EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 9
Issue: 12
320-327
Year: 2022

DRUG UTILIZATION EVALUATION OF ANTIHYPERTENSIVE DRUGS IN TERTIARY CARE HOSPITAL

Dr. Ganesh Prasad Jaiswal[1*], Dr. Mihir Kumar Biswas[2], Dr. Beulah Milton[3], Dr. L. Padma[4] and Dr. Narayanaswamay V.B.[5]

[1]Pharm D Graduate RR College of Pharmacy, [2]Pharm D Graduate RR College of Pharmacy, [3]Department of clinical practice RR College of pharmacy, [4]Department of Pharmacology, Sapthagiri Institute of Medical Sciences and Research Center, [5]Principle, RR College of Pharmacy, Sapthagiri Institute of Medical Sciences and Research Center, Heseraghatta Main Road, Karnataka Bangalore, 560090.

***Corresponding Author: Dr. Ganesh Prasad Jaiswal**
Pharm D Graduate RR College of Pharmacy, Heseraghatta Main Road, Karnataka Bangalore, 560090.

Article Received on 13/10/2022 **Article Revised on 02/11/2022** **Article Accepted on 23/11/2022**

ABSTRACT
Introduction: Hypertension, also known as high or elevated blood pressure, is a condition in which the blood vessels have persistently raised pressure**. Objective:** TO conduct a retrospective and prospective study on drug utilization evaluation of antihypertensive drugs.**Methodology:** Drug use utilization data of 150 patients, attending inpatients and out patient's department of Sapthagiri Hospital was collected from patient's case Notes and prescriptions. This study is retrospective and prospective observational study. The data were analysed to find out the demographic characteristics of the patients, number of drugs prescribed per patients, drugs which are commonly prescribed, mono therapy, combination therapy (two drug therapy, three drug therapy), route of administration, adherence with JNC VIII, drug treatment based on stages of hypertension, co-morbidities of patients. Patients suffering from hypertension with or without co-morbid conditions were included in the study. **Result:** During the 6-month period of study 150 prescription for Hypertension were analysed. Among 150 prescriptions most of the patients were female (56.66%) while (43.33%) were male and major age group having HTN was found to be 51-60 years (30.66%). Regarding co-morbidity 33.33% patients had HTN with DM. the study revealed that most of the patients were on combination therapy of anti-hypertensive drugs (63.33%) while 36.66% patients received mono therapy. Mostly prescribed rout of administration was oral route (86.66%). Among 150 prescriptions 85.34% of prescription were found to be adhered with JNC VIII guidelines. **Conclusion:** 14.67% deviation from JNC VIII guidelines and 16.67% prescription had drug interaction was observed in the treatment with respect to selection of antihypertensive drugs.

KEYWORDS: drug utilization, co-morbidities, antihypertensive, JNC VII, DI.

INTRODUCTION
Drug utilization studies is an ongoing authorised and systemic quality improvement process done to analyse prescribed drugs to patients, taking into account patient safety, clinical evidence, cost effectiveness and treatment efficacy and others factors. As well as hypertensive treatment is lifelong treatment, the prescriptions need special emphasis of considerations of these factors.[1]

Hypertension, also known as high or elevated blood pressure, is a condition in which the blood vessels have persistently raised pressure. Normal adult blood pressure is defined as a blood pressure of 120 mmHg when the heart contracts (systolic) and a blood pressure of 80 mmHg when the heart relaxes (diastolic). When systolic blood pressure is equal to or above 140 mmHg and/or a diastolic blood pressure equal to or above 90 mmHg the blood pressure is considered to be raised or high.[2] the focus of the World Health Day (WHD) this year is on one of the main non-communicable disease (NCD) risks factors, hypertension. It is currently the leading risk resulting in considerable death and disability worldwide and accounted for 9.4 million deaths and 7 percent of disability adjusted life years (DALYs) in 2010.[3] Hypertension is one of the leading contributing factors to many others diseases including myocardial infraction (IM), stroke, heart failure and retinopathy, a leading cause of death also.[4]

Types of Hypertension
Types.
Mainly there are two types of HTN which are generally described[5]

Essential hypertension. (Primary Hypertension)

Secondary mainly there are two types of hypertension which are generally classified as hypertension. Essential hypertension: It is also termed as primary hypertension. Usually people with primary hypertension have no symptoms, but you may experience frequent headaches, tiredness, dizziness or nose bleeding. Although the cause is unknown, but it is said that obesity, smoking, Alcohol, heredity all play a role in essential hypertension. it is the most common type of hypertension affecting about 95% of total hypertension patients. Secondary hypertension: The most common cause of secondary hypertension is an abnormality in the arteries supplying blood to the kidneys. Others cause include airway obstruction during sleep, diseases and tumours of the adrenal glands, hormone abnormalities, thyroid disease, and too much salt or alcohol in the diet. Drugs can cause secondary hypertension, including over –the-counter medicines such as ibuprofen and pseudoephedrine. If the cause is detected, hypertension can often be controlled.

Also the hypertension is of additional types they are[4]
1. Isolated Systolic Hypertension.
2. Malignant hypertension.
3. Resistant hypertension.

Isolated systolic hypertension: Blood pressure is recorded in two numbers: The upper or the first number is the systolic pressure which is the pressure exerted during the heartbeat and the lower or second number is the diastolic pressure which is the pressure as the heart is resting between the beats. Normal blood pressure is 120/80 mmHg. With isolated systolic hypertension the systolic pressure rises above 140 while the diastolic pressure stays near the normal range i.e below 90. This type of hypertension is most common in people over the age of 65 and is caused by the loss of elasticity in the arteries. The systolic pressure is much more important than the diastolic pressure when it common to the risk of cardiovascular disease for an older person.

Resistant Hypertension

If your doctor has prescribed three different types of antihypertensive medication and your blood pressure is still too high, you may have resistant hypertension. Resistant hypertension may occur in 20-30% of patients with hypertension. Resistant hypertension may have genetic component and is more common in people who are older, obese, female, African–American, or have an underlying illness, such as diabetes or kidney disorder diseases.

Causes

Different causes of hypertension can be categorised as[5]
1. Age: The chance of hypertension increase with age, one possible mechanism involves a reduction in vascular compliance due to stiffening of the arteries. A decrease in glomerular filtration rate is related to ageing and thus result in decreasing efficiency of sodium excretion due to which elderly people are at higher risk of suffering from hypertension.

2. Hereditary: if there is family history of high cholesterol then this may be the leading cause for the hypertension.
3. Obesity: Obesity can increase the risk of hypertension of fivefold as compared with normal weight and up to two-thirds of hypertension cases can be attributed to excess weight. More than 85% of cases occur in those with a BMI greater than 25. Theses mechanism include the activation of the sympathetic nervous system as well as the activation of the Renin-Angiotensin-Aldosterone system.

Salt: Another risk factor is salt (sodium) sensitivity. Approximately one third of the essential hypertensive population is responsive to sodium intake. When sodium intake exceeds the capacity of the body to excrete it through the kidneys, vascular volume expands secondary to movement of fluids in to the extra vascular compartment. This cause the arterial pressure to rise as the cardiac output increase. Which the finally leads to increase in blood pressure.

Alcohol Consumption: Excessive alcohol consumption is another contributing factor for developing the hypertension. If the person is intoxicated with the alcohol the he/ she should immediately stop drinking. Alcohol also contains a high density of calories and may contribute to obesity.

Vitamin D deficiency: it has been suggested that vitamin D deficiency is associated with cardiovascular risk factors. It has been observed that individuals with vitamin D deficiency have higher systolic and diastolic blood pressure than average. Vitamin D inhibits renin secretions and its activity. Hence, a deficiency in vitamin D leads to an increase in renin secretion. This is possible mechanism of increasing BP due to lack of vitamin D.

7. Lazy life style: Lack of regular exercise and lazy lifestyle leads to increase risk of hypertension. The UK National Health Service advises 150 minutes (2 hours and 30 minutes) of moderate intensity aerobic activity per week to help prevent hypertension.

8. Contraceptive's pills: in the recent studies it was noted that the regular intake of oral contraceptive pills may lead to hypertension.

MATERIAL AND METHODS

A hospital based Retrospective and Prospective observational study was conducted in Sapthagiri Institute of Medical Science and Research Centre, Bangalore-90 for a period of six months. Around 150 patients for whom at least one anti-hypertensive drug is prescribed were included in the study after obtaining their consent in a pre-designed consent form. The patient case sheet, medication chart, laboratory data were reviewed. The data required for study has collected by reviewing the prescription list and patient case sheet. The data collected have noted in a self-designed data collection form. The

statistical analysis of collected data was performed by using Microsoft excel, IBM SPSS software.

RESULTS

GENDER DISTRIBUTION

In our hospital based observation-cum-interventional study conducted to drug utilization evaluation of antihypertensive drugs in tertiary care hospital, 150 in patients and out patients with uncontrolled HTN admitted to department of general medicine were studied. Out of 150 study subjects, 43.33 (n=65) were male, 56.66% (n=92) were female.

Table 1: Patient distribution based on gender.

GENDER	NUMBER (n)	PERCENTAGE (%) OF PATIENT
Male	65	43.33%
Female	85	56.66%

PATIENTS AGE WAS CATEGORIZATION

In our study out of 150 patients, The study subjects were divided in to 6 different age groups as 30-40, 41-50, 51-60, 61-70, 71-80, >80 The youngest subject is 30 years old and the oldest subject is 84 years old, the patient aged between 51-60 years was found to be the highest(30.66%) and the least (4.66%) were found between the age groups of 30-40 years as in Table 2.

Table 2: Age-group distribution of study patients.

Age-groups(years)	Number of patients	Percentage (%)
30-40 years	7	4.66%
41-50 years	18	12%
51-60 years	46	30.66%
61-70 years	44	29.33%
71-80 years	20	13.33%
>80 years	15	10%

SOCIAL HABBIT WISE CLASSIFICATION

In our study, all the subjects with HTN admitted to the Department of general medicine were classified on the basis of social habits in to Alcoholic, smoker, Non Alcoholic and non-smoker. Among them the majority of patient were smokers 40.66%.

Table 3: classification of patients based on social habits.

SOCIAL HABITS	NUMBER (n)	PERCENTAGE (%)
Alcoholic	32	21.33%
Smoker	61	40.66%
Non-alcoholic and non-smoker	57	38%

DEPARTNENT WISE DISTRIBUTION OF PATIENT

The majority of patient were admitted to female medical ward which consist of 30% of total patients and least was from ENT and OBG of 0.66%.

Table 4: Department was distribution of patient.

DEPARTMENT	NUNMBER OF PATIENT(N)	PERCENTAGE OF PATIENT (%)
General medicine	15	10%
Male medical ward	35	23.33%
Female medical ward	45	30%
Orthopedic	15	10%
Nephrology	5	3.33%
Surgery	7	4.66%
Gynecology	10	6.66%
ICU	8	5.33%
Pulmonology	3	2%
Psychiatric	3	2%
Ophthalmology	2	1.33%
ENT	1	0.66%
OBG	1	0.66%

PATIET WITH CO-MORBIDITIES

Regarding co-morbidity, 33.33% of patient was suffered from HTN and DM, 21.33% patients were having HTN and CAD, 18.66% patients were suffered from HTN and CKD, 13.33% were having HTN and stroke, 06% patient were having HTN along with heart failure and 7.33% patient were having HTN and other diseases.

Table 5: Patient with comorbidities.

COMORBIDITY	NO.OF PATIENTS	PERCENTAGE%
HTN+DM+ others	50	33.33%
HTN+CAD	32	21.33%
HTN+CKD	28	18.66%
HTN+STROKE	20	13.33%
HTN+HEART FAILURE	09	06%
HTN +other/ alone	11	7.33%

CLASSIFICATION OF PATIENT BASED ON DRUG THERAPY

In our study, the patients were divided on the basis of mono drug therapy and combination drug therapy.

In the management of Hypertension, combination therapy was preferred as 63.33% of prescriptions where as 36.66% of prescriptions were prescribed with mono therapy.

Table 6: patient with mono drug therapy and combination drug therapy.

THERAPY	NUMBER	PERCENTAGE
Mono therapy	55	36.66%
Combination Therapy	95	63.33%

CLASSIFICATION OF MONOTHERAPY

In our study, the patients were prescribed with mono therapy drugs like, ACE inhibitors, B-blockers, calcium channel blockers, diuretics, ARB inhibitor and other HTN drug. Among them the most prescribed drugs is calcium channel blockers 32.72% and the least prescribed drugs is other HTN drugs 3.63%.

Table 7: classification of mono therapy drugs.

CLASS OF DRUGS	NO. OF DRUGS	PERCENTAGE (%)
ACE inhibitors	7	12.72%
B blockers	16	29.09%
Calcium channel blockers	18	32.72%
Diuretics	5	9.09%
ARB inhibitor	7	12.72%
Other HTN Drug	2	3.63%

CLASSIFICATION BASED ON COMBINATION THERAPY

The study subjects were prescribed with the following combination drug therapy.

Diuretics + calcium channel blockers, Diuretics + ACE inhibitor, Diuretic + Beta-Blocker, Diuretic + ARB inhibitor, CCB + Beta-Blocker, CCB + ARB inhibitor, CCB + ACE Inhibitor, ARB Inhibitor + Beta-Blocker, ACE inhibitors + B-Blocker, CCB + diuretic + Beta-blocker, ACE inhibitor + Diuretic + Beta blocker, ARB + Diuretic + Beta blocker.

Among them the mostly prescribed drugs combination is Diuretics + CCB (22.10%) and least prescribed is ARB +B-blockers and ARB + B-blocker (2.10%).

Table 8: classification based on combine drug therapy.

Combination of drugs	No. of patients	Percentage (%)
Diuretic +CCB	21	22.10%
Diuretic + ACE inhibitor	11	11.57%
Diuretic + B-Blocker	6	6.31%
Diuretic + ARB inhibitor	10	10.52%
CCB + Beta-Blocker	9	9.47%
CCB + ARB inhibitor	5	5.26%
CCB + ACE inhibitor	6	6.31%
ARB inhibitors + beta-blocker	2	2.10%
ACE inhibitor + beta-blocker	7	7.36%
CCB + diuretic + beta-blocker	9	9.47%
ACE inhibitor + diuretic + beta-blocker.	6	6.31%
ARB + diuretic +Beta-blocker	3	3.15%

ROUTE OF ADMINSTRATION

In our study the drugs were classified on the basis of oral and intravenous route of administration among them most of the patients were prescribed with oral route 86.66% (N=130) and 13.33% (N=20) were prescribed with Intravenous route.

Table 9: Route of administration.

Route of Administration	No. of patient(N)	Percentage (%)
Oral	130	86.66%
Intravenous	20	13.33%

DRUGS INTERACTION

In our study, the drugs which were prescribed to the patients, some drugs interact with others drugs which were.

Table 10: Drug interaction.

DRUGS	INTERACTING DRUGS	EFFECT	NO. Of PATIENTS
Metoprolol	Glimepiride	Metoprolol increase the risk of hypoglycaemia	5
Ramipril	Aspirin	Aspirin decreases effect of Ramipril	9
furosemide	Aspirin	Diuretic decrease activity of NSAID.	6
spironolactone	Atorvastatin	Spironolactone increase level or effect of Atorvastatin	3
Amlodipine	Carbidopa/levodopa	Pharmacodynamics synergism	2

In 150 prescriptions 16.67% (25) of prescription have interaction among prescribed drugs while 83.33% (125) prescriptions were without drug interaction.

PRESCRIPTION	PRESCRIPTION WITH DRUG INTERACTION	PRESCRIPTION WITHOUT DRUG INTERACTION
150	25	125

DRUG THERAPY COMPARISION WITH JNC VII GUIDELINES.

Table 11: Drug therapy comprasion with JNC VII GUIDELINES.

S.NO	Comorbidity	Drugs according to JNC VIII	Total prescription	Prescription adherence to JNC VIII	Prescription non adherence to JNC VIII
1.	HTN + DM + OTHER	ACEI or ARB + CCB or THIAZIDE	50	45	5
2.	HTN +CKD	ACEI or ARB + CCB or THIAZIDE	18	15	3
3.	HTN + CAD	BB + ACEI or ARB + CCB	37	33	4
4.	HTN + Heart failure	ACEI or ARB + BB + DIURETIC	17	13	4
5.	HTN + STROKE	ACEI or ARB + CCB or thiazide	13	10	3
6.	HTN + other / alone	CCB or ACEI or ARB or Diuretic	15	12	3

In 150 prescriptions 85.33% of prescription was found to be adherence with JNC VIII guidelines while 14.66% was non-adherence to JNC VIII guidelines.

Prescription status	No.of Prescription
Prescription adherence to JNC VIII	128
Prescription non adherence to JNC VIII	22

LENGTH OF STAY OF HYPERTENSIVE PATIENT IN HOSPITAL

In our study, N=81 patients were stayed for less than equal to 2 days and N=14 patients were stayed for 9-10 days.

Table 12: length of hospital stay of hypertensive patient.

DURATION OF DAYS	NUMBER OF PATIENTS (N)
Less than=2	81
3-5	35
6-8	20
9-10	14

DISCHARGE HYPERTENSIVE MEDICATION

The mostly prescribed antihypertensive drugs as discharge medication was calcium channel blocker in 20 patients.

ANTIHYPERTENSIVE DRUGS	NO.OF PATIENT
Calcium channel blocker	20
Angiotensinogen receptor blocker	10
ACE inhibitor	12
Diuretics	11
B-blockers	12
CCB + diuretics + b-blockers	18
Diuretic + CCB	14
CCB+ ACE inhibitor	10

LIFESTYLE MODIFICATION FOR PREVENTION OF HYPERTENSION

1. Lose weight if overweight.
2. Limit alcohol
3. Increase physical activity
4. Decrease sodium intake
5. Keep potassium intake at adequate levels
6. Take inadequate amount of calcium and magnesium
7. Decrease intake amount of saturated fat and cholesterol
8. Adequate vitamin D level.
9. Stop smoking

SIDE EFFECTS OF ANTIHYPERTENSIVE DRUGS

Antihypertensive drugs may causes some serious and minor side effects.

ACE inhibitors causes cough, diarrhea, nausea, vomiting

B-blockers are contraindicated in respiratory disease because it may cause bronchospasm.

Diuretics should not be given in Gout or family history of Gout, abnormal lipid profile, pregnancy induce hypertension.

DISCUSSION

The study was carried out with the aim to analyses the drug use evaluation of antihypertensive drugs in tertiary care hospital. A prescription based study is considered to be one of the most effective methods to assess and evaluate the prescribing attitude of physicians and dispensing practice of pharmacists.

The results of our study suggest that hypertension is more prevalent in female patients (56.66%) than Male patients (43.33%) which is similar to the study conducted by **J.M Okonta, S.O Nduka and V.E Idodo et al** in which 44.9% male and 55.1% female were prescribed with antihypertensive drugs.[28]

My finding, provide direct evidence of an increasing burden of hypertension especially among the elderly population. Prevalence of HTN increase with increasing age, 46 (30.66%) patients had suffered from HTN within the age of 51-60 years which is similar to the study conducted by Pyarelal, et al in which 96.7% of the study subjects were suffered from hypertension lies between the age group of 40-60 years.[26]

My study shows that 40.66% of patient had smoking habits, 21.33% have alcoholic behavior and remaining 38% patients were non-alcoholic and non-smoker, alcohol and smoking well established risk factors of HTN.

My study shows majority of the patient were admitted to female medical ward and also shows that disease condition i.e. co-morbidity affects the prevalence of HTN, 33.33% of patients were suffered from HTN with Diabetes Mellitus followed by 21.33% suffered from HTN with CAD, 18.66% of patients had HTN with CKD and 13.33% of patients had HTN with stroke followed by 13.33% of patients had HTN with other complications which is similar to the study conducted by **Pavitra R Y, Geetha, Rajeev Aggarwal, shomashekar H S et al** in which 45% patient were diabetic with HTN,47.66% with HTN and other disease and 7.33% with HTN alone.[32]

My study shows that 63.33% of the study subject shows combine anti-hypertensive drug therapy and 36.66% as mono anti-hypertensive drug therapy which is similar to study conducted by **Jangan et al** in which about 75.5% of the patient received combination therapy.[21]

Our study shows that the mostly prescribed mono therapy drugs were calcium channel blockers 32.72%, followed by B-blockers 29.09%, ACE inhibitor, ARB blocker which is similar to the study conducted by.

Mahanjit konwar, Pranav Kumar Paul, swarnamoni Das et al in which CCB is the most commonly prescribed anti-hypertensive drugs.[29]

In our study mostly prescribed combination drug therapy was diuretics + calcium channel blocker (22.10%) and the least prescribed is ARB + B-blocker which is similar to **Mahanjit konwar, Pranav Kumar Paul, swarnamoni Das et al** in which the most prescribed combine drugs are CCB + Diuretics (30%), followed by ACE inhibitors + diuretics (20%).[29]

In our study the major interacting drugs is between Ramipril and Aspirin in 9 of the total prescription followed by Metoprolol and Glimepiride.

128 prescriptions of our study were adherence to JNC VII and 22 prescription were non adherence to JNC VII.

In our study the duration of length of hospital stays for less than 2 days was found to be 81patients which is highest in number and the least was 9-10 days was found to be 14 patients.

Our study shows the mostly prescribed antihypertensive discharge medication was calcium channel blockers.

CONCLUSION

In our study, among 150 patients with HTN in tertiary care hospital the demographic data shows that prevalence of HTN is more in female than male and most of them of age group of 51-60 years. Smoking and alcohols was found to be risk factor in 93 individuals.

In our study, 14.67% deviation from guidelines was observed in the treatment with respect to the selection of antihypertension drugs in various clinical conditions. No errors were observed with respect to route of administration. Around 16.67% prescription had Drug interaction and reported to the study department. Our results were showed that the choice of anti-hypertensive drugs reasonably comply with JNC VIII guidelines on the management of hypertensive which means to say that prescriptions were adhered by clinicians with JNC VIII guidelines for the treatment of hypertensive. This study concludes that there is wide use of diuretics, ARBS, ACEI, CCB and B-blockers for hypertension based on the requirement and clinical condition of patients. However, there is a need for improved patient education on adherence to therapy and greater attention to issues of life style modifications, so as to improve BP control rate in the society.

REFERNCES

1. Chobanian AV, BakrisGL, Black HR et al (2003). The eight report of the joint National committee on prevention, detection, evaluation, and treatment of High blood pressure: the JNC 8 report JAMA, 289: 2560-2572.
2. Londhe SPI,3*, Silvy s[2,] sridevi ss[2,] Cherian TS[2,] Baishnab s. Evaluation of cost and different treatment alternatives for hypertensive patients in a tertiary care teaching hospital, Davangere international journal for pharmaceutical Research scholars (IJPRS) V-4, 1-1, 2015.
3. Lim ss, Vos T, Flaxman AD, Danaei G, Shibuya k, Adair-1. Rohani H, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Diseases study 2010. Lancet, 2013; 380: 2224-60.
4. Guilbert, J.J, 2003. The world health report 2002: reducing risks, promoting healthy life.educ. Health, 16: 230-230.
5. Maryon-Davis A, press V on behalf of the Faculty of Public Health and National Heart Forum. 2005. Easing the pressure: tackling hypertension. A tool kit for developing a local strategy to tackle high blood pressure. London: Faculty of public Health.
6. Texas Heart institute Journal and Recommendation Published on 2015 june 1st, (www.ncbi.nlm.nih.gov/pmc/articles/PMC011565/)
7. Siyad. A. R. Hypertension, H. J. D. Med, April-October 2011; 3(1): 1-16.
8. Devin K. Binder et al "idiopathic interaction Hypertension". Neurosurgery, 2004; 54(3): 538-552.
9. Martin Thomas, "Hypertension-clinical features and investigation", Hospital pharmacist (special features), April 2007; 14: 111-116.
10. James P.A, Oparil, Carter B.L., Cushman W.C, dennison-Himmelfarb c., Handler j.et al.2014 evidence-based guideline for the management of high blood pressure in adults: 2014 evidence- based guideline for the management of high blood pressure in adults: report from the panel members appointed to the eighth joint National Committee (JNC 8) [published erratum appears in JAMA, 2014; 311(17): 1809] JAMA, 2014; 311(5): 507-20.
11. Arauz-Pacheo c, Parrot MA, Raskin P, for the American Diabetes Association. Hypertension management in adults with diabetes. Diabetes care, 2004; 27(supp11): S65-S67.
12. Mahanjit konwar, drugs in Essential Hypertension in Medicine Out Patients Department in A Tertiary Care Hospital, Asian J pharm Clin Res, 2014; 7(2): 142-144.
13. Chobanian AV, Bakris GL, Black HR, et al., for the National Heart, Lung, Blood Institute Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; National High Blood Pressure Education Program Coordinating Committee. The seventh Report of the Joint National Committee on prevention, Detection, Evaluation, and treatment of high blood pressure: the JNC 7report [published correction appears in JAMA, 2003; 290:197]. JAMA, 2003; 289(19): 2560-2572.
14. Your guide to lowering your blood pressure with DASH http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf. accessed august 11,2008.
15. Mahanjit konwar, pranab Kumar Paul, swarnamoni das et al, prescribing Anti-Hypertensive Drugs in Essential Hypertension in Medicine Out Patients Department in a tertiary care hospital. Asian J pharm clin Res, 2014; 7(2): 142-144.
16. Tumbull F, Blood pressure Lowering Treatment Trialist; Collaboration. Effect of different blood pressuring lowering regimens on major cardiovascular events: results of prospectively designed overviews of randomised trials. Lancet, 2003; 362: 1527-35.

17. Essentials of medical pharmacology by KD Tripathi antihypertensive 6Th edition pg no. 540-550.
18. http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/nephrology/arterial-hypertension/
19. International journal of integrative sciences, innovation and technology (IJIIT), 4(4): 7-14.
20. Ashok K. sharma, Navdeep Dahiya, Jayant k. Kairi, sandesh M, Bharati, et al. prescription patterns of antihypertensive drugs in a tertiary care hospital in india. IJBCP international journal of basic and clinical pharmacology, 2015; 55-59.3.
21. Jangan T, kavitah R, sridevi A, veerendra V. prescription pattern of anti-hypertensive drugs used in hypertensive patients with associated type 2 diabetes mellitus in a tertiary care hospital. Int j pha research and review, Jan 2014; 3(1): 1-5.
22. Jun Ma, ky-Van lee, Randall S. Stafford et al. Changes in antihypertensive prescribing During US outpatient Visits for uncomplicated Hypertension, 1993-2004(hypertension, 2006; 48: 846-852.)
23. Rathnakar UP, Ashok S et al, prescribing patterns of fixed dose combination in hypertension, diabetes mellitus and dyslipidaemia among patients attending a cardiology clinic in a tertiary care teaching in india. Pharmacie Globale (IJCP), 2011; 6(05): 1-3.
24. ISSN: 0976-5530 and E-ISSN:0976-5549, 2012; 3(2): 118-120.
25. Etuk E, Isezuo SA, chika A, Akuche J, Ali. Prescription pattern of anti-hypertensive Drugs in a Tertiary care hospital in Nigeria. Annals of African medicine, 2008; 7(3): 128-132.