 cardiovascular medications were prescribed. Out of the total 658 drugs prescribed, 15.95% (105) were from Essential Drug List of India (2015). (Table 6).

DISCUSSION

The reason for increased incidence of cardiovascular diseases in female in these age groups could be the loss of cardio protective effect of estrogenic after menopause. These results were similar to the study by Kiran et al and Vijayprasad et al.[11]

The prevalence of cardiovascular diseases was more in male patients. This was in concordance with the study conducted by Ram et al, Kumar et al.[12]

In this study, hypertension and CAD were more prevalent diseases which was found similar to the results of the study by Solanki et al and Patel et al.[13] Various co-morbid conditions like diabetes mellitus, Renal disorders, Respiratory disorders, dyslipidaemia, thyroid disorders and haematological disorders, orthopaedic disorders, GIT disorders and gynaecological disorders were seen among these patients. In this study Diabetes was the most common comorbidity found. This was seen similar to the study conducted by Solanki et al.[13]

Aspirin was the most common drug prescribed among cardiovascular drugs. Similar results were found in study conducted by Zachariah et al and Pooja et al.[14] In this study, drugs prescribed for comorbidities include Anti-diabetics, haematinics, thyroid drugs, bronchodilators, antihistamines, NSAIDs, non-opioid analgesics,

corticosteroids, muscle relaxants, anxiolytics, anti-convulsant, laxatives and stool softeners, enzymes, antioxidants, antiulcer, antiemetics, antibiotics, and vitamins (Table 3).

In the present study, the average number of drugs per prescription was 5.98, which was in concordance with the previous study by Bhavika et al and Prasanna et al.[15]

In this study, total number of drugs prescribed, which was in concordance with the previous study by Hirsh et al and Warkenitin et al.[17]

There are some of the limitations in this study such as sample size (167), short duration (6 months) and single centre. Sample size does not reflect the actual population and prescriptions in the country. Since this is a single centre study, extrapolation of results would be better if other tertiary care hospitals of the city are included. So large sample size with longer duration of study might provide effective patterns of prescription and utilization of drugs.

CONCLUSION

In our study, we found that cardiovascular drugs are more common in males than females. Hypertension is the more prevalent cardiovascular disease, followed by coronary artery disease and acute coronary syndrome. Diabetes mellitus and hematological disorders are most found co morbidities along with cardiovascular diseases. Most prescribed category of drugs are anti-platelets (aspirin, clopidogrel and atorvastatin), Antihypertensives (Olmesartan) and Beta blockers (Metoprolol). Combination therapy (Aspirin + Atorvastatin + Clopidogrel) found to have an implication for the good cardiovascular outcome on long term follow-up. Monotherapy is more prescribed than Dual and Triple therapies. The use of anticoagulants and anti-platelet is value addition in the effective treatment as well as prevention of other heart diseases.

ACKNOWLEDGEMENTS

Authors would like to thank the Department, Head and other Faculty for encouraging and supporting them in the conduction of this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kenchugundu J, Padmashali PB, Divate S, Jyothi SS. Prevalence of cardiovascular diseases and drug utilization review at secondary care hospital in South India. Int J Community Med Public Health 2023;10:2171-9.