# INTERNATIONAL JOURNAL OF
# PHARMACEUTICAL RESEARCH AND BIO-SCIENCE

# A PROSPECTIVE, PHARMACO EPIDEMIOLOGIC STUDY TO ASSESS THE ANTI-HYPERTENSIVE DRUG PRESCRIPTION PATTERN AT A TERTIARY CARE TEACHING HOSPITAL

PAMIDI PRADEEP[*1], MADAPATI VINOD KUMAR[1], M.PRUDHVI KUMAR[1], P. CHANDRA SAI[1], ALURI RAMYA[1]

1. Pharm. D Intern, Chalapathi Institute of Pharmaceutical Sciences, Guntur, A.P, India.

**Abstract:** **Objective:** To assess the drug prescription pattern of antihypertensive agents in hypertensive patients with regard to drug, drug class, ATC coding and combination therapy. **Methodology:** A prospective observational study, for a period of 6 months in the general medicine department of a tertiary care hospital. Ethical clearance was obtained prior to the study. The patient data was collected by using a patient data collection form and their drug use was recorded and subjected to analysis. **Results:** During the study period, 486 patient's data was recorded and analyzed for the pattern of use of antihypertensives. The drugs were classified according to their class where amlodipine (27.98%) was found to be most prescribed followed by enalapril (20.98%). The combination therapy of furosemide+ spironolactone was most frequently prescribed followed by furosemide + amlodipine. Average number of drugs per prescription was 7.02±3.27 showing polypharmacy. Drugs prescribed by generic names were 91.13% which is very much higher than that prescribed by their brand names 8.87% **Conclusion:** Drug utilization studies and rational prescribing are of utmost importance in the medical management of chronic non-communicable diseases. The present study could serve as a frame work upon which further studies in prescription audit can be launched to investigate the scope for educational intervention and improvement in prescribing patterns.

**Keywords:** Hypertension, Drug utilization studies, Anti-hypertensive drug prescribing Pattern, Anatomical therapeutic chemical classification ATC code.

*PAPER-QR CODE*

**Corresponding Author: MS. PAMIDI PRADEEP**

**Access Online On:**

www.ijprbs.com

**How to Cite This Article:**

Pamidi Pradeep., IJPRBS, 2015; Volume 4(4): 79-88

## INTRODUCTION

Hypertension, also known as high or raised blood pressure, is a condition in which the blood vessels have persistently raised pressure. Blood is carried from the heart to all parts of the body in the vessels. Each time the heart beats, it pumps blood into the vessels. Blood pressure is created by the force of blood pushing against the walls of blood vessels (arteries) as it is pumped by the heart. The higher the pressure the harder the heart has to pump.[1]

Hypertension (HTN) is an important public health challenge in both developing and developed countries resulting in high mortality and morbidity in today's world. Socioeconomic, behavioral, nutritional and public health issues have also led to increase in cardiovascular disease (CVD), including stroke and myocardial infarction throughout the world.[2] A surplus of new drugs is now available, leading to better quality of life for these patients. Number of drugs in various combinations is generally used for effective long-term management.[3]

In India, treatment of hypertension starts with changing lifestyle and dietary measures which are usually the first step, the second being pharmacotherapy. Due to the availability of multiple classes and multiple drugs in each class it becomes necessary for the physician to prescribe the AHA which is most beneficial to the patient. A study of factors(patient factors like age, sex, weight, coexisting illnesses determine the prescription) affecting prescribing of a particular drug and a combination of drugs gives a clear view as to how a particular drug or combination of drugs control a disease in different patients. Many international and national guidelines provide evidence-based recommendations for the treatmen. It is recognized that new guidelines or insights are not always implemented in daily practice because there are many individual patient factors which need to be considered while prescribing any drug.[4]

Drug utilization research was defined by WHO as the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting in medical and socioeconomic consequences. Drug utilization studies, which evaluate, analyze the medical, social and economic outcomes of the drug therapy, are more significant and observe the prescribing attitude of physicians with the aim to provide drugs rationally.[5]

Drug utilization studies are the actual powerful exploratory tools to ascertain the role of drugs in the society. It aims to analyse the present state and the development of drug usage at various levels of the healthcare systems whether national, local or institutional. Drug utilization study is an important tool to study the clinical use of drugs in populations and its impact on health-care system.[6]

Drug therapy is the most commonly used method of any disease treatment in general practice. However, the patterns of drug prescribing are often inappropriate. Irrational prescription of

drug has become very common in clinical practice due to lack of knowledge about drugs and also unethical drug promotion.[7] Irrational use of drugs can lead to misuse, underuse or overuse of medicines.[8]Hence EML (essential medicine list) was formulated to promote rational prescribing.

**OBJECTIVE:** The objective of this study was to assess the pattern of anti-hypertensive drug prescription pattern and usage among the hypertension patients attending general medicine department in a tertiary care teaching hospital in south India.

**MATERIALS AND METHODS:**

**Study design:** This is a prospective, observational, non-interventional, uncontrolled, unblended, unicentric, pharmaco epidemiologic study.

**Study duration:** The study is conducted for a period of 6 months i.e.; from April 2014 to September 2014 in the general medicine (both inpatient and outpatient) department.

**Study site:** Government General Hospital, Guntur is a 1200 bedded tertiary care teaching hospital with 24 medical departments, one among them being general medicine department.

**Significance of the study:** There were no studies conducted previously in this hospital regarding the pattern of drug use in hypertension. Hence the present study is taken to know the pattern of prescription and drug use in hypertension. This type of study will help to provide data which might be helpful in improving rational prescribing.

**Selection criteria**:

**Inclusion criteria:**

Patients of the age group 30 years and above, of both the genders  male and female,  diagnosed with Hypertension attending  the general medicine department of Government General Hospital, Guntur hospital were included.

**Exclusion criteria:**

Patients with any chronic psychiatric illness, Patients admitted in wards other than general medicine department, Patients with serious illness or who are critically ill and transferred  from general medicine department to acute medical care unit or intensive care unit  were excluded from the study. Patients who are pregnant, and/or breast feeding their infants were also excluded from the study.

**Data collection process:** The patient data was collected by using a patient data collection form and their prescription pattern and drug use was recorded and subjected to analysis. Data were

collected for age, gender, diagnosis, duration of stay, laboratory investigations and treatment provided during the stay in the hospital.

**STATISTICAL ANALYSIS:**

Data, subjected to descriptive analysis using Microsoft Excel. Drugs were classified according to the WHO ATC classification[9], verified by WHO EML [10] (Essential Medicine List) as well as NLEM [11] (National List of Essential Medicines) 2011. Different parameters were analyzed using simple statistical tests and then given as percentage.

**RESULTS AND DISCUSSION:**

Data from 486 hypertensive patient records were analysed. Out of 486, 237 were males and 249 were female patients. Almost nearly equal numbers of male and female were observed in our study. Among them 368 were both hypertensive and diabetics (75.72%) and 118 (24.28%) were only hypertensives.

Among 486 patients, most of them were in the age group of 51-60 both for males (45.99%) and for females(40.9%) as depicted in table -1. The mean age of admitted patients was 56.62±13.39 years which is similar to a study done by Solanki et al[2] (56.74±11.23 years).

**Table -1: Age wise distribution among hypertensive patients.**

| Age in Years | No. of Males(%) | No. of Females(%) |
|---|---|---|
| 30-40 | 2 (0.84 %) | 1(0.4%) |
| 41-50 | 9(3.8%) | 9(3.61%) |
| 51-60 | 109(45.99%) | 102(40.9%) |
| 61-70 | 67(28.27%) | 81(32.5%) |
| 71-80 | 42(17.72%) | 52(20.8%) |
| >80 | 8(3.37%) | 4(1.6%) |
| Total | 237 (48.76%) | 249 (51.23%) |

In our study, hypertension was associated with various concurrent diseases and its complications, requiring polypharmacy.[14]Diabetes mellitus (75.72%) was the most common comorbid condition followed by Ischaemic stroke (60.4%) in our study. The most common comorbid conditions in the study population are Ischaemic stroke, a cerebrovascular accident, Haemorrhagic stroke, Anaemia, Chronic Renal Failure(CRF) Tuberculosis, Angina pectoris, hyperthyroidism, ischemic heart disease, alcoholic liver disease, coronary artery disease, cirrhosis of liver, malaria, dengue fever, Chronic Obstructive Pulmonary Disease, Myocardial Infarction, Urinary Tract Infection(UTI), Acute Renal Failure(ARF), peptic ulcer, inflammatory bowel disease, squint orbit, obesity, gastro oesophageal reflux disease, congestive cardiac

failure, cerebral palsy, migraine, glaucoma, rheumatoid arthritis, polyarthritis. Comorbidity increases the total burden of illness in a patient and also influences clinical and economic outcomes.

The antihypertensive drug utilization in hypertensive patients who were on monotherapy were analyzed according to WHO-ATC coding system[11] [12] as shown in table-2.

**Table-2. Drug Utilization in hypertensive patients according to WHO-ATC coding system**

| Pharmacological class of the drug (ATC CODE) | Name of drug | WHO-ATC CODE of drug | No. (Percentage %) of patients |
|---|---|---|---|
| ACE inhibitors (C09A) | Enalapril | C09AA02 | 102 (20.98%) |
| | Ramipril | C09AA05 | 4 (0.823%) |
| Angiotensin II antagonists (C09C) | Losartan | C09CA01 | 12 (2.469%) |
| Calcium channel blockers(C08) | Amlodipine | C08CA01 | 136 (27.98 %) |
| Dihydropyridine derivatives(C08CA) | Nifedipine | C08CA05 | 2 ( 0.411%) |
| High-ceiling diuretics (C03CA) | Furosemide | C03CA01 | 94(19.34%) |
| Sulfonamides, plain( C03CA) | Torasemide | C03CA04 | 6(1.23%) |
| $K^+$ sparing Agents (C03D) Aldosterone antagonists(C03DA) | Spironolactone | C03DA01 | 18(3.70%) |
| Thiazide diuretics(C03AB) | hydrochlorothiazide | C03AB03 | 2 (0.411%) |
| Beta blocking agents (C07) | Atenolol | C07AB03 | 98 (20.16 %) |
| α and β blocking agents(C07AG) | Labetalol | C07AG01 | 2 (0.411%) |
| α adrenoreceptor blockers(C02CA) | Prazosin | C02CA01 | 2 (0.411%) |
| Central sympatholytics (C02AC) | Clonidine | C02AC01 | 8(1.64%) |

**Analysis of prescription pattern of antihypertensive drugs:**

No. of prescriptions containing a single antihypertensive drug = 378

% of prescriptions containing a single antihypertensive drug = 378/486 ×100 =77.77%

No. of prescriptions containing an oral (single) antihypertensive drug= 392

% of prescriptions containing an oral (single) antihypertensive drug = 392/486 ×100 =80.66%

No. of prescriptions containing parenteral (single) antihypertensive drug = 94

% of prescriptions containing parenteral (single) antihypertensive drug = 94/486 ×100 =19.34%

No. of prescriptions with a combination (more than a single) of antihypertensive drugs =108

The % of prescriptions with a combination (more than a single drug) of antihypertensive drugs = 108/486 ×100 =22.22%

Furosemide was the one and only prescribed parenteral drug among AHA accounting for 19.34% of all the prescriptions, besides Insulin,a parenteral hypoglycemic drug. The single use i.e., monotherapy was screened and amlodipine was the most commonly used antihypertensive drug. amlodipine (C08CA01 =136 (27.98 %) was the most commonly prescribed antihypertensive drug followed by enalapril (C09AA02=20.98%), atenolol (C07AB03=20.16 %) and furosemide (C03CA01=19.34 %).

Loop diuretics are particularly preferred in patients with severe HTN especially with cardiac and renal insufficiency. [15] Our findings were not in accordance with study conducted by Solanki et al [2] in out patients setting who reported ACEIs (79.66%) were the most commonly prescribed drug followed by Atenolol (49.66%), Amlodipine (33.83%), Furosemide (17%) and Metoprolol (4.66%).[2] Another study conducted by Jaiprakash et al, [16] showed beta blockers (45%) were used more often followed by calcium channel blockers (25%). This difference might be due to the P-drug concept which holds good here, i.e., physician's choice with relation to the characteristics of patients, their concurrent illness, as well as the availability of medicines.[15] Combination therapy is generally required for adequate control of HTN. Likewise, in the present study, it is observed that multiple drug therapy was common than single drug therapy which is in dissonance to Solanki et al,[2] 66.84% and 33.16% respectively.

Among combination therapy, furosemide +spironolactone combination was most frequently prescribed followed by furosemide + amlodipine, enalapril+ hydrochlorothiazide, losartan+ hydrochlorothiazide, atenolol + furosemide, torasemide + enalapril, and furosemide +clonidine.

In a nutshell,378(77.77%) prescriptions contained a single antihypertensive drug whereas 108 (22.22%) a combination of antihypertensive drugs. The combination used commonly to treat hypertension was furosemide +spironolactone.

To our surprise, acetazolamide, thiazide-like diuretics, vasodilators were not at all prescribed to even a single patient because of the lack of availability and to be purchased from outside the vicinity of the hospital, whereas all the remaining drugs prescribed here are easily available that too at free of cost to all the patients attending the hospital for treatment.

Regarding adjuvant drug utilization therapy, pantoprazole (A02BC02=78%) was the most commonly used drug followed by atorvastatin (C10AA05=68%). Metformin (A10BA02 =31.72%) was the most commonly prescribed antidiabetic agent followed by glimepiride(A10BB12=18.6%). One among ceftriaxone (J01DD04), cefuroxime (cephalosporin antibiotics), amoxicillin, Piperacillin + Tazobactum was found in all the prescriptions. Either of pantoprazole or ranitidine had a place in almost all of the prescriptions. Aspirin + clopidogrel,

atorvastatin, Ipratropium bromide + Salbutamol, Insulin, multivitamin supplements were also amongst the most prescribed to the patients because of existing comorbid conditions.

Out of the total 486 prescriptions studied, WHO core indicators were assessed, analyzed and are explained as in the table-3.

**Table-3: Elaborates the WHO core indicators.**

| WHO core indicators | Results |
| --- | --- |
| Total number of drugs | 3416 |
| Total antihypertensive drugs | 689 (20.16%) |
| Total number of drugs per prescription | 7.02 (3416/486) |
| Total number of antihypertensive drugs per prescription | 1.417(689/486) |
| Drugs on WHO EML | 2136 (62.52%) |
| Drugs on NLEM 2011 | 2498(73.12%) |
| Drugs prescribed by brand name | 303/3416 (8.87%) |
| Drugs prescribed by generic name | 3113/3416 (91.13%) |
| Total encounters having injectable formulation | 182/3416 (5.32%) |
| Drugs prescribed as fixed dose combinations | 196/3416 (5.73%) |

The average duration of hospital stay was 8.41 ± 4.39 days. A total of 3416 drugs (5.32% parenteral, 94.68% oral formulations, 91.13% generic and 5.73% FDCs) [Table 3]were prescribed in all patients. The mean number of drugs prescribed per patient was 7.02 ± 3.27 (3416/486) which shows polypharmacy,[14] indicating increase in drug utilization and 87.32% cases used five or more drugs which may be related with multiple comorbidities. Use of five or more drugs concomitantly, called polypharmacy [14]could augment drug interactions and drug related problems. It is essential to stabilize the number of drugs and effective pharmacotherapy as it is difficult to treat patients in the emergency care with multiple comorbidities, who require treatment for specific condition as well as for prophylaxis.

Drugs on WHO EML[10]were 2136 (62.52%)while on NLEM [11]were 2498(73.12%) which is much higher than the similar study by Jaiprakash et al[16] (50%), suggesting improved adherence to these essential medicine lists in our Indian set up.

Drugs prescribed by generic names were 91.13% which is very much higher than that prescribed by their brand names 8.87%, as illustrated in table-3, which is the need of the hour for physicians as well as patients or medicine consumers to opt for generic drug utilization of pharmaceuticals and medicines in order to reduce economical burden on the society as well as on the consumers and patients.

**CONCLUSION:**

The information gathered should be a pointer to the trends in prescribing patterns. The present study could serve as a frame work upon which further studies in prescription audit can be launched to investigate the scope for educational intervention and improvement in prescribing patterns. The study emphasizes both needs and feasibility to perform prescription audit analysis using the accepted method of monitoring the utilization of drug in Indian setup. But still certain aspects like using fixed dose combinations during initiation of treatment, providing life style modification, changing the prescription with different combinations and doses of anti hypertensive drugs to attain normal blood pressure, providing advice on life style modification, were to be addressed as per guidelines. Medical audit improves the standards of treatment at all levels of health care delivery system. The study of prescribing pattern is a component of medical audit which seeks monitoring, advice, evaluation and necessary modifications in the prescribing practices of the prescribers to achieve rational and cost effective medical care. It is necessary to define prescribing pattern and to identify the irrational prescribing habits to drive a remedial message to the prescribers.

**LIST OF ABBREVIATIONS:**

AHA- antihypertensive agents

ADR- Adverse drug reactions.

ATC- Anatomical Therapeutic Chemical classification of drugs

DDD- Defined daily dose

EML- Essential Medicine List

 HTN- hypertension

NLEM- National List of Essential Medicines

WHO- World Health Organization

**REFERENCES:**

1. http://www.who.int/topics/hypertension/en/ Retrieved December 15, 2014.

2. Solanki KC, Mistry RA, Singh AP, Jadav SP, Patel NM, Trivedi HR. Drug utilization study of anti-hypertensive drugs and their adverse effects in patients of a tertiary care hospital. J Clin Exp Res, 2013; 1: 58-67.

3. Ramsay LE. British Hypertension Society Guideline for hypertension management: summary. Br Med J, 1999; 319: 630-5.

4. Kamrai D, Sachdeva P. Prescribing Trends of Antidiabetics In diabetic Patients and Hypertensive Diabetic Patients in an Urban Care Hospital. IJPBA. 2010; 1(2):249-55.

5. Tiwari H, Kumar A, Kulkarni KS. Prescription monitoring of anti-hypertensive drug utilization at the Punjab University Health Centre in India. Singapore Med J, 2004; 45(3): 117-20.

6. Sachdeva PD, Patel BG. Drug Utilization Studies- Scope and future perspectives. Int J Pharm Biol Res, 2010; 1: 11-7

7. Rational use of drugs.Retrieved December 5, 2014, from. archives.who.int/tbs/rational/h3011e.pdf

8. Rational use of drugs.Retrieved December 5, 2014, from www.who.int/medicines/areas/rational_use/en/

9. WHO - ATC/DDD Index. Retrieved December 12, 2014, from www.whocc.no/atc_ddd_index

10. WHO | WHO Model Lists of Essential Medicines . Retrieved December 12, 2014, from http://www.who.int/medicines/publications/essentialmedicines/

11. National List of Essential Medicines - Central Drugs Standard. Retrieved December 12, 2014, from. cdsco.nic.in/National%20List%20of%20Essential%20Medicine-%20final%20copy.pdf

12. Oslo: WHO Collaborating Centre for Drug Statistics Methodology; 2002. WHO Collaborating Centre for Drug Statistics Methodology. Guidelines for ATC Classification and DDD Assignment.

13. Oslo: WHO Collaborating Centre for Drug Statistics Methodology; 2002. WHO Collaborating Centre for Drug Statistics Methodology. ATC  index with DDDs.

14. Viktil KK, Blix HS, Moger TA, et al. Polypharmacy as commonly defined is an indicator value in the assessment of drug-related problems. Br J Clin Pharmacol, 2007; 63(2): 187-95.

15. Sharma HL, Sharma KK. Principles of Pharmacology. 2nd ed. New Delhi: Paras Medical Publisher; 2013; 265: 106.

16. Jaiprakash H, Vinotini K, Vindiya, Vsalni, Vikneshwara, Vigneswaran, Vinosha, Min CV. Drug Utilization Study of antihypertensive drugs in a clinic in Malaysia. Int J Basic Clin Pharmacol, 2013; 2(4): 407-10.