A Prospective Study on Prescribing Pattern of Drugs and Medication Adherence in Patients with Coronary Artery Diseases in a Tertiary Care Teaching Hospital

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ABSTRACT

Background: Coronary artery disease has become a predominant cause of morbidity and mortality among various cardiovascular diseases. This study aims to examine the prescription trends in the treatment of coronary artery disease and medication adherence in patients. Knowledge and insight about the patterns in prescribing can facilitate rational drug use and improve the quality of life in patients with CAD. **Materials and methods:** A prospective observational study was conducted among the patients visiting Government Cuddalore Medical College and Hospital [RMMCH]. 120 patients were included in the study and observed for 6 months [November 2021- April 2022]. Data were collected from patient case sheets and personal interactions with patients and was analysed using Microsoft excel. **Results:** In the present study, the incidence was more in male patients [54%] with more prevalent in the age group 61-70 years. The study revealed that 83% of patients presented with comorbidities among which 23% had diabetes mellitus and 15% had hypertension. The prescription pattern revealed the most common drug classes prescribed were antiplatelets 118 [98%], antihyperlipidemic 114[95%], gastric acid secretion inhibitors 81[68%], diuretics 60[50%], anticoagulant drugs 47[39.10%], antidiabetic drugs 54[45%], antibiotics 53[44%], antianginal drugs 39[32.5%]. Polypharmacy was noted [7.65 drugs per prescription]. **Conclusion:** The results of the study concluded that most of the drugs were prescribed rationally in accordance with standard treatment guidelines (ACC\AHA). In our study, the prevalence of medication non-adherence was 47%, Clinical pharmacists' intervention and reviewing the practices periodically on prescribing patterns will address the non-adherent issue and enhance patient's quality of life.

INTRODUCTION

Coronary artery disease is caused by the narrowing of one or more coronary arteries, most commonly atherosclerotic disease plaques, delivering blood to the heart [1]. CAD is one of the major cardiovascular diseases affecting the global human population [2]. The results of global burden of disease study estimates; the prevalence of CAD was 154 million in 2016, representing 32.7% of the global burden of CV disease and 2.2% of the overall global burden of disease [3]. The total number of coronary artery disease patients in India at the turn of the century was 30 million (5.3% of the adult population) [4].

Anti-platelet agents, anticoagulants, antihyperlipidemic, beta-blockers, angiotensin converting enzyme inhibitors, nitrates, calcium channel inhibitors, diuretics, etc; are the various category of drugs used to treat coronary artery diseases. Besides optimal medical therapy surgical revascularization procedures namely, percutaneous transluminal coronary angioplasty and coronary artery bypass grafting play a crucial role in reducing major adverse cardiac events [5][6]. Depending on the extent, severity and clinical presentation of CAD the various treatment options are medical, surgical or a combination of both [7].

The most common risk factors for CAD have been considered to be hypertension, diabetes, raised serum cholesterol, obesity, smoking, excessive alcohol consumption, sedentary life style and advancing age [8][9]. CAD is generally diagnosed by electrocardiogram, echocardiography, coronary angiography, cardiac biomarkers (cardiac troponins T & I, CK-MB, myoglobin) [10].

The keystone to ensure rational drug use is rational prescribing often half of the medications are prescribed irrationally and the majority of the patients fail to take the medications. knowledge on prescribing patterns based on the assessment is the fundamental step to improve rational drug use, quality of prescription, maximize utilization of resources and care of patient in therapeutic regimen [11] [12].

According to recent studies, medication non-adherence in CAD patients is closely linked to unfavourable clinical outcomes such as mortality, morbidity, rehospitalization and higher treatment costs. The widely used indirect method to measure medication adherence of therapies is patient questionnaire. The most frequently used patient questionnaire is Mo risky medication adherence scale (MMAS) which is the simplest, most practical, easiest and inexpensive tool, even though it is subject to bias of results by patient [13] [14] [15].

Citation: Thamizhakaran K S et al. Ijppr.Human, 2023; Vol. 27 (4): 323-337.

324

MATERIALS AND METHODOLOGY:

Study design: This is a prospective cross-sectional observational study.

Study site:

The study was carried out in Department of General Medicine, Government Cuddalore Medical College and Hospital [RMMCH], a 1200 bedded multi-speciality tertiary care teaching hospital located in Rural South India, Chidambaram.

Study population: a total of 120 patients were enrolled in the study.

Study period: 6 months [November (2021)-April (2022)].

Study criteria:

Patients visiting both outpatient and inpatient departments [NICU, CCU] were enrolled in to the study after taking their consent and by considering following inclusion and exclusion criteria.

➢ Inclusion criteria: Prescriptions of patients with coronary artery disease and Patients between the ages of 30 to 80 years with CAD.

➢ Exclusion criteria: Pregnant or lactating women, Patient with psychological illness, Patients who are in critical condition, Patient who are not willing to sign the consent form, Patients below 18 years old.

Data collection:

The data were collected from patients who met the inclusion criteria. During the study period about 120 case records of patients were studied and other necessary data that cannot be obtained from medical records were obtained by direct interaction/interviewing the patient through questionnaires. All the relevant details were noted in a specially designed data collection form/proforma. The data includes, Patients demographic details [age, sex], comorbid conditions, medical history, laboratory details such as blood pressure, prothrombin time, renal function tests, ECG, ECHO and prescribed drugs such as drug dose, frequency and route of administration were noted.

Citation: Thamizhakaran K S et al. Ijppr.Human, 2023; Vol. 27 (4): 323-337.

325

Study procedure:

Phase 1- Subjects were selected based on inclusion and exclusion Informed consent form patients was obtained.

Phase 2- All relevant information needed for the study was collected from case records details about demographic details prescribed drugs, comorbidity, laboratory investigation, surgical intervention results, adverse effects, drug dose, and frequency.

Phase 3- Patients medication adherence was checked using Mo risky medication adherence scale. Patient counselling was provided in terms of oral method.

Phase 4- Collected data were analysed using suitable descriptive statistical tools. The net result of treatment was recorded and tabulated.

RESULTS:

A total number of 120 patients of coronary artery disease were enrolled in our study of which 65(54%) were male patients and 55(46%) were female patients. The incidence of coronary artery disease was more common in males compared to female. We observed the maximum number of patients were from the age group of 61-70(34%), with 100 (83%) patients presenting with comorbid conditions. Various comorbid conditions were observed among which hypertension and diabetes mellitus were the most common conditions.
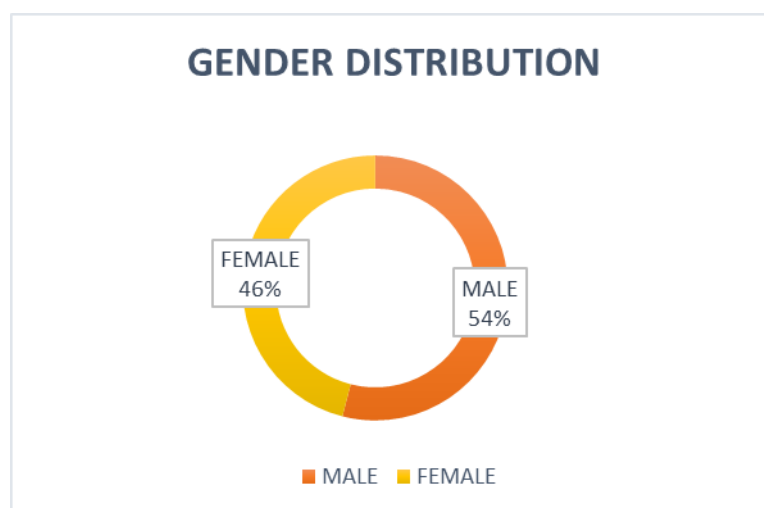

Figure 1: Gender distribution

Citation: Thamizhakaran K S et al. Ijppr.Human, 2023; Vol. 27 (4): 323-337.

326
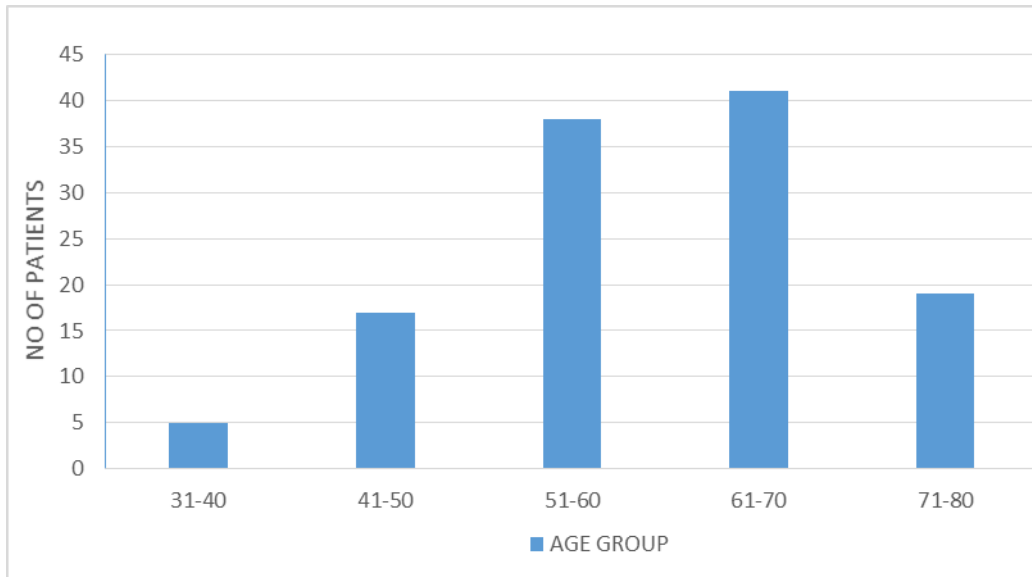
Figure 2: Age-wise distribution

TABLE 1: Details on comorbid conditions

S.NO	COMORBIDITY	NO. OF PATIENTS (n=100)	PERCENTAGE (%)
1	Bronchial asthma	2	2%
2	CKD	1	1%
3	Diabetes Mellitus	23	23%
4	Diabetes+others (CKD,Hypothyroidism,Dyslipidemia,COPD)	3	3%
5	Hypertension+Diabetes Mellitus +others (Hypothyroidism,Bronchial Asthma)	13	13%
6	Hypertension	15	15%
7	Hypertension + Diabetes Mellitus	32	32%
8	Hypertension+others (CKD,Hypothyroidism,Dyslipidemia,Bronchial Asthma)	7	7%
9	Hypothyroidism	3	3%
10	Tuberculosis	1	1%

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327

Drug use pattern:
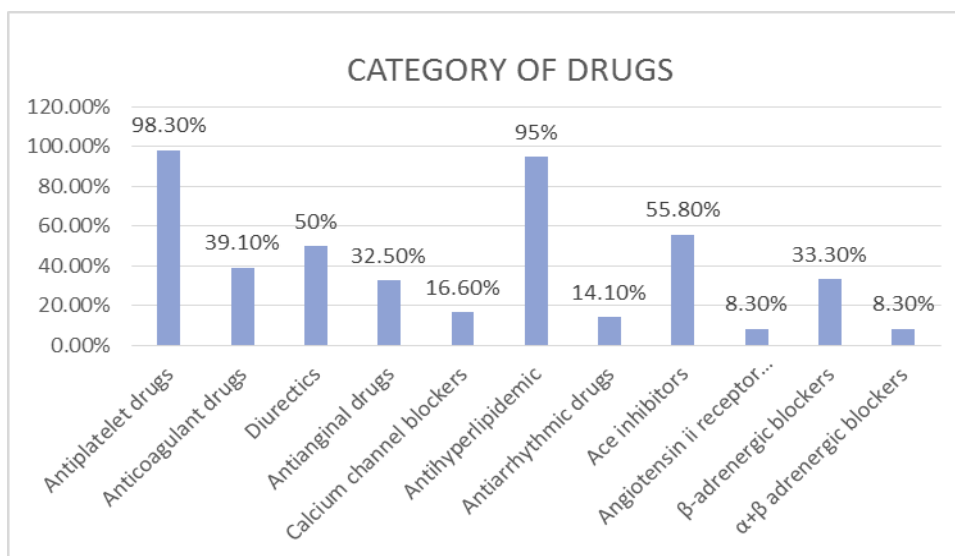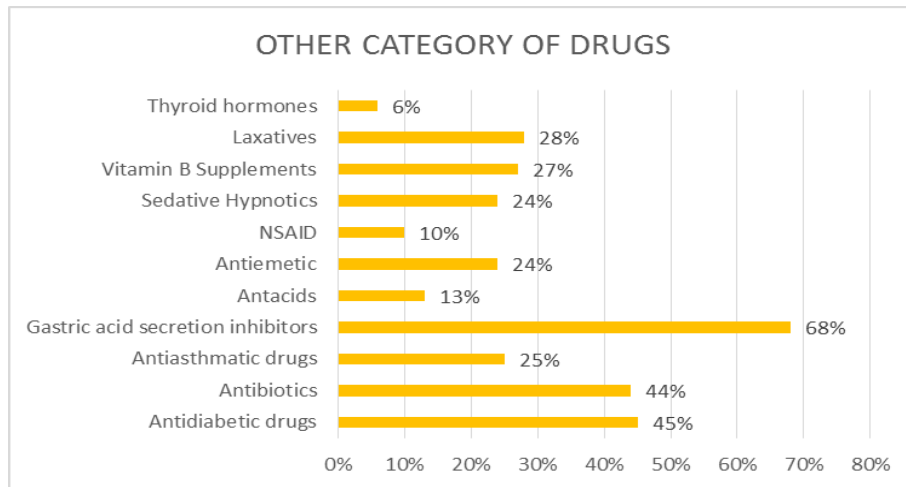

Figure 3: Category of drugs prescribed for CAD

In our study out of 120 prescriptions antiplatelet [98.30%], antihyperlipidemic drugs[95%] and ACE inhibitors[55.80%] were most commonly prescribed, among antiplatelet drugs combination of Aspirin and Clopidogrel[62%] were most commonly given, among antihyperlipidemic drugs Atorvastatin [86%] was most prescribed one, Un fractioned heparin[77%] among the anticoagulants, Frusemide[55%] among Diuretics, Isosorbide dinitrate[79%] among the antianginal drugs, Metoprolol[74%] among the β-adrenergic blockers, Enalapril[84%] among the ACE inhibitors, Telmisartan[12%] among angiotensin-receptor blockers, Amlodipine[80%] among the calcium channel blockers, Digoxin[80%] among the antiarrhythmic drugs were most commonly prescribed ones.

Table 2: List of CAD drugs prescribed

MEDICATION	NO. OF. PATIENTS (n=120)	PERCENTAGE (%)
ANTIPLATELET DRUGS [118]		
Aspirin	32	27%
Aspirin+clopidogrel	73	62%
Clopidogrel	13	11%
ANTIHYPERLIPIDEMIC DRUGS [114]		
Atorvastatin	98	86%
Atorvastatin+Fenofibrate	11	10%
Rosuvastatin	5	4%

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328

ANTICOAGULANT DRUGS [47]		
Heparin(unfractionated)	36	77%
Low molecular weight (LMW) heparin	11	23%
DIURECTICS [60]		
Eplereone	1	2%
Frusemide	33	55%
Frusemide+spironolactone	8	13%
Spironolactone	13	22%
Torsemide	5	8%
ANTIANGINAL DRUGS [39]		
Isosorbide dinitrate	31	79%
Isosorbide dinitrate+Ivabradine	2	5%
Ivabradine	1	2%
Nitroglycerin+Ivabrandine	1	3%
Nitroglycerine	2	5%
B-ADRENERGIC BLOCKERS [40]		
Bisoprolol	1	2%
Metprolol	37	74%
Nebivolol	2	4%
A+B ADRENERGIC BLOCKERS [10]		
Carvedilol	10	20%
ACE INHIBITORS [67]		
Enalapril	65	84%
Ramipril	2	3%
ANGIOTENSIN II RECEPTOR BLOCKERS [10]		
Losartan	1	1%
Telmisartan	9	12%
CALCIUM CHANNEL BLOCKERS [20]		
Amlodipine	16	80%
Cilnidipine	4	20%
ANTIARRHYTHMIC DRUGS [18]		
Digoxin	17	94%
Digoxin + Amiodarone	1	6%

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329

Other categories of drugs prescribed

OTHER CATEGORY OF DRUGS

Thyroid hormones — 6%
Laxatives — 28%
Vitamin B Supplements — 27%
Sedative Hypnotics — 24%
NSAID — 10%
Antiemetic — 24%
Antacids — 13%
Gastric acid secretion inhibitors — 68%
Antiasthmatic drugs — 25%
Antibiotics — 44%
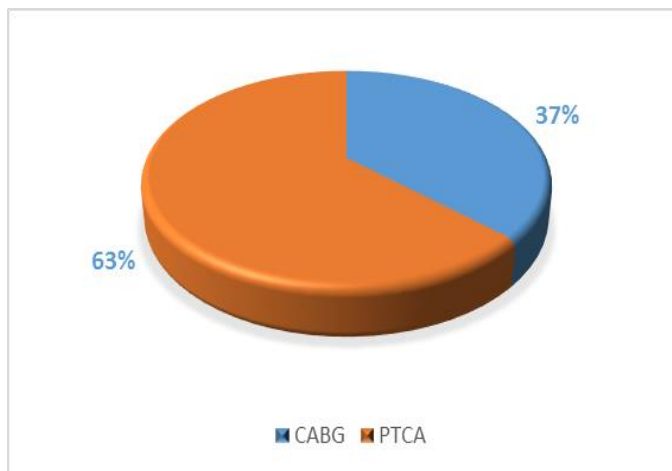Antidiabetic drugs — 45%

Figure 4: Other category of drugs prescribed

Revascularization methods:

Among 120 study populations, 17 patients were undergone PTCA and 10 patients undergone CABG.

37%
63%

■ CABG ■ PTCA

Figure 5: Revascularization methods

WHO core drug prescribing indicators:

In our study, the total number of drugs prescribed among 120 patients was 918. the average number of prescription encounters was 7.65%, which was justifiable even though it is more than WHO standard (1.6 -4.8), because of the comorbid conditions the patients were presenting with, it becomes inevitable. The percentage of prescriptions encountered with an

Citation: Thamizhakaran K S et al. Ijppr.Human, 2023; Vol. 27 (4): 323-337.

330

antibiotic was approximately 5.77% [WHO standard it was 20 to 26.8%]. Antibiotics have been used only when needed minimizing the antimicrobial resistance.

Table 3: WHO core prescribing indicators

S.NO	PARAMETER	VALUE
1	Average number of drugs per prescription (N=918)	7.65%
2	Percentage of drugs prescribed by generic name (N=598)	65.14%
3	Percentage of encounters with an antibiotic prescribed (N=53)	5.77%
4	Percentage of encounters with a parenteral form of medication prescribed (N=212)	23.09%
5	Percentage of drugs prescribed from essential drug list (N=614)	66.88%

Medication adherence:

The extent to which patient's behavior –taking medications was analyzed in this study through their prescriptions according to (MMAS -8), [Mo risky medication adherence scale] the scale consists of 8 questions to determine medication adherence. In this study, data from 120 patients with CAD who gave full and unambiguous replies to all MMAS -8 were included into the analysis. according to MMAS -8 scoring, 64(53%) was found to be high medication adherence, 36(30%) was found to be medium, 20(17%) was found to be low.
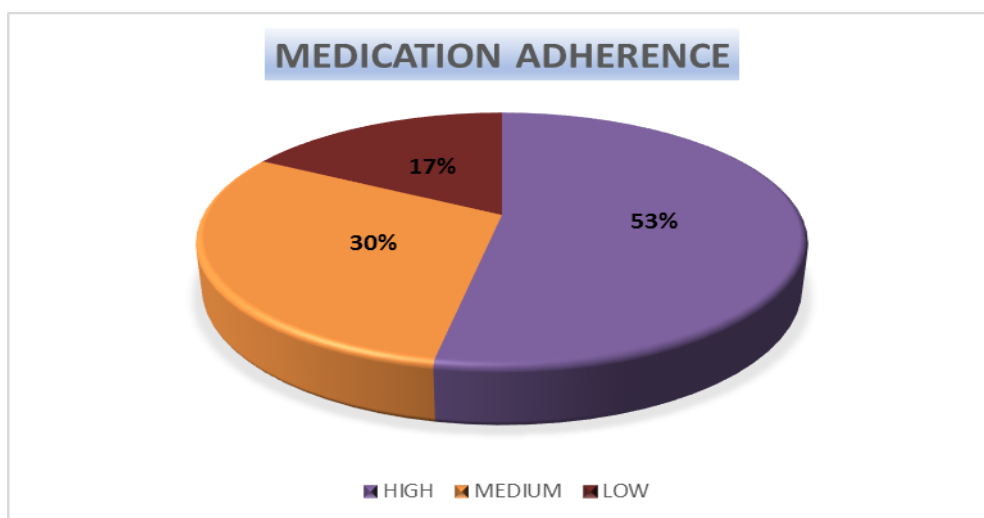
Figure 6: Medication adherence

Citation: Thamizhakaran K S et al. Ijppr.Human, 2023; Vol. 27 (4): 323-337.

331

DISCUSSION

CAD has been one of the leading causes of morbidities and mortalities across the world. Often medications are prescribed irrationally and further, inappropriate use of these medications by patients leads to failure of therapeutic management. Hence rational prescribing and patient counseling regarding the use of medications has become primary step to ensure rational drug use.

Therefore, the present study analyzed the current prescribing pattern of drugs and medication adherence in patient with coronary artery disease.

In this study, out of 120 patients 54% were male and 46% were female. The prevalence of CAD in male patients was higher compared to female patients. This was similar to the results of a study done by Mustafa et .al (2021) which reported a higher incidence of CAD in males (72%) than in females (28%) [5]. The reason for the low occurrence of CAD in females is normally attributed to the protective effect of estrogen [1].

As per the study conducted by blessy et.al (2017) CAD was more commonly found in the age group of 51-60 years, whereas in our study CAD was slightly prevalent in 61-70 years followed by 51-60 years [16].

This study reports that the most common comorbidities were Diabetes Mellitus, Hypertension (32%) in coronary artery disease. Only 17% of the patients presented without any comorbidities.

According to the study, conducted by Rajkumar Venisetty et al (2014), the prescription pattern of various drugs was found to be antiplatelet drugs (99.41%), antihyperlipidemic (95.29%), antibiotics (92.94%), antianginal (80.59%), anticoagulants (64.71), diuretics (62.35%) [17]. In our present study, it was observed that prescription rates of antiplatelet drugs (98.30%), antihyperlipidemic (95%), antibiotics (44%), antianginal (32.5%), anticoagulants (39.10%), diuretics (50%). The prescription rates of antibiotics, antianginal, and anticoagulants in this study were comparatively lower than the previous study.

In the present study Aspirin + Clopidogrel were prescribed (62%), Aspirin (27%) & clopidogrel (11%). It was similar to the study conducted by Rishitha et al (2021) which revealed the utilization of DPAT (81%) was highest compared to monotherapy (19%) [18].

Citation: Thamizhakaran K S et al. Ijppr.Human, 2023; Vol. 27 (4): 323-337.

332

In a study conducted by Tasneem Sandozi et .al (2010), the most commonly prescribed drug among the beta-blockers was Metoprolol (42.5%), calcium channel blockers were Amlodipine (25.71%), ACE inhibitors was Captopril (17.14%) followed by Enalapril (15%) whereas in the present study the most commonly prescribed drugs Metoprolol (74%) among the beta-blockers, Amlodipine (80%) among the calcium channel blockers, Enalapril (84%) among the ACE inhibitors [19]. The result of this study slightly varied from the previous study.

In a study conducted by shamnac et al (2019) the most commonly prescribed drug among the anticoagulant was LMWH (32%), statins were Atorvastatin (96%) whereas in our study most commonly prescribed drug UFH (77%), Atorvastatin (86%) among the statins [4].

In the present study other than cardiovascular drugs, gastric acid secretion inhibitors (68%), antidiabetic drugs (45%), antibiotics (44%), laxatives (28%), vitamin supplements (32), sedative hypnotics (24%), antiemetic (24%), antiasthmatic drugs (25%), antacids (13%), NSAID (10%), thyroid hormones (6%) were prescribed in CAD patients.

The average number of drugs per prescription encounter was 7.65% which was comparably lower to other studies done by Rajkumar Venisetty et .al (9.68%) and Tasneem sandozi et al [17] [19]. WHO standard or ideal value for an average number of drugs per prescription was 1.6% to 4.8%. The associated comorbid illness warrants increased drug prescription.

In our study about 65.14% of drugs were prescribed by generic name, which was found to be higher when compared to the study conducted by Tasneem Sandozi et al (6.00%) [19]. WHO suggests it to be 100% since, prescribing drugs in generic name increases patient compliance, minimizes the cost burden on the patients and chance of duplication is avoided.

In our study the percentage of encounters with antibiotics prescribed was found to be 5.77% similar to the study done by Shravani Karnekanti et al [20]. WHO recommended value was between 20% to 26.8%, since irrational use of antibiotic lead to resistance. In our study, antibiotics were prescribed optimally.

The percentage of encounters with a parenteral form of medication prescribed was 23.09%. According to WHO standards it was (13.4% to 24.1%).

Citation: Thamizhakaran K S et al. Ijppr.Human, 2023; Vol. 27 (4): 323-337.

333

In the present study we observed that 66.88% of drugs prescribed from essential drug list which found to be higher when compared to study done by Solanki et al (2021) [1] whereas WHO suggests a one hundred percent.

In our study we observed that high adherence was found to be 64(53%), 36(30%) was found to moderate and 20(17%) was found to be low in CAD patients. About 53% of the population showed higher medication adherence, 36% of the population had moderate adherence and 17% of the population had poor adherence. This finding is similar to the study conducted by Zyryanov SK et; al where,188(48.7%) had high medication adherence 135(35.0%) - moderate, and 63(16.3) – low [21]. The previous study Asaf Bitton et al; reported that high adherence significantly improves health outcomes and reduces annual costs for secondary prevention of coronary artery disease [22].

CONCLUSION

This study concludes that increased age, history of diabetes and hypertension were the major risk factors for CAD. The most commonly prescribed class of drugs were antiplatelets (98.30%), statins (95%), ACE inhibitors (55.80%), diuretics (50%), anticoagulant drugs (39.10%), gastric acid secretion inhibitors (68%), antidiabetic drugs (45%), antibiotics (44%).

Aspirin plus Clopidogrel, Atorvastatin, Enalapril, Metoprolol, Heparin, Frusemide, Isosorbide dinitrate, Pantoprazole, Vitamins were commonly prescribed drugs in patients with CAD. This study concludes that most of the drugs were prescribed rationally in accordance with standard treatment guidelines (ACC\AHA) and antibiotics were prescribed optimally. No adverse effects were found in this study. The overall prescription pattern involved in our study is satisfactory. The prevalence of medication non-adherence in patient with CAD was 47%, further local research is needed to address this serious problem. During the study, patient counselling was provided to improve medication adherence. The findings of this study are expected to offer physicians with relevant and useful feedback. Clinical pharmacists' intervention and reviewing the practices periodically on prescribing patterns will provide better follow-up rates of patients, thereby improving the medication adherence and improving the health-related quality of life by preventing complications of the disease.

Ethical clearance:

This prospective study was approved by Institutional Human Ethics Committee, Number: IHEC/884/2022 and permitted by Member Secretary, Institutional Human Ethics Committee,

Citation: Thamizhakaran K S et al. Ijppr.Human, 2023; Vol. 27 (4): 323-337.

334

Government Cuddalore Medical College & Hospital (RMMCH), Annamalai University. The registration number of IEC is EC/NEW/INST/2020/1249. Patient Informed Consent forms were obtained. Since, human participants were involved in this investigation.

Acknowledgment:

Author contribution:

Conceptualization and methodology including data collection: ST, SI, TS; Writing – original draft preparation and literature search: ST, SI; Writing – Review and Supervision: TS. The final manuscript has been read and approved by all the authors.

Conflict of interest:

The authors affirm that the publishing of this paper is free of conflict of interest.

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335

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336

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Citation: Thamizhakaran K S et al. Ijppr.Human, 2023; Vol. 27 (4): 323-337.

337