

Pharmacoeconomic Evaluation For Most Common Life Style Diseases & Their Compelling Indications Of Patients Admitted In A Tertiary Care Hospital

Naga Latha Dhulipalla*¹, Shashi Kiran Mishra², Varun Dasari¹

¹Department of Pharmacy Practice, Sri Indu Institute of Pharmacy, Sheriguda (V), Ibrahimpatnam (M), R.R Dist, Telangana-501510, India.

²Department of Pharmaceutical Sciences, University Institute of Pharmacy, CSJM University, Kanpur, Uttar Pradesh-208024, India.

ABSTRACT

Lifestyle diseases share risk factors similar to prolonged exposure to three modifiable lifestyle behaviours smoking, unhealthy diet, and physical inactivity -- and result in the development of chronic diseases, specifically heart disease, stroke, diabetes, obesity, metabolic syndrome, chronic obstructive pulmonary disease, and some types of cancer. These illnesses used to be considered the diseases of industrialized countries, so-called "Western diseases" or "diseases of affluence"; however, internationally they are known as non-communicable and chronic diseases, part of the degenerative diseases group. Chronic disease can result in loss of independence, years of disability, or death, and impose a considerable economic burden on health services. Pharmacoeconomics is a scientific discipline that compares the costs and consequences of drug therapies and medical interventions. The main objective of this study is to assess the various Anti-hypertensive drugs and oral hypoglycemic receiving by the patients at a tertiary care hospital for hypertension and diabetes and to evaluate the expenses involved in different treatments, also evaluate the cost effectiveness analysis and determine which of the treatments for hypertension and diabetes is most cost effective. This study also discussed about assess the rational use of Anti-hypertensive drugs and oral hypoglycemics.

Key words: Diabetes, Hypertension, Direct cost, Indirect cost, Pharmacotherapy, Pharmacoeconomics

INTRODUCTION:

Pharmacoeconomics is a scientific discipline that compares the costs and consequences of drug therapies and medical interventions. It is a collection of descriptive and analytic techniques for evaluating pharmaceutical interventions in the health care system. Pharmacoeconomics is often referred to as Health Economics. It is an innovative method that aims to decrease health expenditures,

while optimizing healthcare results. Pharmacoeconomic evaluation provides us with the methodology to determine those treatment options, which will yield the maximum health gain per unit of currency spent.¹⁶

METHODS OF ECONOMIC EVALUATION

All methods of pharmacoeconomic evaluation share the common feature of comparing inputs (cost) with outcomes (benefits) resulting from drug intervention.

COST

Cost is the value of the resources consumed by a program or drug therapy of interest. Different costs associated with the economics of health care are:

1. Direct cost:

Direct medical cost: Direct medical costs are associated with monetary transaction and represents costs that are incurred during the provision of care. It is the cost incurred for medical products and services used for the prevention, detection and treatment of a disease.

Direct non medical cost: Cost of non medical services arising due to illness but do not involve purchasing medical service. Eg: Cost of transportation to hospital, cost of parking the vehicle, cost of accommodation needed near the treatment centre, on food, etc.

Indirect non-medical cost: Indirect costs may be experienced by the patient, family or society and might include loss of earnings, loss of productivity and cost of travel to hospital.

Intangible cost: Many of these costs are difficult to measure as are “intangible” costs for pain or other distress a patient might suffer.

CONSEQUENCES

Consequences are also known as outcome. The effects, outcomes of the programme or therapy of interest can be categorized as:

Economic outcome: It is the direct, indirect and intangible costs compared with the outcomes of medical treatment alternatives.

Clinical outcomes: It is the medical events that occur as a result of disease or its treatment, like adverse drug reaction, efficacy.

Humanistic outcome: It is the outcomes of disease or their treatment on the functions or quality of patient, quality adjusted life years and intangibles. Consequences can be positive (desired effect of a drug manifested as therapeutic efficacy), and negative (treatment failure, drug toxicity, adverse drug reaction or even death)

METHODS FOR PHARMACOECONOMIC EVALUATION

A Pharmacoeconomics study evaluates the cost (expressed in monetary terms) and effects (expressed in terms of monetary value, efficacy or enhanced quality of life) of a pharmaceutical product.

The basic task of Pharmacoeconomic evaluation is to identify, measure, value and compare the costs and consequences of the alternatives being considered. A full economic evaluation answers two questions.

Is there a comparison of two or more alternatives? Are both costs and consequences of the alternatives compared/examined?

The methods can be separated in two different categories.

Humanistic evaluation

Eg: QOL, patient preference, patient satisfaction

Economic evaluation

Eg: Cost of illness, cost minimization, cost benefit, cost effectiveness, cost utility
Cost of illness (COI): COI or burden of illness identifies & estimates the overall cost of particular disease on a defined population. It involves measuring the direct & indirect costs of a treatment or prevention strategy by successfully identifying direct & indirect costs of an illness. COI does not compare 2 treatment alternatives but estimates the financial burden of the disease.

The four pharmacoeconomic evaluations frequently used includes cost minimization analysis (CMA), cost effectiveness analysis (CEA), cost benefit analysis (CBA) and cost utility analysis (CUA).

1. Cost-minimization analysis (CMA): CMAs are used to compare relevant costs and consequences of two or more therapeutic interventions where the outcomes associated with the treatments are shown to be equivalent. Since equivalency is established and assumed in a CMA, the objective is essentially to choose the least costly agent. Thus, the least costly alternative is the cost-effective choice in a CMA.

2. Cost-effective analysis (CEA): CEA is an analysis which compares costs and consequences of alternative approaches to achieving a common therapeutic objective and is measured in natural units. The term natural units refers to traditional markers of clinical outcomes, including: blood pressure, life years saved, cholesterol levels, hospitalizations avoided, infection cures, lives saved, etc.

Results of CEA are also expressed as a ratio either as Average cost-effectiveness ratio (ACER) or as Incremental CER (C/E)

ACER is $AC/E = \text{Healthcare cost}$

Clinical outcomes

It yields the monetary cost per specific clinical outcome gained independent of comparators. Hence, costs & outcomes are reduced to a single value for comparison so that the least costly alternative per clinical outcome gained is preferred.

CEA is a cost optimization process rather than cost reduction as the most cost-effective treatment may not always be the least costly alternative to obtain a specific therapeutic outcome. Incremental CE can be used to determine the additional cost & effectiveness gained on comparing one treatment alternative to the next best one. Therefore, the additional cost which a treatment alternative imposes over another one is compared with the additional benefit/outcome provided.

$ICER = \frac{Cost_a - Cost_b}{Effect_a - Effect_b}$

This gives additional cost required to get the additional effect gained by switching from drug A to B.

3. Cost-benefit analysis: CBA is an economic analysis that assesses whether the outcomes (benefits) of an intervention outweigh the inputs (costs). Although called a CBA, it is typically expressed as a benefit: cost ratio.

Benefit to cost ratio- B/C , a net benefit or a net cost.

Guidelines for interpretation:

$B/C > 1$ A ratio greater than one indicates a positive yield, or in other words is an investment which

yields more benefits than program costs. Typically, the higher the benefit: cost ratio, the more favorable the program.

$B/C=1$ Benefit equals costs

$B/C<1$ Program/Treatment is not beneficial economically

CBA may be used to compare treatment alternatives in which costs and benefits do not occur simultaneously. It can also be used to compare programs with different objectives as all benefits are converted in terms of money.

It can also be used to compare multiple programs or to evaluate a simple program, but it is difficult to put a financial value to human suffering such as loss of vision or hearing impairment, loss of life, etc.

4. Cost-utility analysis (CUA): CUAs compare costs of therapeutic alternatives which are adjusted for patient "utility" or preference. CUAs are considered a variation of cost-effectiveness analysis. Outcomes are most often reported in quality adjusted life years (QALY). Using QALY as an outcome measure has the advantage of measuring both quality and quantity simultaneously. It also has the advantage of allowing one to compare treatments for totally different disease states with the same outcome measure, i.e., QALY. For example, cost per QALY data can help a formulary group decide how to allocate budgeted funds between a new gout treatment and a new asthma therapy.

BENEFITS OF PHARMACOECONOMICS

- Pharmacoeconomics can qualify value of products/services provided.
- Aids in clinical & policy decision making.
- Assists in choosing between competing treatment alternatives.
- Provides data necessary to make better medication use decision.
- Assists in balancing cost with quality & product outcome.

Objectives of the study:

To assess the various Anti-hypertensive drugs and oral hypoglycemic receiving by the patients at a tertiary care hospital for hypertension and diabetes.

To evaluate the expenses involved in different treatments.

To evaluate the cost effectiveness analysis and determine which of the treatments for hypertension and diabetes is most cost effective.

To assess the rational use of Anti-hypertensive drugs and oral hypoglycemics.

Material and methodology

Study site

This study conducted in inpatients in general medicine department at a tertiary care hospital

Study design

Hospital based prospective study, statistical study

Study period

The study carried out for a period of 2 years from June 2017 to Dec 2019.

Study criteria

Inclusion criteria

- Inpatients of either gender aged ≥ 18 years who have been diagnosed with primary and secondary hypertension and diabetes at the Medicine Department, in a tertiary care hospital.
- Patients receiving anti-hypertensive drugs, oral hypoglycemics

Exclusion criteria

- Patients attending outpatient department.
- Pregnant women.
- Children <18 years

Source of data

The data for this study is taken by interviewing patients, past medical history, past medication history, patient case notes, treatment chart, laboratory reports and discharge cards.

Forms used in the study

The study procedure involved the use of some forms for data collection, documentation and analysis of the data. Forms used in study are patient profile form, drug interaction and intervention reporting form.

Methodology

This is a prospective, longitudinal study which was conducted in a tertiary care hospital on assessment of prescribing patterns on antihypertensive drugs and oral hypoglycemics. The study was to be conducted by reviewing and collecting the case sheets of patients who were diagnosed with Hypertension & diabetes patients admitted in the hospital. Patient demographic details such as name, age, sex were collected. Common and uncommon signs and symptoms observed in patients were noted. Past medical history of patients as well as family was noted. Past medication history of patients were documented. Smoking, drinking and other social habits of the patients were noted in patient profile form. Therapeutic data such as name of drug, dose, frequency and duration of therapy was collected from treatment chart of patients. Drug interactions in treatment regimen of patients were assessed using drug data base Micromedex 2.0 and the interactions found were documented in the drug-drug interaction form, any interventions made during the study time were documented using intervention reporting forms, follow up of all patients were done until discharge from the hospital. The inpatient data was collected and created separately in computer based formats, stored and retrieved whenever required in MS office assess format.

Results:

Table.1. According to Gender Wise Distribution:

Sl. No.	Gender	No. of inpatients	No. Inpatients [%]
01	Male	265	58.88
02	Female	185	41.11

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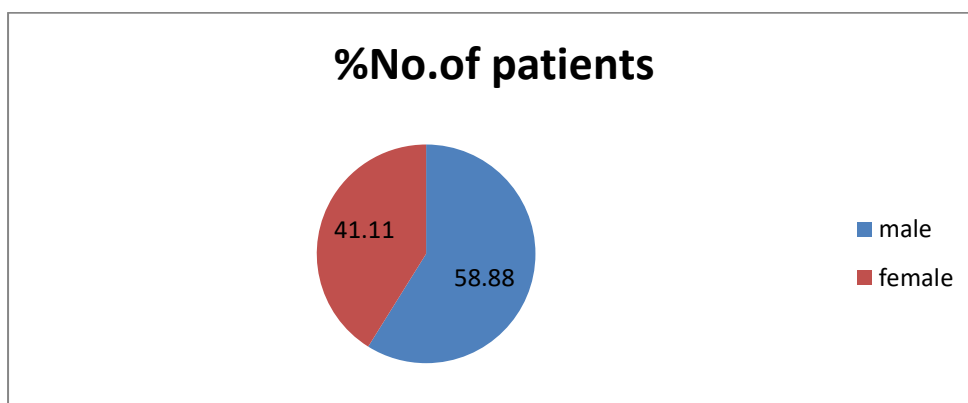


Figure.1. Gender wise distribution of patients.

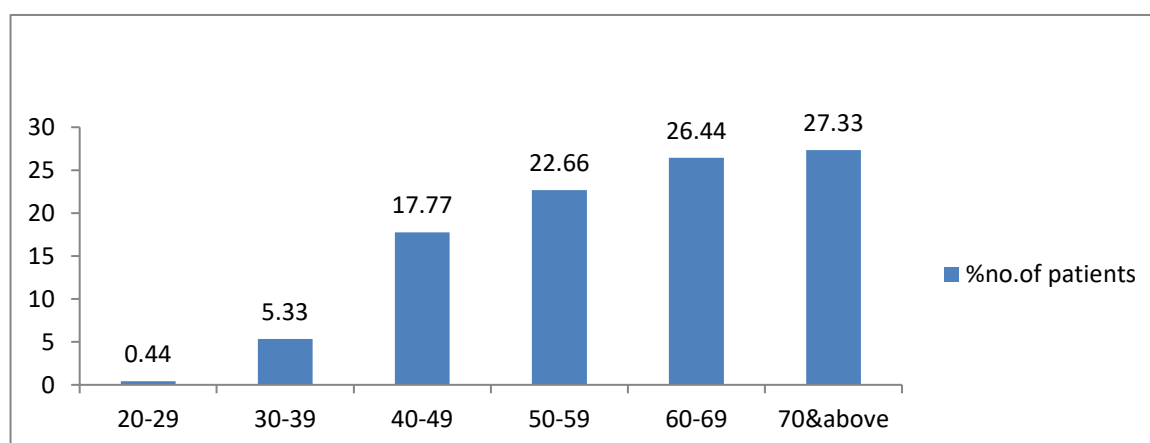


Figure. 2. Age wise categorization of patients.

Table. 2. Age wise categorization of patients:

Age	Gender	No. of patients	%Total no.of patients
20-29yrs	Male	2	0.44
	Female	0	
30-39yrs	Male	17	5.33
	Female	07	
40-49yrs	Male	47	17.77
	Female	33	

50-59yrs	Male	63	22.66
	Female	39	
60-69yrs	Male	69	26.44
	Female	50	
70& above	Male	67	27.33
	Female	56	
Total	Male	265	58.88
	Female	185	41.11

Table 3. Percentage of Co-morbidities in Antihypertensive in-patients at tertiary care hospital:

Sl No.	No. of co morbidities	No. of in patients	No. of inpatients [%]
01	One	213	53.77
02	Two	155	34.44
03	Three	60	13.33
04	>FOUR	29	6.44
05	DEATH	03	0.66

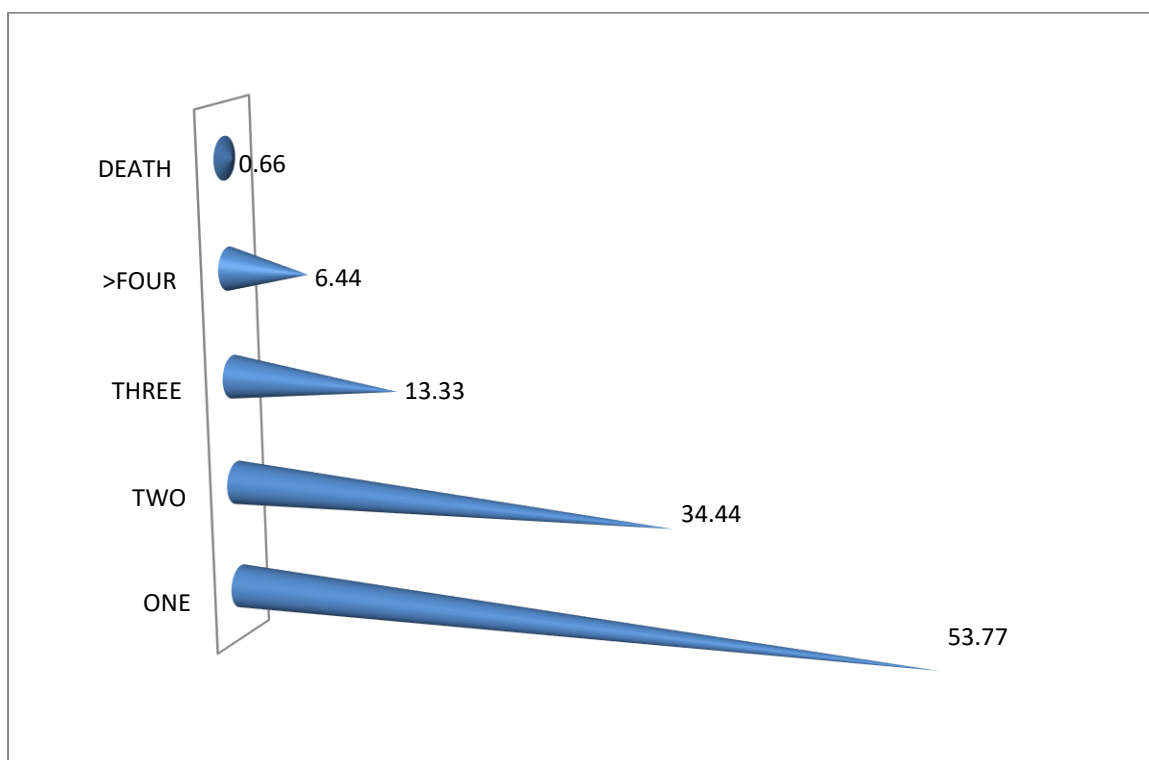


Figure 3. Percentage of Co-morbidities in Antihypertensive in-patients at tertiary care hospital:

Figure 4 Class Of Antihypertensive Drugs Prescribed For Hypertension Patients:

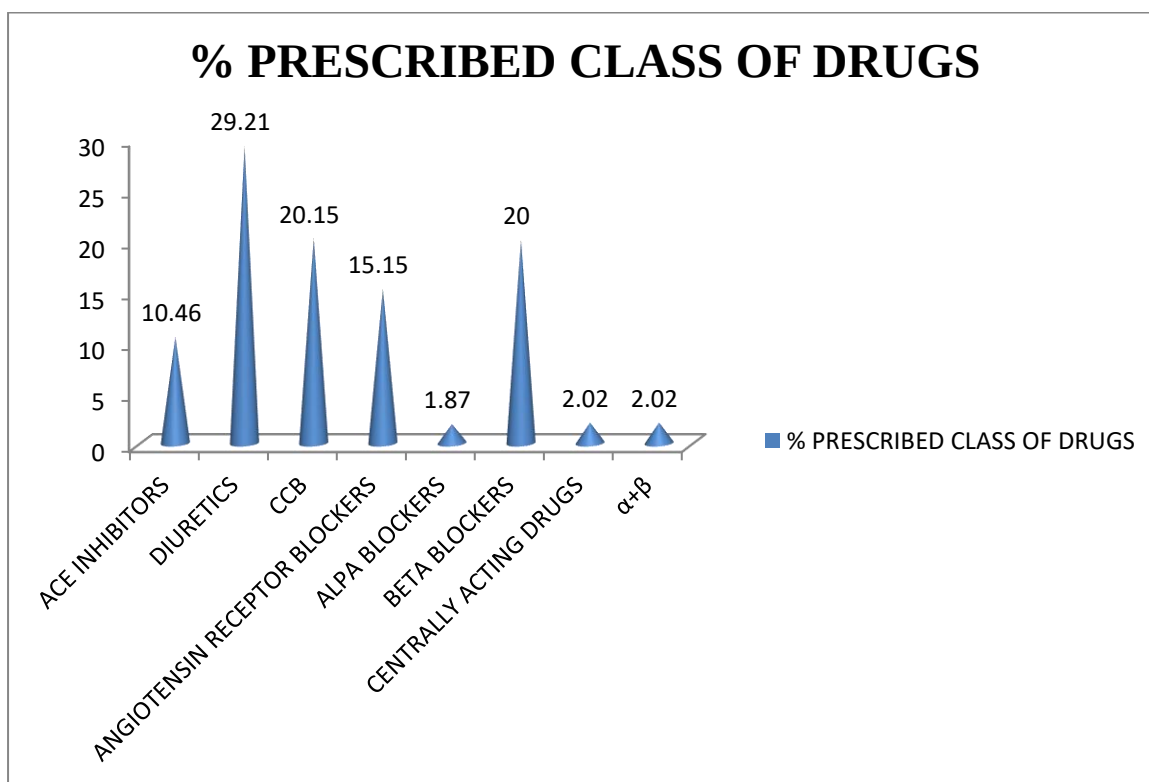


Table 4 Class Of Antihypertensive Drugs Prescribed For Hypertension Patients:

s.no	Class of anti hypertensives	No. of drugs prescribed	% of prescribed drugs
1	ACE Inhibitors	67	10.46
2	Diuretics	187	29.21
3	CCB	129	20.15
4	Angiotensin Receptor Blockers	97	15.15
5	α -Blockers	12	1.87
6	β -Blockers	128	20
7	$\alpha+\beta$ Blockers	10	1.56
8	Centrally Acting Drugs	13	2.02
9	TOTAL	643	

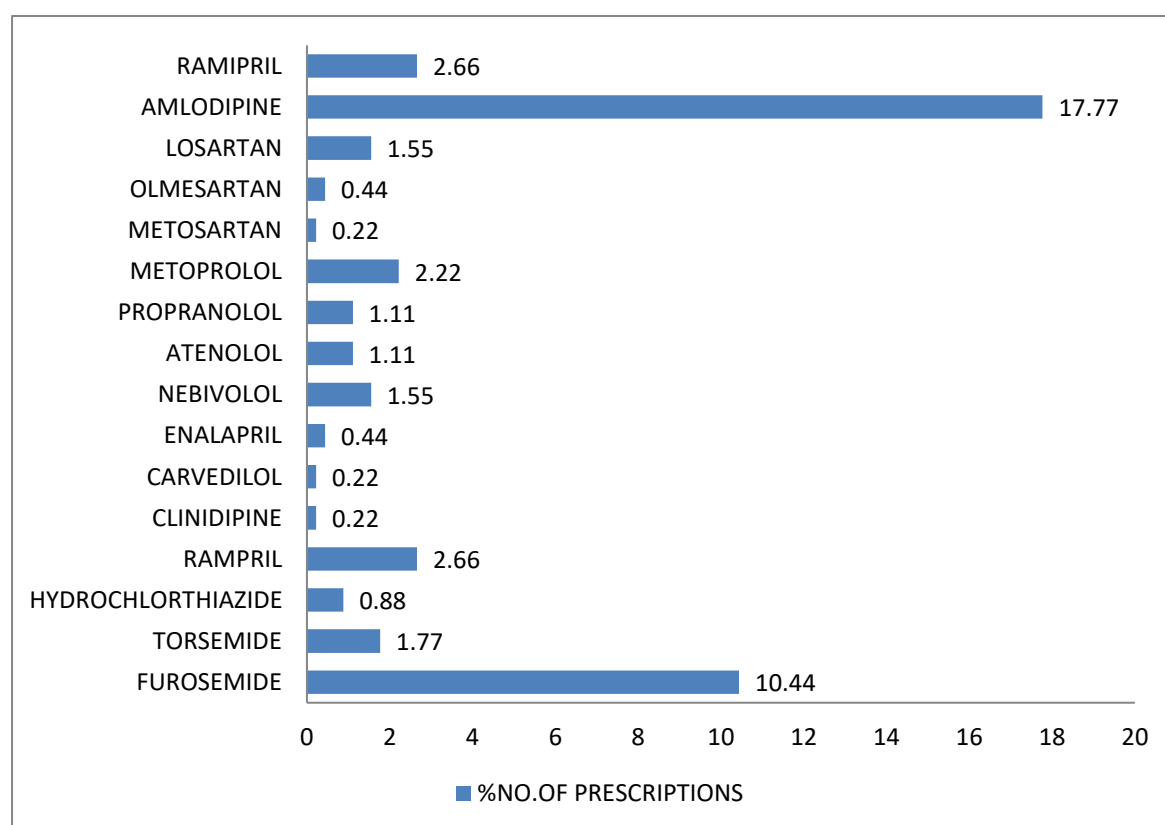


Figure 5. Mono drug regimen prescribed for hypertensive patients

Table 5. Mono drug regimen prescribed for hypertensive patients

S.NO	NAME OF DRUG	NO. OF PRESCRIPTIONS	% NO. OF PRESCRIPTIONS
1	FUROSEMIDE	47	10.44
2	TORSEMIDE	08	1.77
3	HYDROCHLORTHIAZIDE	4	0.88
4	RAMIPRIL	12	2.66
5	CLINIDIPINE	01	0.22
6	CARVEDILOL	01	0.22
7	ENALAPRIL	02	0.44
8	NEBIVOLOL	07	1.55
9	ATENOLOL	05	1.11
10	PROPRANOLOL	05	1.11
11	METOPROLOL	10	2.22
12	METOSARTAN	01	0.22
13	OLMESARTAN	02	0.44
14	LOSARTAN	07	1.55
15	AMLODIPINE	80	17.77
16	RAMIPRIL	12	2.66

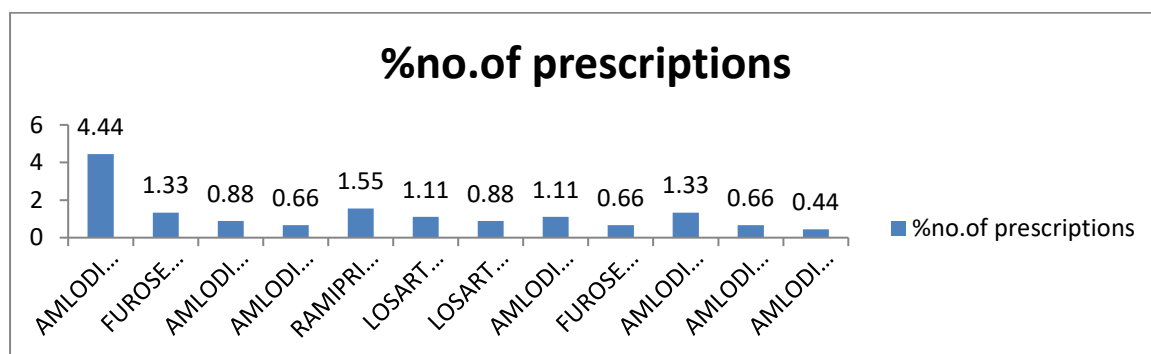


Figure .7 Three Drug Regimen Prescribed For Hypertensive Patients:

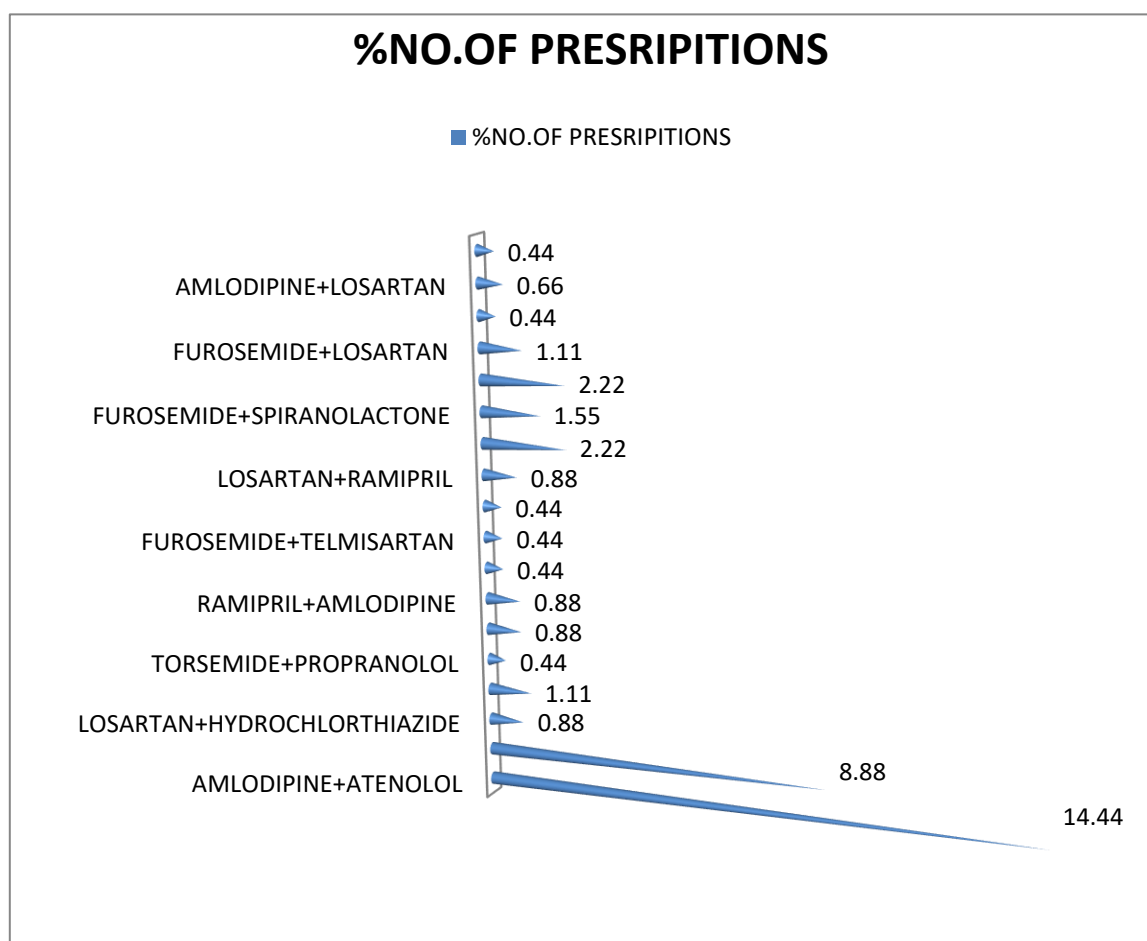


Figure. 6. Two Drug Regimen Prescribed For Hypertensive Patients

Table.6. Two Drug Regimen Prescribed For Hypertensive Patients

S.NO	NAME OF DRUG	NO. OF PRESCRIPTIONS	% NO. OF PRESCRIPTIONS
1	AMLODIPINE+ATENOLOL	65	14.44

2	AMLODIPINE+HYDROCHLORTHIAZIDE	40	8.88
3	LOSARTAN+ HYDROCHLORTHIAZIDE	04	0.88
4	AMLODIPINE+FUROSEMIDE	05	1.11
5	TORSEMIDE+PROPRANOLOL	02	0.44
6	TELMISARTAN+HYDROCHLORTHIAZIDE	04	0.88
7	RAMIPRIL+AMLODIPINE	04	0.88
8	AMLODIPINE+METOPROLOL	02	0.44
9	FUROSEMIDE+TELMISARTAN	02	0.44
10	TELMISARTAN+AMLODIPINE	02	0.44
11	LOSARTAN+RAMIPRIL	04	0.88
12	TORSEMIDE+SPIRANOLACTONE	10	2.22
13	FUROSEMIDE+SPIRANOLACTONE	07	1.55
14	FUROSEMIDE+RAMIPRIL	10	2.22
16	RAMIPRIL+TORSEMIDE	02	0.44
17	AMLODIPINE+LOSARTAN	03	0.66

Table .7 Three Drug Regimen Prescribed For Hypertensive Patients:

S.NO	NAME OF DRUG	NO. OF PRESCRIPTIONS	%NO. OF PRESCRIPTIONS
1	AMLODIPINE+ATENOLOL+FUROSEMIDE	20	4.44
2	FUROSEMIDE+LOSARTAN+HYDROCHLORTHIAZIDE	06	1.33
3	AMLODIPINE+FUROSEMIDE+RAMPRIL	04	0.88
4	AMLODIPINE+METOPROLOL+TELMISARTAN	03	0.66
5	RAMIPRIL+TORSEMIDE+SPIRANOLACTONE	07	1.55

6	LOSARTAN+HYDROCHLORTHIAZIDE+METOSARTAN	05	1.11
7	LOSARTAN+HYDROCHLORTHIAZIDE+METOPROLOL	04	0.88
8	AMLODIPINE+FUROSEMIDE+SPIRANOLACTONE	05	1.11
9	FUROSEMIDE+SPIRONOLACTONE+RAMIPRIL	03	0.66
10	AMLODIPINE+HYDROCHLORTHIAZIDE+OLMESARTAN	06	1.33
11	AMLODIPINE+HYDROCHLORTHIAZIDE+TELMISARTAN	03	0.66
12	AMLODIPINE+METOPROLOL+HYDROCHLORTHIAZIDE	02	0.44

Table 8. Four Drug Regimen Prescribed For Hypertensive Patients

S.NO	TREATMENT REGIMEN	NO. OF PRESCRIPTIO NS	%NO. OF PRESCRIPTIO NS
1	FUROSEMIDE+LOSARTAN+AMLODIPINE+HYDROCHLORT HIAZIDE	06	1.33
2	BISOPROLOL+AMLODIPINE+TORSEMIDE+SPIRANOLACT ONE	04	0.88
3	FUROSEMIDE+CLONIDINE+AMLODIPINE+ATENOLOL	03	0.66
4	AMLODIPINE+ATENOLOL+FUROSEMIDE+PRAZOSIN	01	0.22
5	AMLODIPINE+ATENOLO+FUROSEMIDE+LOSARTAN	02	0.44

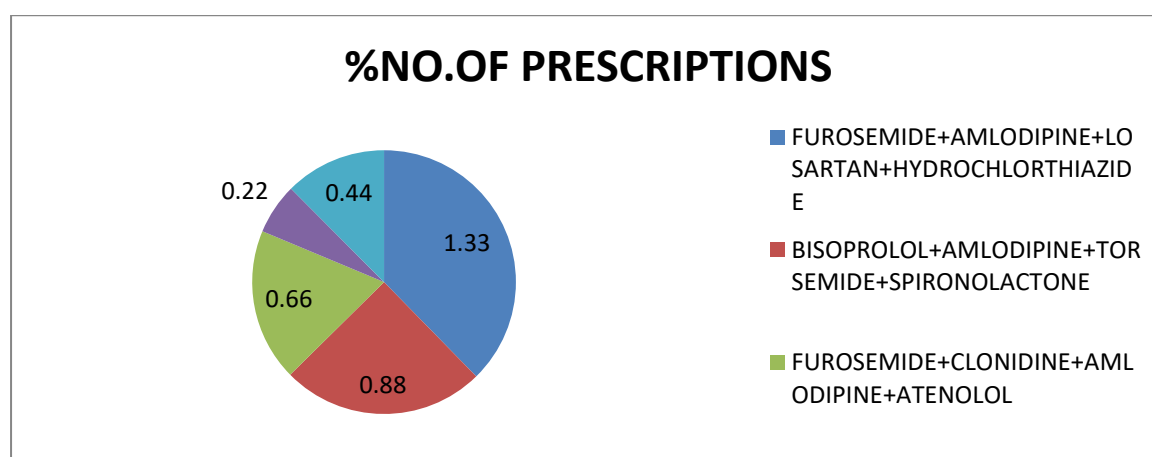


Figure 8. Four Drug Regimen Prescribed For Hypertensive Patients

Table 9: No. Of Prescriptions With Compelling Indications:

S.NO	COMPELLING INDICATIONS	NO.OF PRESCRIPTIONS	%NO.OF PRESCRIPTIONS
1	HTN+OTHER	145	32.22
2	HTN+DM+OTHERS	207	46
3	HTN+CAD+OTHERS	38	8.44
4	HTN+CKD+OTHERS	40	8.88
5	HTN+STROKE+OTHERS	20	4.44

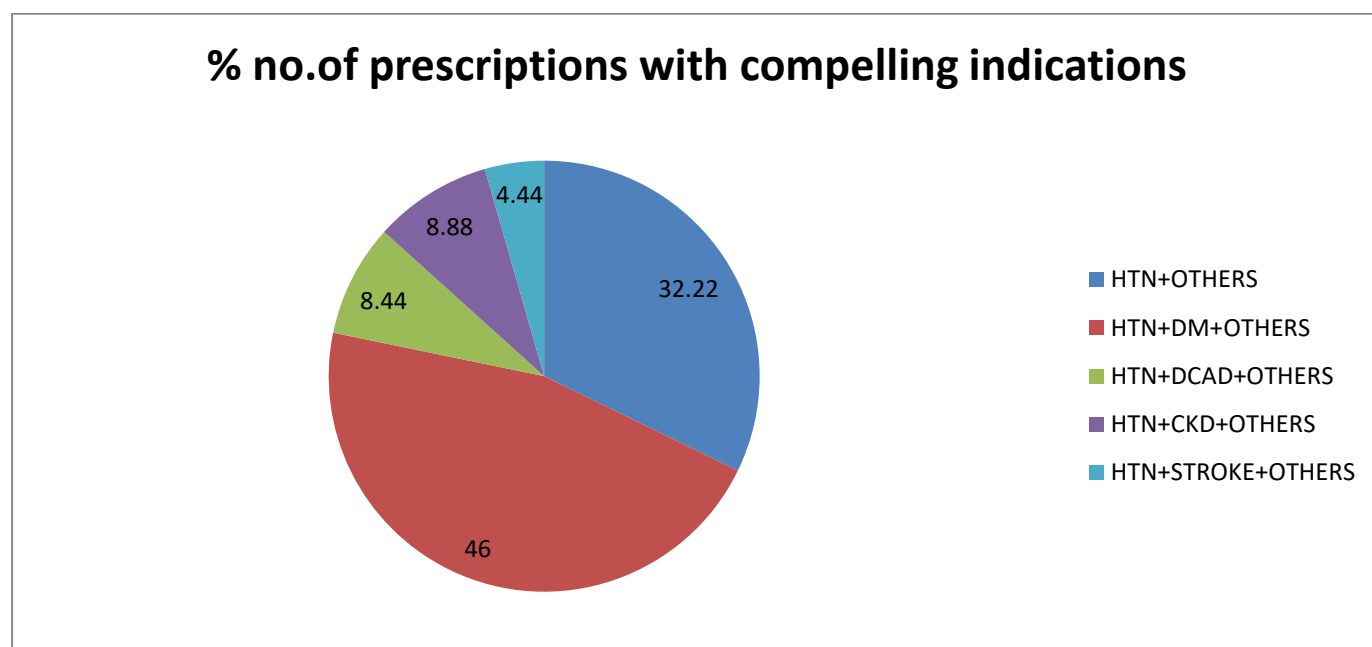


Figure.9. No. Of Prescriptions With Compelling Indications:

Table.10. Duration of hospital stay:

No. of days in hospital stay	No. of patients	%no. of patients
0-3 days	208	46.22
4-6 days	152	33.77
7-10 days	59	13.11
11-13 days	18	4
14-16 days	13	2.88

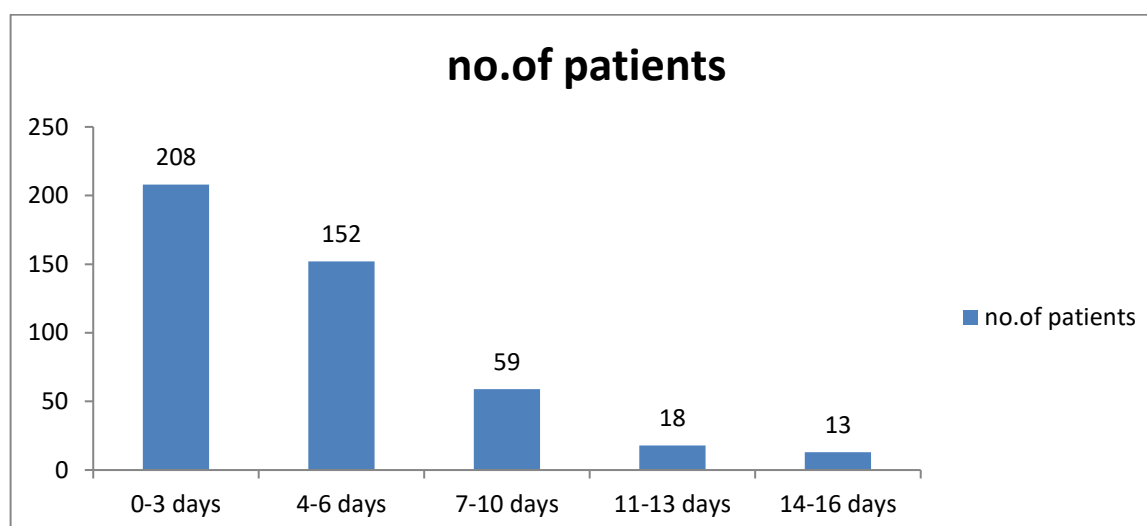


Figure.10. Duration of hospital stay:

Table.11. Diagnostic tests performed for the patients:

Diagnostic tests	No. of patients
CBC	450
ECG	391
ESR	165
Lipid Profile	189
Serum Electrolytes	201
Renal function tests	236
X-RAY	68
CT-Scan	51
USG	132
Liver Tests	108
Troponin-I	56
Creatinine Kinase-I	83

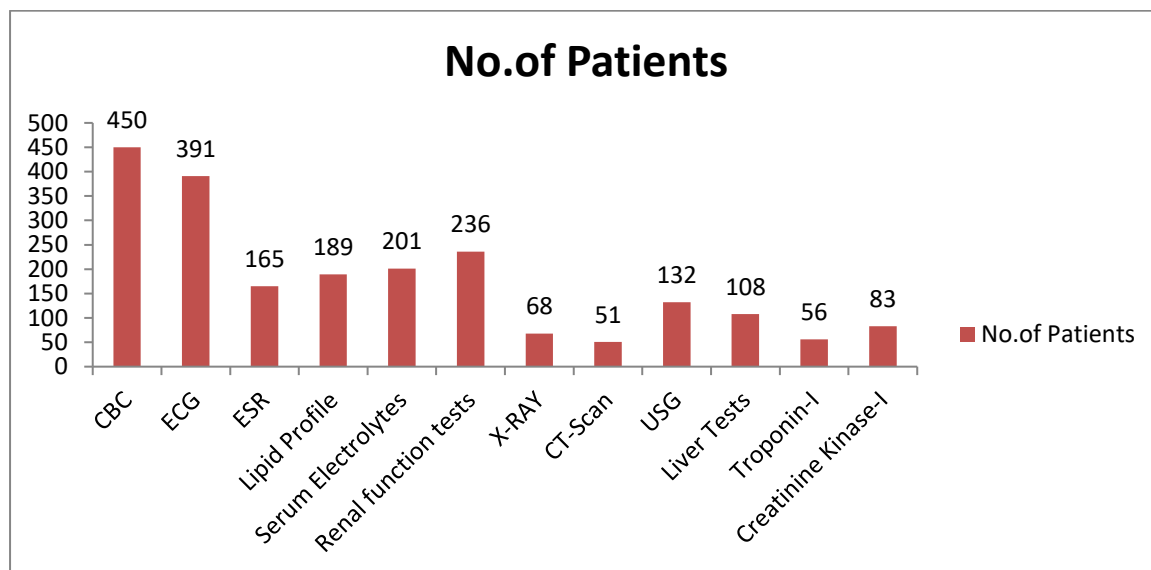


Figure.11. Diagnostic tests performed for the patients:

Table.12. Total direct cost:

Direct cost(Rs)	No of Patients	%No. of Patients
0-5000	156	34.66
5001-10000	232	51.55
10001-15000	39	8.66
15001-20000	23	5.11

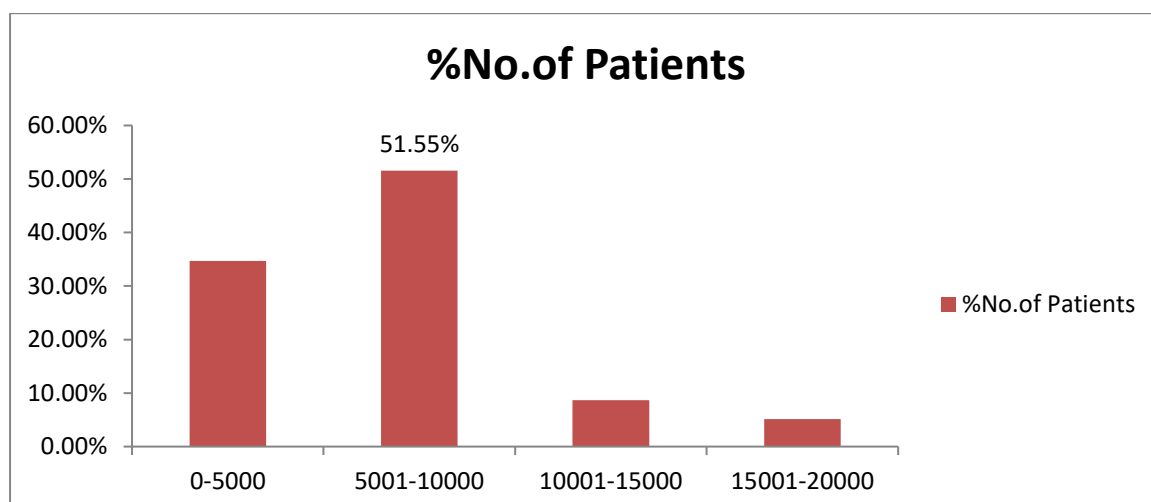


Figure. 12. Total direct cost:

Table.13. Average cost incurred for treatment of Hypertension:

Average cost of different parameters	Cost	Percentage
Cost of drugs	82.9	1.26
Hospitalization charges	2324.06	35.34
Physician charges	625	9.50
Nursing charges	410.50	6.24
Cost for diagnostic& laboratory Procedure	3132.24	47.64

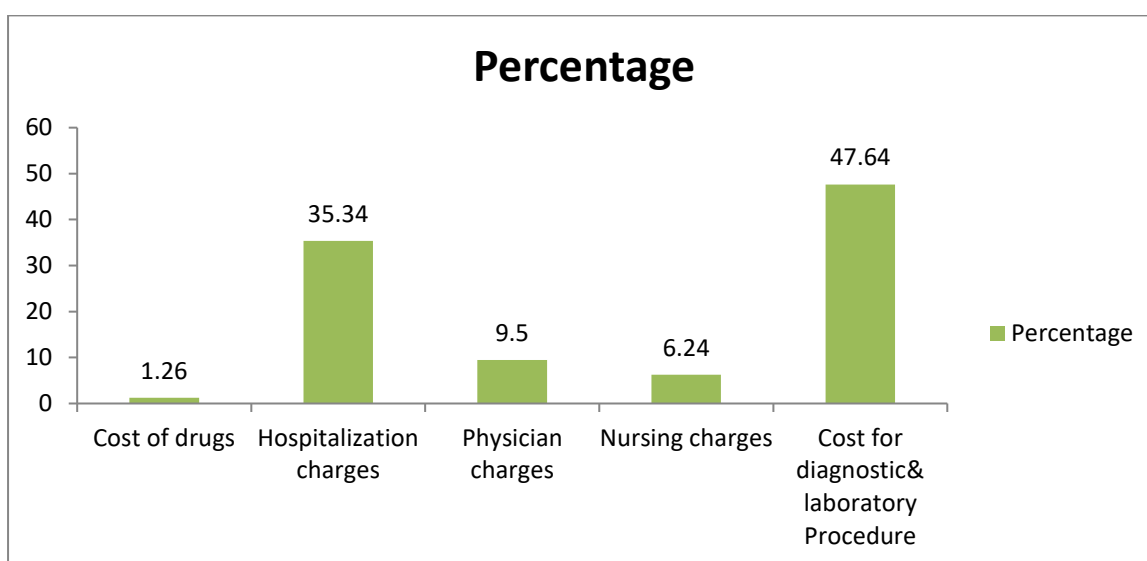


Figure.13. Average cost incurred for treatment of Hypertension:

DIABETES MELLITUS:

Table 1. Gender wise distribution

S.NO	GENDER	TOTAL NUMBER	PERCENTAGE (%)
1	MALE	82	40
2	FEMALE	123	60

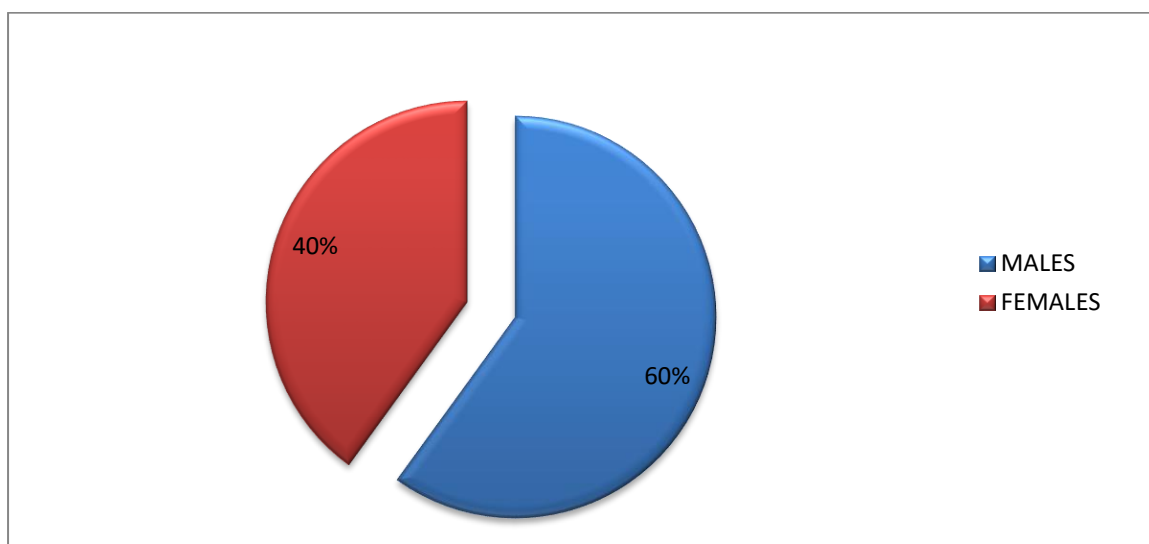


Figure 1. Gender wise distribution.

TABLE 2: NUMBER OF PATIENTS ADMITTED IN HOSPITAL

S.NO	AGE(YEARS)	MALES	FEMALES
1	30-39	06	01
2	40-49	40	27
3	50-59	34	20
4	60-69	32	17
5	70-79	08	12
6	> 80	03	05
Total		123	82

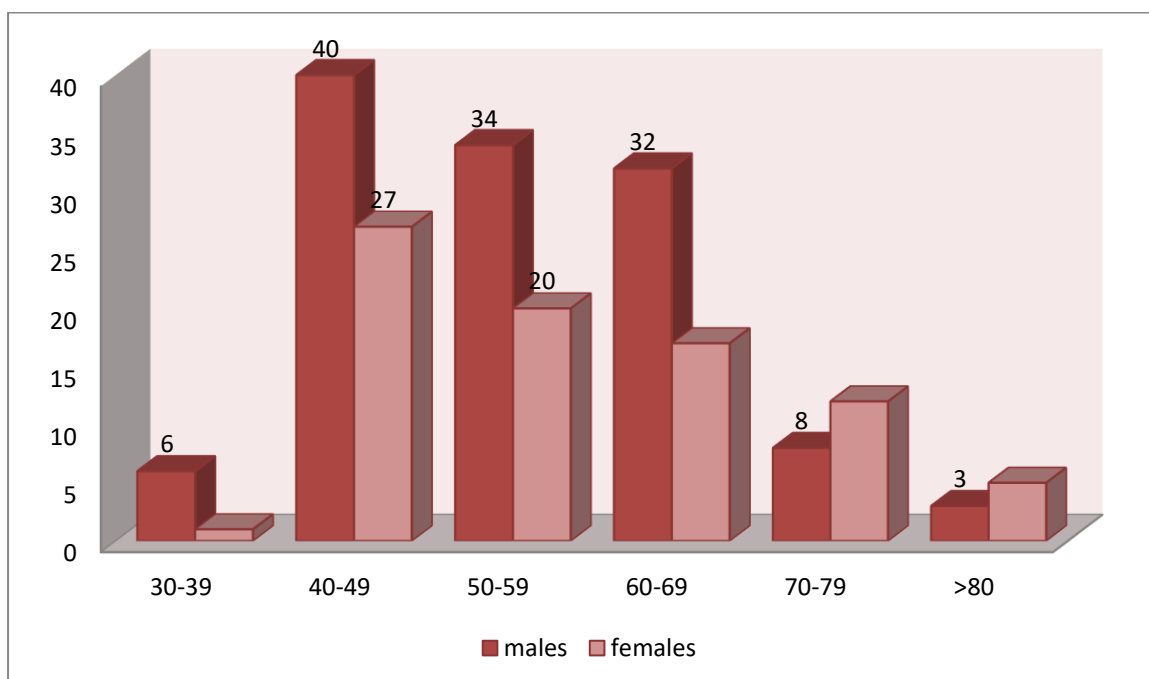


Figure 3: Number Of Patients Admitted In Hospital

Table 3: Complications Of Type 2 Diabetes Mellitus

THERAPY	NO.OF DRUGS PRESCRIBED IN 205 PRESCRIPTIONS	PERCENTAGE
INSULIN	167	41.03%
OHA COMBINATION THERAPY	145	35.62%
OHA MONOTHERAPY	95	23.34%

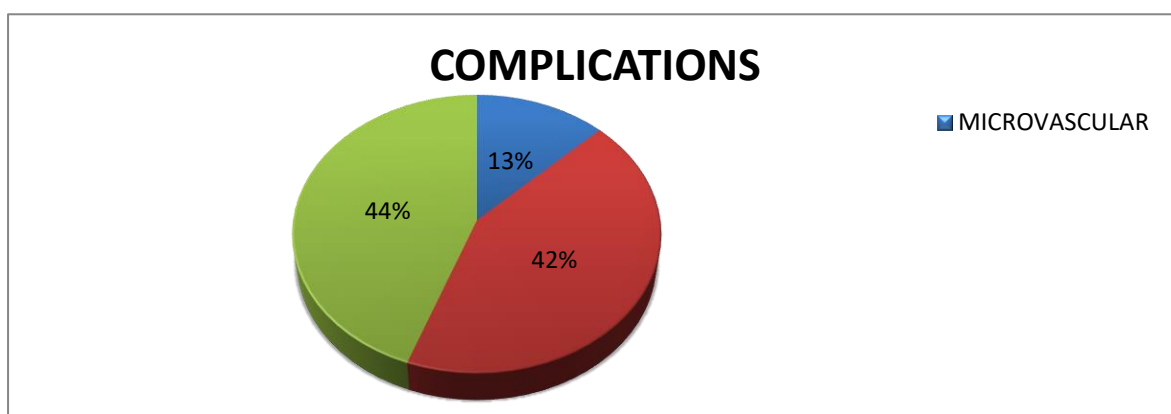


Figure.4: Complications Of Type 2 Diabetes Mellitus.

Table 4: Drug Therapy Given To The Patients.

Complication	Number Of Prescription	Percentage (%)
Microvascular	26	12.68%
Macro vascular	88	42.92%
Microvascular & Macrovascular	91	44.39%
Total	205	100%

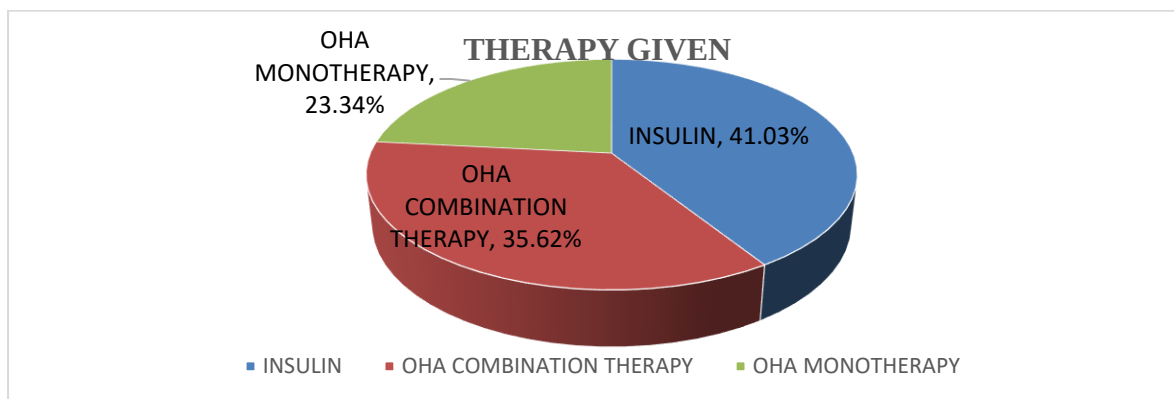


Figure. 5: Drug Therapy Given To the Patients.

Table. 5 Monotherapy of OHA'S

Name of the drug	No.of prescriptions
Glimiperide	26
Metformin	48
Sitagliptin	6
Vildagliptin	2
Voglibose	1
Acarbose	1
Saxagliptin	4
Teneligliptin	5
Canagliflozin	1
Dapagliflozin	1
Gliclazide	1

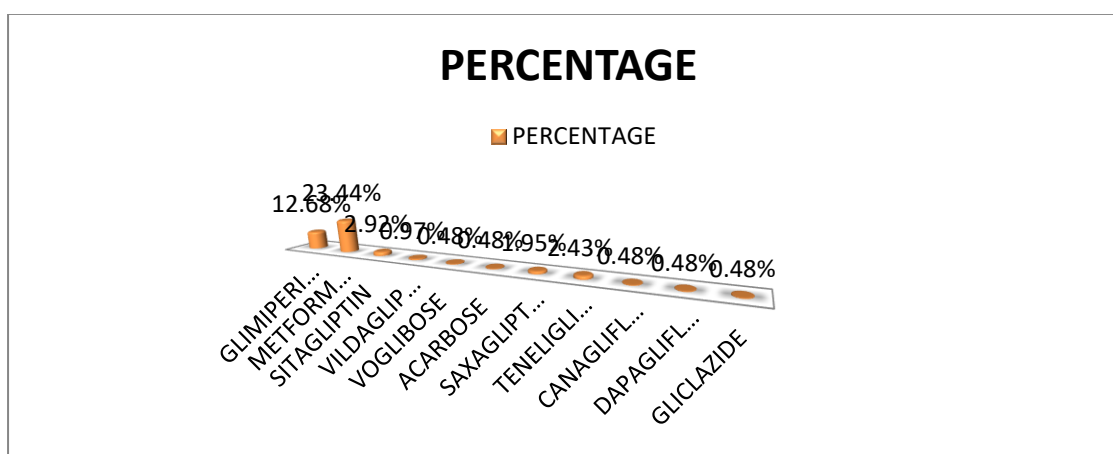


Figure.6 Monotherapy of OHA'S

Table.6. Diagnostic tests performed for the patients:

Diagnostic tests	No. of patients
CBC	135
ESR	52
Lipid Profile	101
Serum Electrolytes	85
Renal function tests	69
X-RAY	12
CT-Scan	03
USG	29
Liver Tests	63

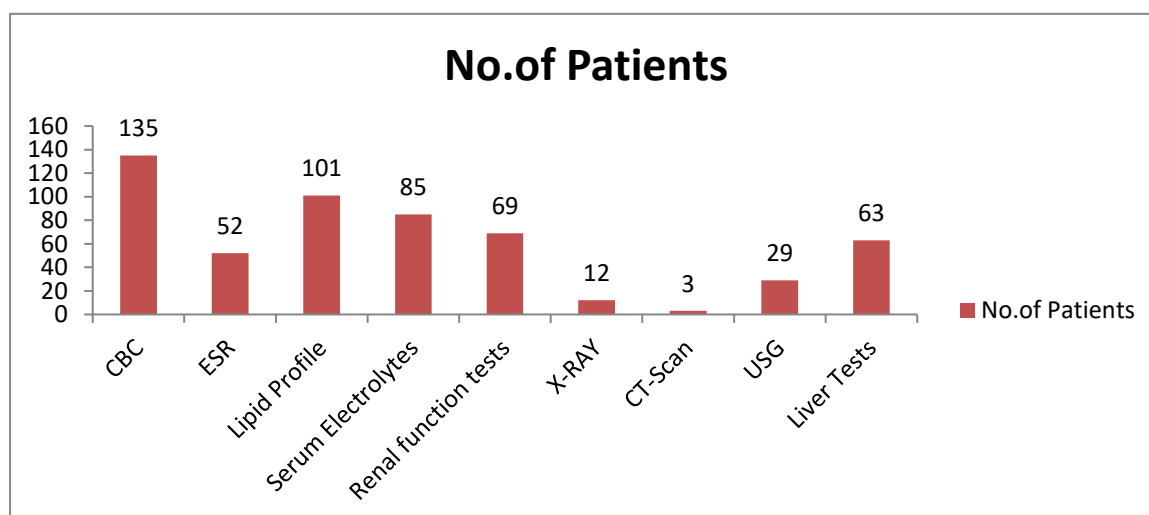


Figure 7. No of patients with diagnostic tests

Table.7. Duration of hospital stay:

No. of days in hospital stay	No. of patients	%no. of patients
0-3 days	101	49.26
4-6 days	65	31.70
7-10 days	21	10.2
11-13 days	03	1.46
14-16 days	15	7.31

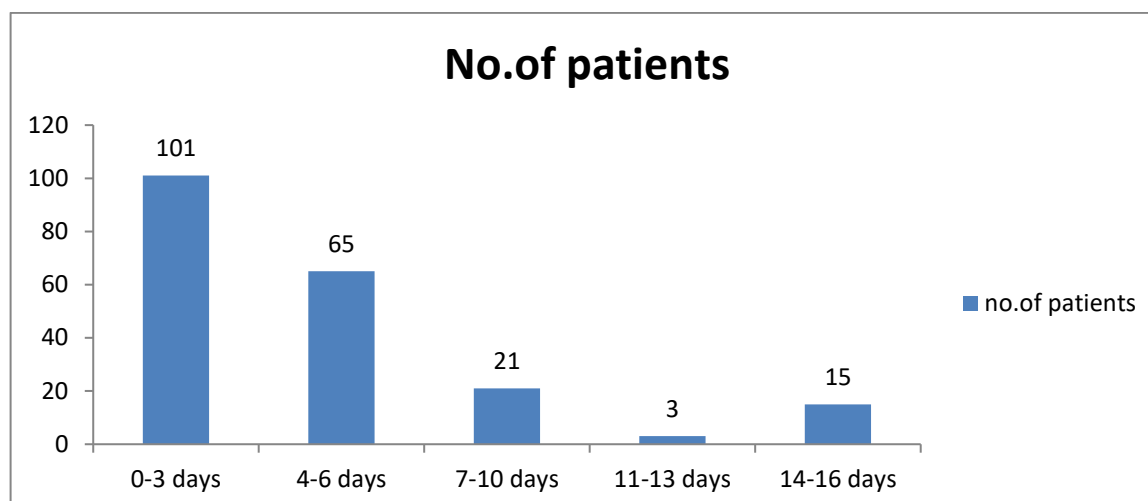


Figure. 8. Duration of hospital stay:

Table. 8. Total direct cost:

Direct cost (Rs)	No of Patients
0-5000	106
5001-10000	56
10001-15000	23
15001-20000	20

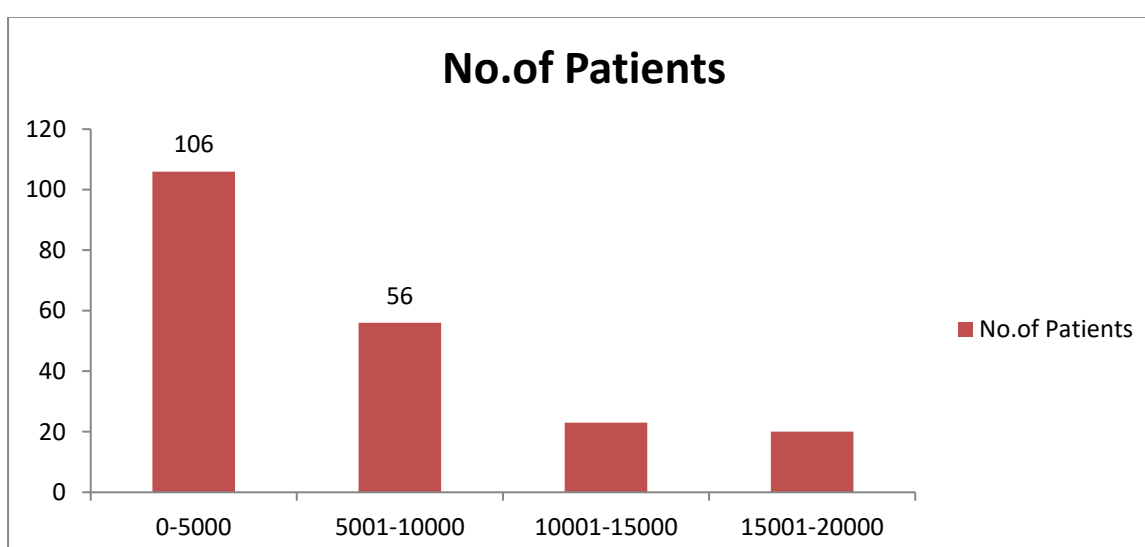


Figure .9. Total direct cost:

Table.9. Average cost incurred for treatment of Hypertension:

Average cost of different parameters	Cost	Percentage
Cost of drugs	85.6	2.25
Hospitalization charges	895	23.54
Physician charges	201.63	5.30
Nursing charges	56.1	1.47
Cost for diagnostic& laboratory Procedure	2563.24	67.42

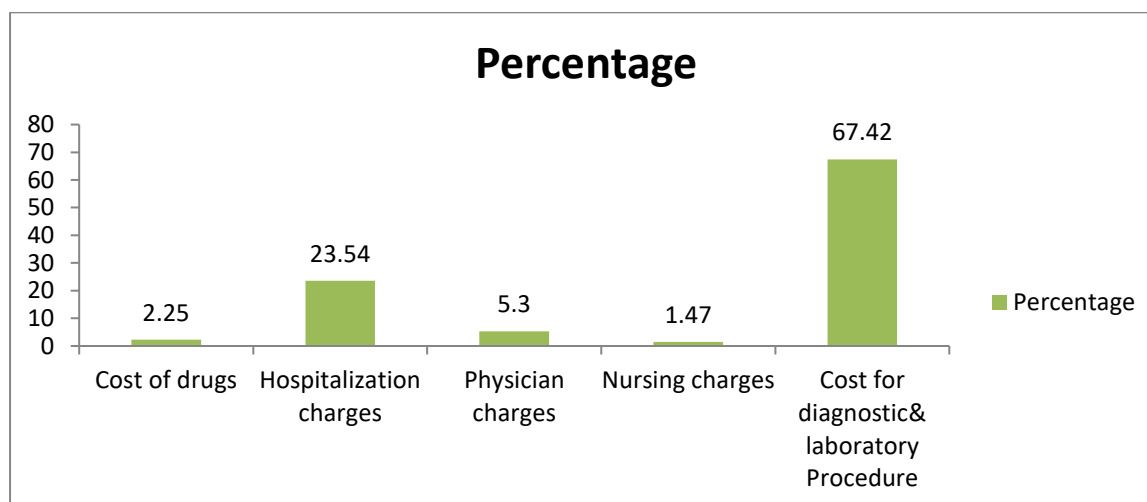


Figure. 10. Average cost incurred for treatment of Hypertension:

Discussion:

In our study we have gone through pharmaco economics study briefly. Patients duration of stay in a hospital, physician charges, cost of the medicines and average cost incurred was calculated in our study for the patients admitted for various diseases like hypertension and diabetes in a tertiary care hospital. Although drugs are generally cheaper in India than in most developing countries, treatment of hypertension imposes a considerable burden on the patients. Moreover, lack of health insurance makes patients pay for their medications and investigations. Diuretics was the less cost medication compared to the other antihypertensive drugs . met for min is less compare to other oral hypoglycemics.

Conclusion:

In our study we have evaluated the expenses involved in different treatments for hypertension and diabetes mellitus. We also assessed the rational use of Anti-hypertensive drugs according to JNC7 guidelines. In our study, the cost of different antihypertensive and oral hypoglycemic treatment alternatives for HTN and diabetes in both in-patients was compared to find out the most

cost effective treatment for the patients . the patients who are economically less can go for the cost effective treatment .that means with less cost same effectiveness was observed that drugs they can prefer. The total direct costs can be reduced for the patients who are economically not affordable. Clinical pharmacist activities plays an important role for the patients to maintained the blood pressure and RBS normal by changing the life style modifications like dietary etc.

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