



A PROSPECTIVE STUDY ON DRUG UTILIZATION AND EVALUATION OF PRESCRIBING PATTERN OF DRUGS USE IN PATIENTS OF MYOCARDIAL INFARCTION

Dr. T. Muthuvel*, Nitty Reji¹, Pharm D., Vipin V.¹ Pharm D., H. Rajamathanky²
M. Pharm and Dr. V. Ganesan³, M. Pharm, PhD.

*Senior Surgeon, Govt Head Quarters Hospital, Tiruppur.

¹The Erode College of Pharmacy and Research Institute, Erode. Tamil Nadu, India.

²Department of Pharmacology, the Erode College of Pharmacy and Research Institute.

³Department of Pharmaceutics, the Erode College of Pharmacy and Research Institute.

Article Received on
28 Dec. 2018,

Revised on 18 Jan. 2018,
Accepted on 08 Feb. 2019,

DOI: 10.20959/wjpps20193-12968

*Corresponding Author Dr.

T. Muthuvel

Senior Surgeon, Govt Head
Quarters Hospital, Tiruppur.

ABSTRACT

Background: Myocardial infarction is an emergency condition where usage of many drugs during its treatment is common. This could leads to polypharmacy. Keeping this in mind our study was carried out to evaluate the drug utilization pattern in myocardial infarction. **Aim:** To carry out drug utilization study and prescription pattern of drugs use in patients with myocardial infarction using WHO and INRUD core drug use indicators. **Result And Discussion:** In this study we analysed total of 100 prescription of patient diagnosed with myocardial infarction out

of that 75 belongs to male and 25 belongs to female. STEMI was found in 86 patients and NSTEMI in 14 patients. Average number of drugs per prescription was 10.01. The percentage of drugs prescribed in generic name was found as 82.71. Percentage of antibiotics prescribed was approximately 25%. In present study number of prescriptions with injectable was 99%, higher than WHO standard value (<20%). All drugs in this study was prescribed from hospital formulary(100%). In our study IRDP was found as 3.4 according to WHO the optimal value of the IRDP is 5. In the present study poly pharmacy was found as 0.3 shows great variation from WHO value. In this study the index of generic prescribing was found as 0.82 and antibiotic prescribing was found as 1.2. The index of injection prescribing was 0.10 which is more than optimal value. **Conclusion:** The present study shows the over all pattern of drugs used in myocardial infarction. We observe polypharmacy and prescription of drugs with brand names and high prescription of injectables.

KEYWORDS: WHO and INRUD.

INTRODUCTION

Cardiovascular disease is the reason for about 1/3 of deaths and likely to remain as the prevalent eradicator globally.^[1] According to WHO around 17 million people died due to coronary heart diseases every year. Considering the cardiovascular mortalities, 20 million people are reported in 2015 and more than 24 million people are expected by the year 2030^[2] Incidence of cardiovascular diseases are found to be greater than non communicable diseases as it occupy 1/3 of deaths. From various developing countries, CVD occupied 86% of global burden.^[3]

Among CVD, acute coronary syndrome (ACS) is considered as one of the leading causes of mortality and morbidity globally.^[4] Acute coronary syndrome occurs when the level of biochemical markers elevates or in the absence of electrocardiographic changes.^[5] The anatomical site of blockage, the length of time that blood flow is obstructed and the extent of damage that occur will determine the type of ACS.

Myocardial infarction is a common type of ischemic heart disease(IHD). Myocardial infarction is defined as the death of heart muscle (myocardium) due to the sudden blockage of a coronary artery by a blood clot or fat deposition.^[6] The muscles of the heart get damaged due to the sudden stoppage of circulating blood and deprived oxygen supply. Infarcts can be defined as either ST- Elevation (STEMI) or Non –ST elevation (NSTEMI) according to the pathophysiological differences and ECG changes.⁷In NSTEMI, ST segment do not get elevated, the blockage may be temporary /partial so the degree of damage will be relatively small. In STEMI, the ST segment get elevated and the blockage of blood supply may be prolonged. It affect large area of heart muscles.

After an attack, nly 10-20% cases do not develop major complications and they recover easily. Remaining 80-90% patients develop one or more major complications some of which are life threatening. The sudden mortality from acute MI (Cardiac arrest) is about 25%.^[8] complications include arrhythmic complications, left ventricular aneurysm, cardiac aneurysm, peripheral circulatory failure, ventricular septal rupture, cardiogenic shock.

The MI is diagnosed by taking patients clinical history, presenting symptoms, biomarker levels and electrocardiographic results.

Drug utilization study was defined by WHO as the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences.^[9,10] The main aim of drug utilization study in patients was to provide rational use of medicines in public populations. DUE is defined as the authorised structured, ongoing review of physician prescribing, pharmacist dispensing and patient use of medication. DUE is ongoing, systematic process designed to maintain the appropriate and effective use of drugs.^[9]

MEASURING DRUG USE

Rational use of drugs cannot be defined without a method of analysis and reference standard.^[15] It was reported that, more than 50% of all drugs are prescribed, dispensed or sold inappropriately and other 50% of medicines are taken incorrectly by patients. Irrational use of medicines include poly pharmacy Irrational use of medicines include the use of too many medicines (poly pharmacy) use of antibiotics for viral infections, inadequate dosage, use of injections when oral medications is appropriate, prescribing medicines in generic names and patient who are taking self medications.

The International Network for Rational Use of Drugs (INRUD) and the WHO Action Programme on Essential Drugs developed a set of 12 quantitative indicators to measure some key aspects of prescribing and the quality of care. The core indicators are classified into prescribing, patient care and facility specific.^[11]

PRESCRIBING INDICATORS

average number of drugs per encounter percentage of drugs by generic names percentage of encounters with an antibiotic prescribed percentage of encounters with an injection prescribed percentage of drugs prescribed from essential drugs list or formulary.^[12,13]

MATERIALS AND METHODS

STUDY DESIGN

This is a prospective study conducted in Intensive Care Unit and Department of general medicine in Govt. head quarters hospital, tirupur.

STUDY PERIOD

The study is carried out for 6 months from March 2018 to August 2018.

STUDY POPULATION

The study population includes the patients admitted with myocardial infarction in Govt. Head Quarters hospital, tirupur. A total of 100 number of cases are collected.

STUDY METHODS

Methods for calculating prescription indicators

Average number of drugs per encounter(C)

This indicator is obtained by first counting the total no.of encounters for which data was collected (A). The total number of drugs prescribed for the total encounter or prescription is determined as (B). In determining the value of combined drugs it should be counted as one instead of two. By dividing the total no. of drugs prescribed(B) by the no. of encounters (A) gives the average no. of drugs per encounter (C). this is expressed as: **Formula: (C)=B/A.**

Percentage of drugs prescribed by generic name(E)

This indicator (E) is calculated by dividing the total number of generic drugs prescribed(D)by the total number of drugs prescribed(B), and multiplying it by 100 to make a desired percentage(E). The WHO proposes that, all drugs (100%) should be prescribed by generic names. The calculation of this indicator is expressed as: **Formula: (E)=D/B×100%.**

Percentage of encounters with an antibiotic prescribed(G)

The percentage of encounters with antibiotic prescribed (G) is measured by calculating the total no. of patients who received antibiotics (one or more)(F) by the total no. of encounters (A) and multiply it by 100 to express the value in percentage. According to WHO it should be (<30%). Mathematical expression is given as: **Formula: (G)=F/A×100%.**

Percentag encounter with an injection prescribed(I)

This indicator is calculated by dividing the total number of patients who received one or more injections(H) by the total no. of encounters studied (A) and multiply by 100 to express the value in percentage. Mathematical expression is given as: **Formula: (I)=H/A×100%.**

Percentage of drugs prescribed from essential drug list (K)

The percentage of drugs prescribed from EDL/formulary (K) is calculated by dividing the total number of EDL drugs prescribed(J) by the total number of drugs prescribed(B)and then multiply by 100 to express in percentage. Mathematical expression is given as: **Formula: (K)=J/B×100%.**

INDEX OF RATIONAL DRUG PRESCRIBING(IRDP)

Zhang and zhi developed an index system to measure the overall performace of a health care system in terms of drug use. Non poly pharmacy, rational antibiotics use and safe use of injections are calculated by using the following formula.

$$index = \frac{\text{optimal value}}{\text{observed value}}$$

The indices like essential drug list(EDL) and generic name were calculated by the following formula.

$$index = \frac{\text{observed value}}{\text{optimal value}}$$

The optimal index of all indices was set as 1. The values closer to 1 indicate rational use of drugs. The Index of Rational Drug Prescribing was fixed as 5.

RESULTS AND DISCUSSIONS

Table no 1: Types Of MI.

Type	Number Of Patients(n=100)	Percentage (%)
STEMI	86	86
NSTEMI	14	14

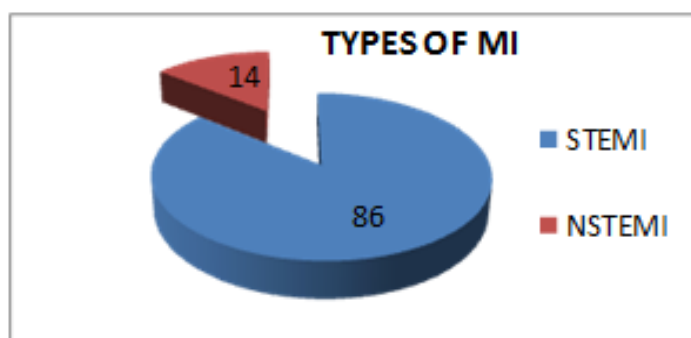


Figure no 1: Types Of MI.

Table 1: and Figure 1: Shows That More Patients Are Having STEMI 86(86%) Than NSTEMI 14(14%).

Table no 2: Gender Wise Classification.

Gender	Number Of Patients(n=100)	Percentage (%)
Male	75	75
Female	25	25

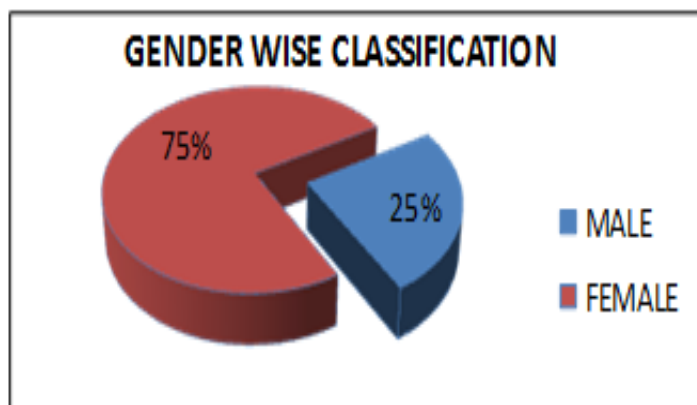


Figure no 2: Gender Wise Classification.

Table 2 and Figure 2 indicates that out of 100 patients, 75(75%) were males and 25(25%) were females. Result shows males were more prone to MI as compared to females.

Table No 3: Age Wise Classificati.

Age Group	Number Of Patients(n=100)	Percentage(%)
25-35	5	5
36-45	21	21
46-55	34	34
56-65	22	22
66-75	14	14
76-85	4	4

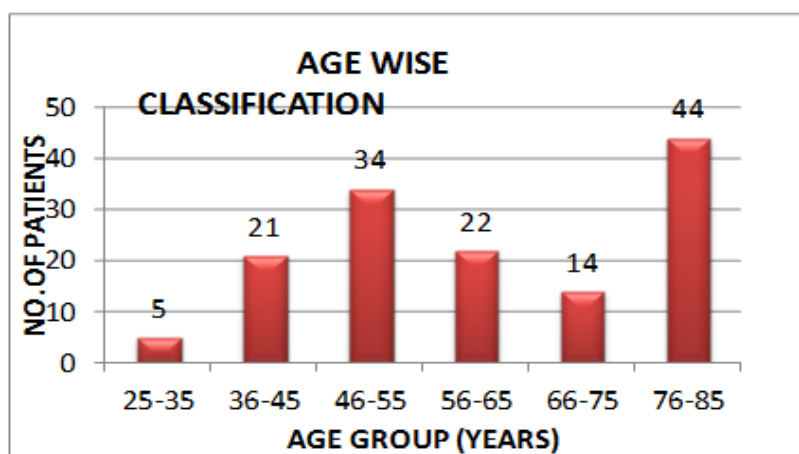


Figure no 3: Age Wise Classification.

Table 3 and Figure no 3 describes age groups less than 25- 35years the number of patients was found to be significantly less as 5 (5%) compared to age group 36-45 years 21(21%).34 (34%) belongs to the age group 46-55, 22(22%) belongs to the age group 56-65 and 14(14%)

belongs to the age group 66-75. A very significantly less than 4(4%) number of patients belongs to age group above 76.

Table no 4: Age And Gender Wise Classification.

Age Group (Years)	Gender Wise Classification			
	Male	%	Female	%
25-35	5	5	0	0
36-45	15	15	6	6
46-55	29	29	5	5
56-65	14	14	8	8
66-75	9	9	5	5
Above 75	3	3	1	1

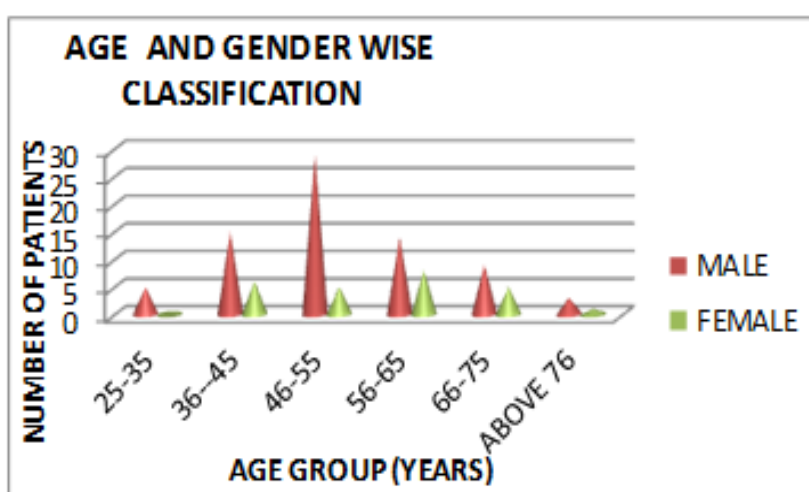


Figure no 4: Age and Gender Wise Classification.

Table 4 and Figure 4, When categorizing age group with gender 5% of males and 0% of females was found in age group of 25-35 which is significantly less in number. 15% of males and 6% of females was found in age group of 36-45. Considering the age factor 29(29%) male patients and 5 (5%) female patients belongs to the age group of 46-55, 14 (14%) males and 8(8%) females belongs to age group of 55-65, 9(9%) males and 5 (5%) females belongs to 65-75 age group and 3(3%) of males and 1 (1%) of female belongs to the age of above 75.

Table no 5: Patient Outcomes.

Outcome	Number Of Patients(n=100)	Percentage(%)
Discharged	77	77
Referred	10	10
Absconded	8	8
Death	5	5

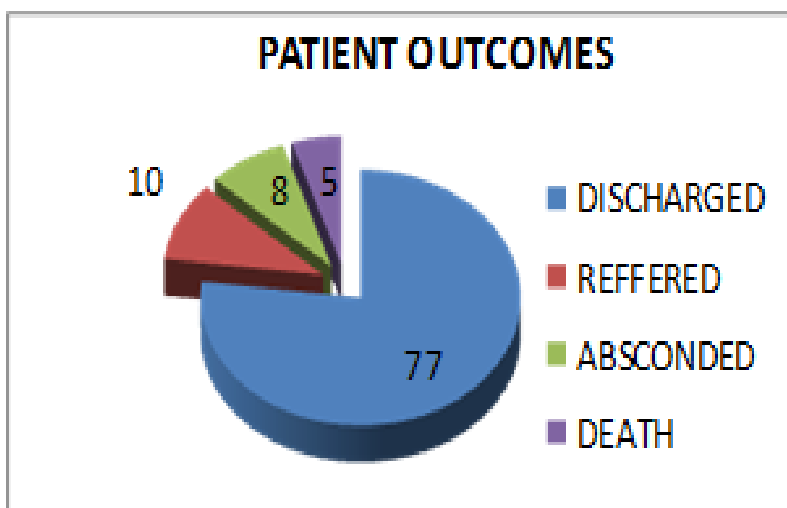


Figure no 5: Patient Outcomes.

Table 5 and Figure 5 Outcome of patients was found as 77(77%) patients were discharged after treatment 10% were referred to other hospitals for further evaluations and better treatment, 8% were absconded without any information. 5% of death was recorded from the cases collected.

Table no 6: Co-Morbidities.

Co-Morbidities	Number Of Patients(n=100)	Percentage(%)
Hypertension	14	14
Diabetics Mellitus	21	21
COPD	1	1
Seizure	1	1
CAD	8	8
CCF	1	1
Hyperlipidemia	3	3
SHT+DM	6	6
CAD+SHT	3	3
CAD+DM	1	1
CAD+DM+SHT	3	3
COPD+DM	3	3
COPD+LVF	1	1
COPD+SHT	1	1
CKD+SHT	1	1
COPD+SHT+DM	1	1
None	31	31

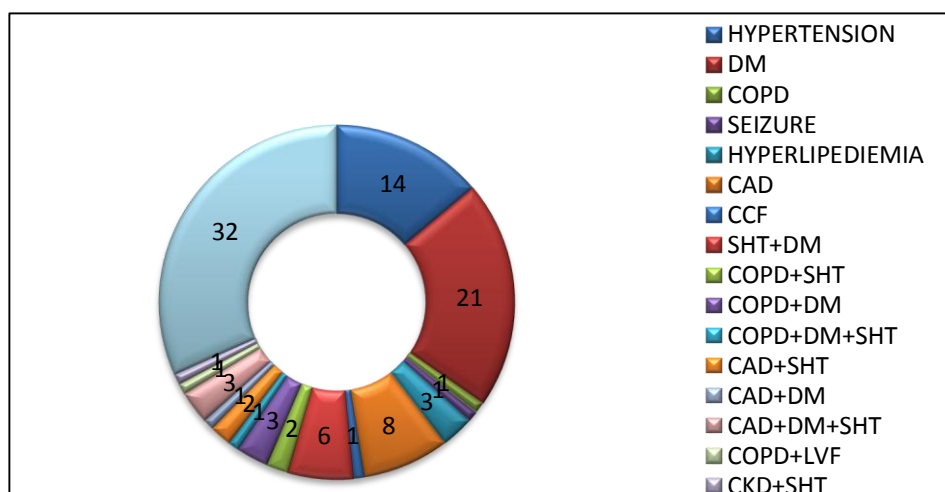


Figure 6: Co-Morbidities.

Table 6 and Figure 6 shows various co-morbid conditions found in patients with MI. Among 69 co morbidities, diabetic mellitus was found to be in large number 21(21%) of total patients with MI. Patients with systemic hypertension was found to be 14(14%), patients with CAD 8(8%). patients with hyperlipidemia 3(3%). Other co morbid conditions like COPD, seizure and CCF was found as 1% in each condition. It is very common to have more than one co morbid conditions, in the present study 6(6%) of patients were having DM + SHT, 3(3%) with CAD + SHT, 1(1%) with CAD+DM, 3(3%) with COPD +DM, 3(3%) with CAD+DM+SHT, 1(1%) with COPD+SHT+DM. 1(1%) of patients was found to have COPD+LVF, COPD+SHT, CKD +SHT respectively. Among 100 patients, no co morbidities are reported in 31 (31%) patients.

Table no 7: Route Of Administration Of Drugs.

ROA	Sub Class	Frequency	Percentage(%)
Injectables	IM	7	0.69
	IV	243	24.27
	SC	32	3.19
Oral	-	716	71.52
Inhale	-	2	0.2
Topical	-	1	0.1

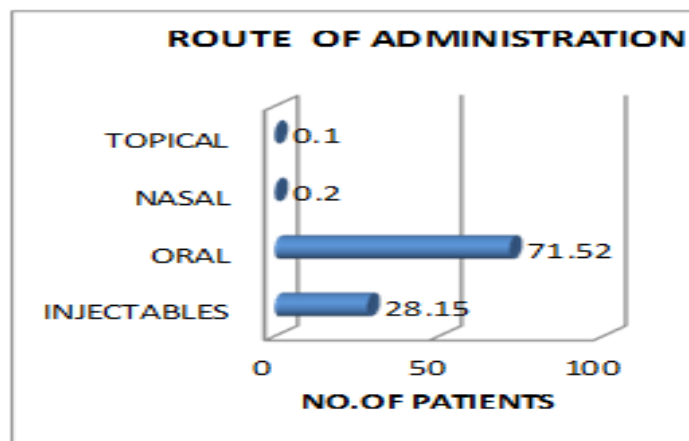


Figure no 7: Route Of Administration Of Drugs.

Table 7 and Figure 7 shows 28.15% of drugs were prescribed as injections, 71.52 % of drugs as oral, 0.2 % and 0.1% of drugs as nasal and topical respectively.

Table no: 8 Prescribing Trend Of Physician.

Classes Of Drugs	Number Of Patients(n=100)	Percentage (%)
Anti Hypertensives	74	74
Anti Diabetics	26	26
Anti Platelets	100	100
Anti Hyperlipidemics	96	96
Anti Anginal	86	86
Anti Ulcer Agents	92	92
Anti Coagulants	76	76
Anti Emetics	5	5
Anti Thrombotics	19	19
Antibiotics	25	25
Analgesics	96	96
Benzodiazepines	60	60
Bronchodilators	14	14
Laxatives	48	48

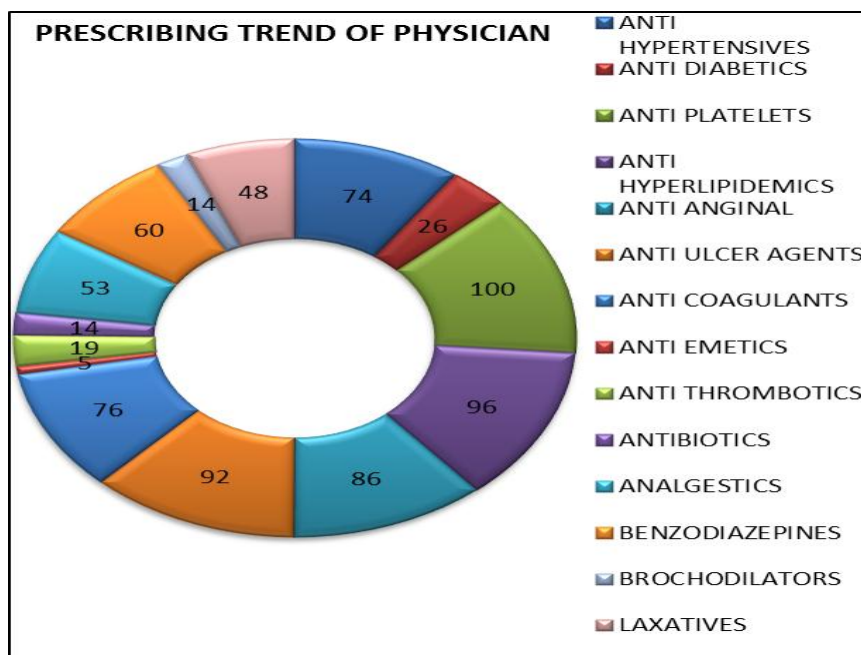


Figure no 8: Prescribing Trend.

Table 8 and Figure 8 shows 74% of patients are prescribed with antihypertensives, 26% with antidiabetics, 100% with antiplatelets, 96% with antihyperlipidemics, 86% with anti anginal, 92% with anti ulcer agents, 76% with anticoagulants, 5 with antiemetics, 19% with anti thrombotics, 25% with antibiotics, 96% with analgesics, 60% with benzodiazepines, 14% with bronchodialators and 48% with laxatives.

DRUGS USED FOR MI CONDITION

Table no 9: Anti Hypertensive Drugs.

Class Od Drugs	No.Of Patients (n=100)	Percentage(%)
Beta Blockers	30	30
Atenolol	9	9
Metaprolol	21	21
Calcium Channel Blockers	22	22
Amlodipine	20	20
Nifedipine	1	1
Verapamil	1	1
Ace Inhibitor	57	57
Enalapril	57	57
Diuretics	23	23
Frusemide	19	19
Spiranolactone	1	1
Frusemide + Spiranolactone	3	3

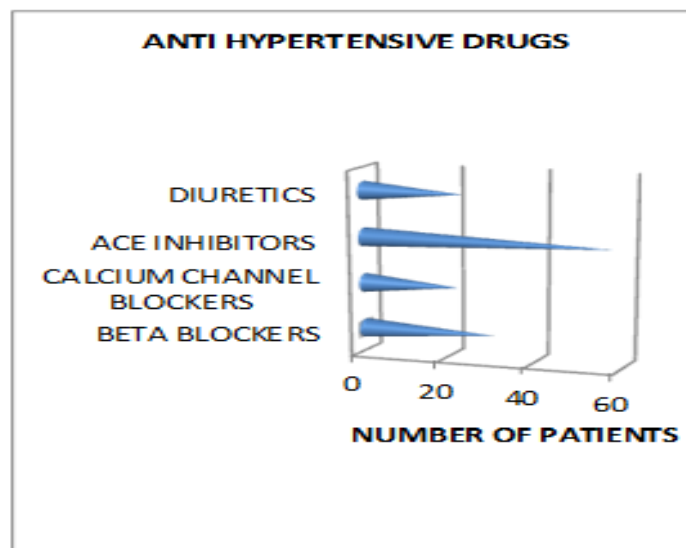


Figure no 9: Anti Hypertensive Drugs.

Table 9 and Figure 9, Among anti hypertensive drugs, Beta blockers was given to 30% of patients (Atenalol 9(9%) and metaprolol 21(21%)), CCB was given to 22% of patients (Amlodipine 20%,verapamil 1%,nifedipine 1%), ACE Inhibitors was given to 57% of patients (enalapril 57%),diuretics was given to 23% of patient.

Table no 10: Anti platelet drugs.

Drug Name	Number Of Patients(N=100)	Percentage (%)
Aspirin	100	100
Clopidogrel	100	100

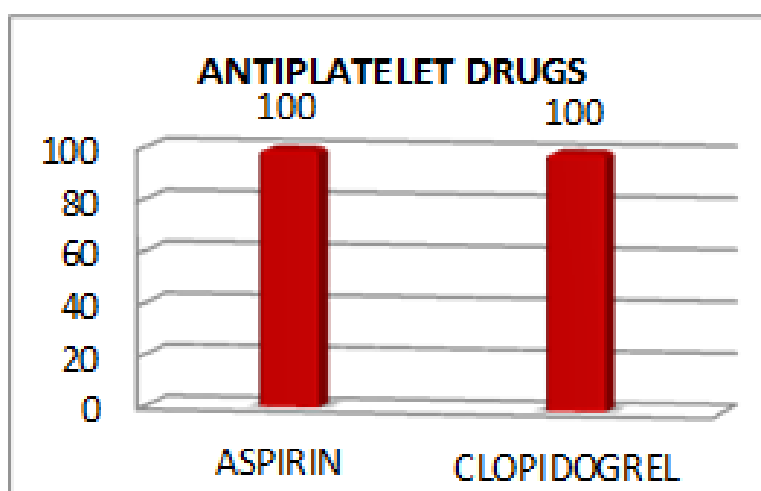


Figure no 10: Anti platelet drugs.

Table 10 and Figure 10: shows most frequently prescribed drugs were Antiplatelets (aspirin, clopidogrel) were given to all the 100 patients i.e. the drug prescription rates of antiplatelets were 100 %. The physicians of India suggests that all patients with MI, should receive dual antiplatelet therapy.

Table no 11: Anti anginal drugs.

Drug Name	No, Of Patients (n=100)	Percentage (%)
ISDN	85	85
NTG	1	1

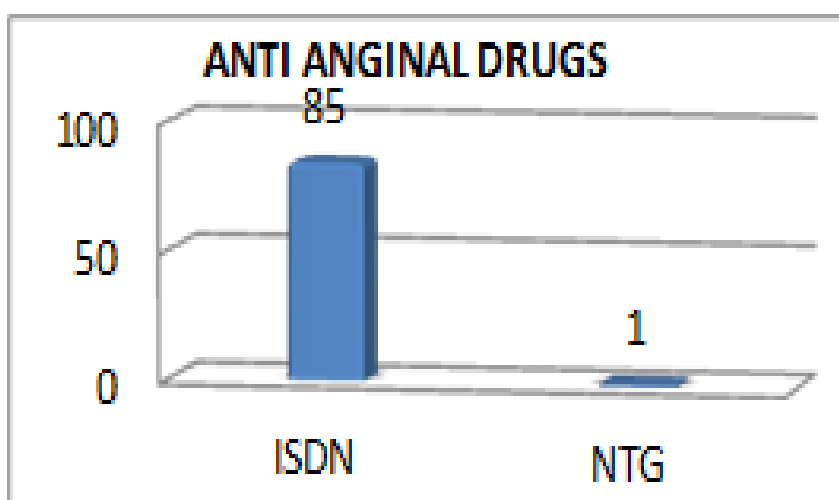


Figure no 11: Anti Anginal Drugs.

Table 11 and Figure 11 describes the most commonly prescribed anti anginal drug was ISDN in 85(85% of patients, and only 1 (1%) of patients received NTG.

Table no 12: Anti Thrombotic Drugs Prescribed.

Drug Name	Number Of Patients (n=100)	Percentage (%)
Anti Platelet Alone	13	13
Anti Platelet +Fibrinolytics	6	6
Anti Platelet+Anti Coagulant	62	62
Antiplatelet+Anti Coagulant +Fibrinolytics	17	17

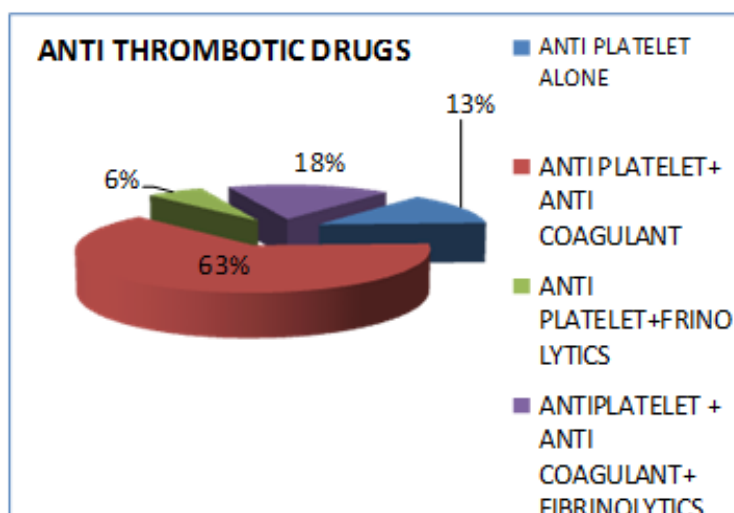


Figure no 12: Anti Thrombotic Drugs Prescribed.

Table 12 and Figure 12 shows 13% of patients received antiplatelet alone and 6% received anti platelet and fibrinolytics, 62% received anti platelet and anti coagulant, 17% received anti platelet, anti coagulant and fibrinolytics.

Table no 13: Analgesics.

Drug Name	No. Of Patients(n=100)	Percentage (%)
Diclofenac	6	6
Morphine	85	85
Pentazocine	5	5

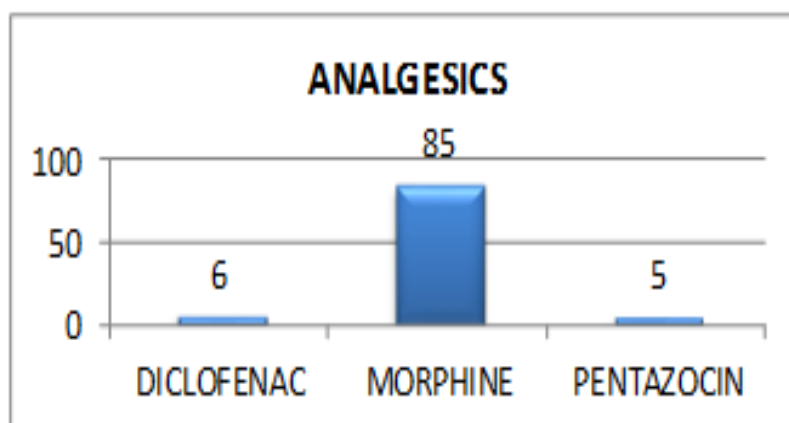


Figure no 13 Analgesics.

Table 13 and Figure 13 shows out of 100 patients 96 patients received analgesics.6% of patients received diclofenac,85% received morphin and 5% of them received pentazocin.

Table no 14: Benzodiazepines.

Drug Name	No.Of Patients(n=100)	Percentage (%)
Diazepam	48	48
Alprazolam	5	5
Diazepam+ Alprazolam	7	7

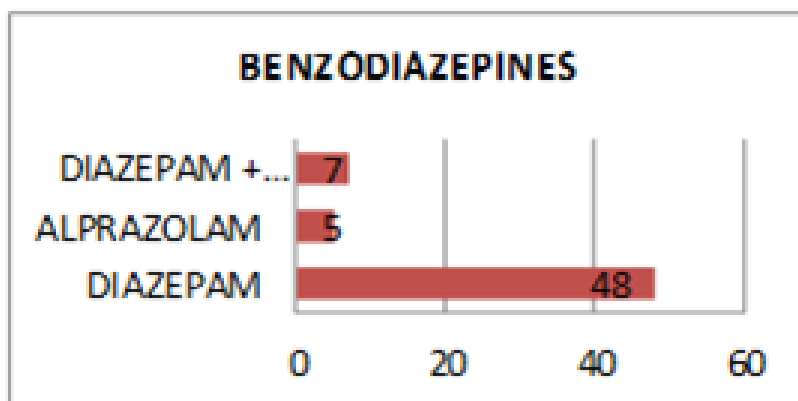
**Figure no 14: Benzodiazepi.**

Table 14 and Figure 14 describes the benzodiazepine usage in patients.48% of patients treated with diazepam,5% treated with alprazolam and 7.% treated with diazepam+ alprazolam.

Table no 15: Anti Hyperlipidemics.

Drug Name	Number Of Patients(n=100)	Percentage (%)
Atorvastatin	96	96

Table 15 shows out of 100 patients 96 of them received atorvastatin. Atorvastatin is recommended as the most common choice of drug among the various statins available to reduce cholesterol levels. In addition. Atorvastatin reduces the risk of CHD and stroke.

Table no 16: Anti Emetics.

Drug Name	Number Of Patients (n=100)	Percentage (%)
Odansetrone	5	5

Table no 16: shows 5% of patients prescribed with odansetron to avoid nausea and vomiting.

Table no 17: Prescribing Indicator Of Myocardial Infarction Patients.

Indicator	Percentage
Average number of drugs per prescription	10.1%
% of drug prescribed by generic name	82.71%
% of drugs prescribed with an injection	99%
% of prescription with antibiotics	25%
% of drugs prescribed from edl/ formulary	100%

From the present observations, it was found that average number of drugs per prescription encounter was 10.01, which was justifiable even though it is more than WHO standard (<2), as they were prescribed for cardiovascular emergency (myocardial infarction). This cannot be considered as poly pharmacy as there is need of empirical therapy till diagnosis become more clear and for management of life threatening conditions. Different studies in India shows varied results but all of them point to multiple drug usage in emergency conditions.

The WHO highly recommends physicians to prescribe the drugs in generic names. It provides safety precautions to patients about the identification of drug and better communication between health care individuals. In this study, drugs prescribed by generic name was about 82.71%. According to WHO standard it was 100%. Prescribing drugs in generic name increase patient compliance, minimise drug cost and chance of duplication is avoided., Irrational use of antibiotics may leads to various health hazards in patients, so precautions should be taken when antibiotics are used Present study revealed that percentage of antibiotics prescribed was approximately 25%. WHO recommends a value less than 30%.

Number of prescriptions with injectable was 99%,both are higher than WHO standard value (<20%). This is justifiable in case of drugs which need immediate action. The drugs like low molecular heparin, streptokinase, insulin, morphin etc should be given by injectable routes in emergency situations. In the present study these drugs are used for immediate action and to save the patients from life threatening conditions.

Prescribing drugs from the EDL prepared by WHO means rational prescribing. All drugs in this study was prescribed from hospital formulary.

Table no 18: Index Of Rational Use of Medicines.

Prescription indicators	Optimal value	Observed value	Individual index(optimal index=1)	IRDU (Maximum IRDP=5)
Average no. of drugs/encounter (poly pharmacy)	≤3	10.1	0.3(0.29)	3.4
Generic name prescribing	100%	82.71%	0.82	
Antibiotic prescribing	≤30%	25%	1.2	
Injection prescribing	≤10%	99%	0.10	
EDL/formulary prescribing	100%	100%	1	

Rational prescribing was analysed by the Index of Rational Drug Prescribing (IRDP). WHO/ INRUD core indicators include five dimensions of antibiotic, poly pharmacy, injection, generic name and essential medicines for evaluating the rational prescription. IRDP is a measure to find the extent up to which the prescription met the optimal level of rational drug prescribing.

According to WHO the optimal value of the IRDP is 5 and optimal index for all indicators was fixed as 1. In our study it was found as 3.4. The poly pharmacy is defined as prescribing more number of drugs than clinically indicated or prescribing more number of drugs inappropriately. In the present study poly pharmacy was found as 0.3.

Essential drug list(EDL) and generic name prescribing are commonly used in drug utilization study across the world for healthcare cost reduction. The optimum value set by WHO for generic prescribing is 100%.In this study the index of generic prescribing was found as 0.82. Proper interventions should be given to increase the awareness of prescribers about prescribing the drugs in generic names.

The optimal value of antibiotic prescribing fixed by WHO is ≤30% and in our study the index of antibiotic prescribing was found as 1.2.

The index of injection prescribing was 0.10, which shows a large variation from optimal index 1. Over use of injection was noted in the study due to high proportion of prescriptions with at least one injection.

All the drugs (100%) were prescribed from EDL/Formulary of the hospital. The primary purpose of rational prescribing is to consider the three important aspects i.e cost, efficacy and safety.

CONCLUSION

Cardiovascular disease is a globally occurring disease and early detection of disease are always cost effective, cost saving and clinically benefit. Patient education and understanding nature and complication of therapy on part of clinical pharmacist can avoid many of complications. Clinical and economic outcome reduce cardiac complications, length of hospital stay and cost.

The study shows that protocol of the management of concerned hospital was found near to the recommended standard treatment guidelines. Present study showed that drug utilization pattern was not optimal with the optimal values of WHO/INRUD core indicators. Irrational prescribing of drug was found during the evaluation. Irrationality of drug was found in prescribing injections. Some drugs like *Heparin*, *Streptokinase*, *Morphine* etc should be always given in injectable routes in emergency situations, so this is justifiable. But physicians should be encouraged to prescribe the drugs in oral route when patient is able to take oral drugs.

According to WHO the drugs should be prescribed in generic names but in our study brand names are used. Unindicated use of antibiotics is one of the reason for irrational prescribing of antibiotics. Over use of antibiotics produce negative or unwanted effects in patients.

Average number of drugs per prescription showed great variation from WHO standard. Physicians should be advised to prescribe less number of medicines to patients when ever possible. All drugs prescribed to patients were from formulary of hospital.

REFERENCES

1. Deaton C, Froelicher ES, Shishani K, Jaarsma T. The global burden of cardiovascular disease. *Eur J Cardiovasc Nurs*, 2011; 10(2): 5-13.
2. Fuster V. Global Buren of Cardiovascular disease. *J Am Coll Cardiol*, 2014; 64(5): 520-522.
3. Fuster V, Kelly BB. Promoting Cardiovascular Health in the Developing World: A Critical Challenge to Achieve Global Health. Institute of Medicine (US) Committee on

- Preventing the Global Epidemic of Cardiovascular Disease: Meeting the Challenges in Developing Countries. Washington (DC): *National Academies Press* (US), 2010.
4. Cannon CP, Braunwald E. Non-ST-Segment elevation Acute Coronary Syndrome Non-ST-Segment Elevation Myocardial Infarction and Unstable Angina. In: Kalper DL, Hauser SL, Jameson JL, eds. *Harrison's Principles of Internal Medicines. 19th ed.* New York, NY: McGraw-Hill, 2015; 1593.
 5. Scottish Intercollegiate Guidelines Network, Acute coronary syndromes, *a national clinical guideline*, 2007; 5.
 6. Chandana N, Vijayakumar Subash, A prospective study on drug Browne Lisa. 2010. *Cardiology part 9*, Acute Myocardial infarction, 41–42.
 7. Utilization of cardiac unit in acute myocardial infarction of hospitalized patients: *International Journal of Pharm.*
 8. Ramesh et al evaluation of drug utilization pattern in patient of MI and prevalence of MI by comparison of age, sex, diet, smokers and non smokers, alcoholic and non alcoholic: *american journal of pharmacology and pharmacotherapeutics*, 2015; 2(1): 72-80.
 9. *Acotherapy*, 2013; 3(1): 6-11. Shalini S. et al: Drug utilization studies an overview; *International journal of pharmaceuticalcare sciences and nano technology*, 3(1): 803-808.
 10. WHO Types Of Drug Use Information : *Intoduction To Drug Utilization Research*, 2003; 8-10.
 11. Atif et al Assessment of core drug use indicators using WHO/INRUD methodology at primary healthcare centers in Bahawalpur, Pakistan: *BMC Health Services Research*, 2016.
 12. Hans V Hogerzeil, Promoting rational prescribing: an international perspective; *Br J clin Pharmac*, 1995; 39: 1-63.
 13. How to investigate drug use in health facilities: selected drug use indicators. Geneva, *World Health Organization*, 1993. WHO/DAP/93.1.