Vol 9|Issue 2| 2019 | 52-56.

ISSN 2249 - 7641
Print ISSN 2249 - 765X

International Journal of Pharmacology Research

www.ijprjournal.org

PHARMACOECONOMIC ANALYSIS OF ANTIHYPERTENSIVE DRUGS

Syed Sujat Pasha[1] & Nayana R Sakre[2*]

[1]Tutor, Department of Pharmacology, Bidar Institute of Medical sciences, Bidar, Karnataka, India.
[2]Tutor, Department of Pharmacology, Mandya Institute of Medical sciences, Mandya, Karnataka, India.

ABSTRACT

Clinically, hypertension may be defined as that level of blood pressure at which the institution of therapy reduces blood pressure-related morbidity and mortality. Current clinical criteria for defining hypertension generally are based on the average of two or more seated blood pressure readings during each of two or more outpatient visits. In the study two most frequently prescribed therapies, both in monothereapy and multitherapy group were compared for the cost effective ratio and quality of life. In Monotherapy group, Amlodipine is more cost effective with a mean CER of 8.93 rupees/mm of Hg whereas Atenolol group had a mean CER of 26.15 rupees/mm of Hg. Combination of Amlodipine with Enalapril was more cost effective with a mean CER of 18.24 rupees/mm of Hg as compared to combination Amlodipine with Atenolol with mean CER of 27.73 rupees/mm of Hg.

Keywords: Hypertension, CER, ICER.

INTRODUCTION

Hypertension is a very common disorder, particularly past middle age. It is not a disease in itself, but is an important risk factor for cardiovascular mortality and morbidity. From an epidemiologic perspective, there is no obvious level of blood pressure that defines hypertension. In adults, there is a continuous incremental risk of cardiovascular disease, stroke and renal disease across levels of both systolic and diastolic blood pressure. Among older individuals, Systolic Blood Pressure (SBP) and Pulse Pressure (PP) are more powerful predictors of cardiovascular disease than is Diastolic Blood Pressure (DBP) [1].

Clinically, hypertension may be defined as that level of blood pressure at which the institution of therapy reduces blood pressure-related morbidity and mortality. Current clinical criteria for defining hypertension generally are based on the average of two or more seated blood pressure readings during each of two or more outpatient visits.

Hypertension is one of the leading cause of the global burden of disease. Approximately 7.6 million deaths (13-15% of the total) worldwide were attributable to high blood pressure in 200l [2].

The 2003 global report showed that 7 million people die of hypertension each year and approximately 4.5% of serious diseases are caused by it. The situation in India is more alarming. It was reported that out of a total 9.4 million deaths in India in 1990, cardiovascular diseases caused 25% deaths. It has been predicted that by 2020, there would be a 111% increase in cardiovascular deaths in India. This increase is much more than 77% for China, 106% for other Asian countries and 15% for economically developed countries [3].

According to 'WHO health statistics 2012', the prevalence of hypertension in India was 23.1% in men and 22.6% in women in more than 25 years age.

Epidemiological studies have shown that hypertension is present in 25% of urban and 10% of rural subjects in India. There is a difference in measurement methodology of BP in epidemiological studies as compared

Corresponding Author:- **Nayana R Sakre** EMail ID:shujju88@gmail.com

to clinic-based measurements. It has been reported that, epidemiological studies that rely on single-session measurements over diagnose hypertension by 20–25%. If we discount this proportion, 19% adults in the urban and 7.5% in the rural areas shall be eligible for hypertension therapies. Translating these proportions into numbers reveals a massive burden of this disease in India [4].

A specific cause of hypertension can be established in only 10–15% of patients. Patients in whom no specific cause of hypertension can be found are said to have 'Essential or Primary Hypertension'. Patients with a specific etiology are said to have 'Secondary Hypertension'. It is important to consider specific causes in each case because some of them are amenable to definitive surgical treatment like renal artery constriction, coarctation of the aorta, pheochromocytoma, Cushing's disease, and primary aldosteronism [5].

In most cases, elevated blood pressure is associated with an overall increase in resistance to flow of blood through arterioles, whereas cardiac output (CO) is usually normal. Meticulous investigation of autonomic nervous system function, Baroreceptor reflexes, the Renin Angiotensin-Aldosterone system and the kidney has failed to identify a single abnormality as the cause of increased peripheral vascular resistance in essential hypertension. Therefore, it appears that elevated blood pressure is usually caused by a combination of several (multifactorial) abnormalities [6].

Epidemiological evidence points to genetic factors, psychological stress and environmental and dietary factors (increased salt and decreased potassium or calcium intake) as contributing to the development of hypertension. Increase in blood pressure with aging does not occur in populations with low daily sodium intake. Patients with labile hypertension appear more likely to have blood pressure elevations after salt loading.

The rising costs of healthcare delivery system is a major concern to all patients, healthcare professionals and the government. As the affordability of new medical technologies continues to be the subject of heated debate, attention is also increasingly focused on providing quality and cost-effective healthcare.

In this era of cost-conscious healthcare delivery, pharmacoeconomic research has evolved as a significant and important field of research. Pharmacoeconomic evaluation identifies measures and compares the costs and consequences of pharmaceutical products and services [7].

Economic evaluation of pharmaceutical products is increasingly used, reflecting that healthcare decision makers are placing increased emphasis on value for money from healthcare interventions. The fundamental economic problem is scarcity. Economic scarcity means that choices have to be made in allocating healthcare resources. Increased expenditure in one-area frequently results in a reduction in expenditure in another; economists refer to the benefits foregone as the opportunity cost.

Pharmacoeconomic evaluation provides us with the methodology to determine those treatment options, which will yield the maximum health gain per unit of currency spent. This is achieved by making explicit the opportunity cost of allocating resources to a particular treatment option [8].

Hence, these studies have been increasingly employed to assess the efficacy, effectiveness and availability of health care programs, procedure and services. 'Pharmacoeconomics' is a new word, but economic interest in drug and other treatments of health problems is much older. Decisions about what treatments should be available within a health-care system have always been influenced by the resources available to pay for them [9].

Economic evaluations started about 30 years ago as rather crude analysis, in which the value of improved health was measured in terms of increased labour production.

Over the last decade there has been tremendous interest in economic evaluations of healthcare programmes, especially in the pharmaceutical field. The term pharmacoeconomics was used in public forum was in 1986, at the meeting of pharmacist in Toronto, Canada, when Ray Townsend from the Upjohn company, used the term in presentation. Ray and few others had been performing studies using the term pharmacoeconomics within the pharmaceutical industry since the early eighties.

Today pharmacoeconomics research is a flourishing industry with many practioners, a large research and application agenda, several journals and flourishing professional societies including the international society for pharmacoeconomics and outcomes research (ISPOR) [10].

In many countries like (Australia, Canada, New Zealand, etc.) pharmacoeconomic evaluation is a mandatory part of the dossier for new drug applications and also for the drug to be considered for reimbursement by health care or insurance companies.

METHODOLOGY:

Source of data:

Patients attending OPD in General Medicine Department at Medical College

Inclusion criteria:

- Patients aged > 35 years.
- Both male and female.
- Patients with co morbidity like diabetes, hypothyroidism, coronary artery disease and myocardial infarction.
- Patients with any grade of hypertension.
- Patients with or without complications of hypertension.

Exclusion criteria:

- Pregnant women and lactating mother.
- Patient with psychiatric disorders.

- Patients with co morbidity such as renal transplant.

Sample size calculation:

A study was conducted in Brazil, with the aim to assess the influence of hypertension control upon HRQoL in hypertensive patients with and without complications. In the study 77 hypertensive patients were observed for 12 months with special care program. The patients Health Related Quality of Life (HRQoL) assessed using Bulpitt and Fltchers specific quastionnaire as well as Short Form (SF)-36 scores. Study concluded that special care program significantly controlled the hypertension but did not interfere with the health related quality of life (HRQoL). With reference to the above article in our study we took sample size as 100.

Sampling method:

Observational comparative study.

In the study two most frequently prescribed therapies, both in monothereapy and multitherapy group were compared for the cost effective ratio and quality of life.

RESULTS:

Out of 100 patients, 49% patients were in the stage of prehypertension, 45% were in stage I hypertension, 4% were in stage II and 2% were in stage III hypertension.

Table 1: Stages of Hypertension

Hypertension	Frequency	%
Prehypertension	49	49
Stage 1 HTN	45	45
Stage 2 HTN	4	4
Stage 3 HTN	2	2
Total	100	100

Out of 100 patients, 76% patients had hypertension since 6-10yrs, 16% since 11-15yrs, 5% since 0-5yrs and only 3% had it since last 16-20yrs.

Table 2: Duration of Hypertension

Duration	Frequency	Percent
0- 5 yrs	5	5
6 - 10 yrs	76	76
11- 15 yrs	16	16
16- 20 yrs	3	3
Total	100	100
Mean ± SD		8.67 ± 2.89

Out of 100 patients, 75% patients did not have any comorbid condition along with hypertension, 24% had Diabetes mellitus (DM), and only 1% patient had cancer.

Table 3: Comorbid Conditions

Comorbidity	Frequency	%
Carcinoma	1	1
Diabetes Mellitus	24	24
No comorbidities	75	75
Total	100	100

Out of 100 prescriptions, 74% were Multitherapy and 26% were Monotherapy.

Table 4.Type of antihypertensive therapy used by the study subjects

Therapy	Frequency	%
Monotherapy	26	26
Multitherapy	74	74
Total	100	100

In Monotherapy group, Amlodipine is more cost effective with a mean CER of 8.93 rupees/mm of Hg whereas Atenolol group had a mean CER of 26.15 rupees/mm of Hg with [p-0.0059].

Table 5: Mean CER in monotherapy group rupees /mm of Hg

	No. of			
Monotherapy	cases	Mean	SD	P value
AT	5	26.15	22.43	0.0059
AM	21	8.93	7.57	

Combination of Amlodipine with Enalapril was more cost effective with a mean CER of 18.24 rupees/mm of Hg as compared to combination Amlodipine with Atenolol with mean CER of 27.73 rupees/mm of Hg with [p<0.057].

Table 6: Mean CER in multitherapy group rupees /mm of Hg

	No. of			
Multitherapy	cases	Mean	SD	P value
AT,AM	57	27.73	22.74	0.057
AM,EN	9	18.24	10.90	

Table 7. ICER in Monotherapy Group

Therapy	**AT**	**AM**	**Difference**	**ICER**
Cost(rupees)	126	54	72	51.42
SBP(mmHg)	8	6.6	1.4	

Table 8. ICER in Multitherapy Group

Therapy	AM with EN	AM with AT	Difference	ICER
Costs (rupees)	174	180	6	2.97
SBP (mmHg)	11.56	9.54	2.02	

DISCUSSION:

Hypertension is one of the leading causes of global burden of disease and as it is a chronic condition with significant detrimental effects on the wide range of health outcomes, cost effective management of hypertension appears to be a great challenge for both developed as well as developing countries.

Even though, recently there have been lot of studies in the field of pharmacoeconomics and outcome research (PEOR) on hypertension in different countries , but the results cannot be extrapolated to Indian scenario as the economic status and socioeconomic factors are different in India as compared to the other countries. Hence country specific PEOR studies are required to frame the effective health policies.

Our study was undertaken with an aim to evaluate the most cost effective treatment out of the commonly prescribed antihypertensive drugs at VIMS Bellary, in collaboration the Department of General Medicine.

In a study conducted in Tanzania, Prescription patterns and the cost of some antihypertensives were studied in 600 patients attending medical clinics at four private hospitals in Dar-es-Salaam. About 50% of the prescriptions contained 2 to 3 drugs. Antihypertensives prescribed as monotherapy included Atenolol(23.2%), Bendrofluazide(22%), rusemide(19%),Hydralazine(11.2%), Nifedipine(9.8%), Amlodipine(9.5%) and Enalapril(9.3%). Among the combination therapy drugs were ACE inhibitors +diuretic (7%), BB+diuretic (4%), CCB + Losartan (2.3%), BB+ ACE inhibitor (2.2%), CCB + ACE inhibitor (1.8%) and Diuretic+Hydralazine (1.7%). The cost of Nifedipine, Bendrofluazide and Frusemide were about five to six times higher in the private hospitals than at the government owned medical stores department. This study reveals a need for continued education and standard treatment guidelines for rational prescribing of antihypertensive drugs [11].

Similarly in one more study conducted by De Gusmao JL et al., with the objective to assess the influence of hypertension control upon HRQoL in hypertensive patients with and without complications. In the study 77 hypertensive patients were observed for 12 month [12].

In contrast to the above studies**,** our study included 100 patients, out of which 51% were females and 49% were males.

Prescription pattern analysis showed, multitherapy as major prescription pattern (74%) and monotherapy formed 24% of all prescriptions.

Most frequently used multitherapy was combination of Atenolol with Amlodipine(54%) followed by combination of Amlodipine with Enalapril (9%) and in monotherepy most frequently prescribed drug was Amlodipine (80%) followed by Atenolol (20%).

In a randomized control trial conducted by Tsuji RG et al., to evaluate the cost effective ratio of two antihypertensive therapeutic drug combination Hydrochlorothiazide plus Atenolol versus Losartan plus Amlodipine in patients with different grades of hypertension. Study showed, antihypertensive treatment that used Hydrochlorothiazide combined with Atenolol was more cost effective than the combination of Losartan and

Amlodipine in patients with grade 1 and 2 hypertension, however there was no difference between cost effective ratio of these treatment regime in grade 3 hypertensive patients [13].

A study conducted by Mishchenko O, analysed the cost effectiveness of the new triple Fixed Drug Combination (FDC) Valsartan-Amlodipine-Hydrochlorothiazide compared with other antihypertensive regimes using dual FDCs

Valsartan-Amlodipine, Valsartan-Hydrochloro thiazide, Amlodipine-Hydrochlorothiazide in terms of Ukrain payers. At the end of the study it has been found that triple FDC Valsartan-Amlodipine-Hydrochlorothiazide is more cost effective compared to the other regimes. But with the view of cost analysis, triple FDC is cheapest only to the dual FDC Valsartan-Hydrochlorothiazide [14].

In a comparative study conducted by Ikuo S et al, in 55 years old patients with moderate hypertension with presence or absence of concomitant diabetes, four treatment regimes were compared: initial Angiotensin receptor blocker (ARB) with calcium channel blocker (A+C), initial Calcium channel blocker with additional Angiotensin receptor blocker (C+A), initial ARB with additional Diuretics (A+D), initial Diuretics with additional ARB (D+A). Among patients without diabetes, expected survival and cost were similar in all treatment groups. Among the patients with concomitant diabetes expected survival was longest and expected costs were lowest in the group A+C. Expected survival decreased and expected costs increased in the order of A+D, C+A, D+A groups. The study concluded that presence of concomitant diabetes affected the cost effectiveness [15].

In our study patients with age >35 yrs were included. Majority of the patients (38%) were in the age group of 40-50yrs, (32%) in 50-60 yrs with the mean age as 55.17+10.3yrs.

CONCLUSION:

- Multitherapy was most frequently prescribed, similar to the other studies suggesting that rational prescription and FDCs play an important role in effective management of hypertension.
- In monotherepy Amlodipine is more cost effective than Atenolol and in multitherapy Amlodipine with Enalapril combination is more cost effective than Amlodipine with Atenolol combination.

REFERENCES

1. Walley T, Davey P. Pharmacoeconomics: A challenge for clinical pharmacologists. *Br J Clin Pharmacology*, 40, 1995, 199-202.
2. Fletcher A. Economics of hypertension control: A statement by the world hypertension league. *J Hum Hypertens*, 8, 1994, 789-95.
3. Degli Esposti L, Valpiani G. Pharmacoeconomic burden of undertreating hypertension. *Pharmacoeconomics*, 22, 2004, 907-28.
4. Economic Survey of India 2014-15. Ministry of Statistics and Program Implementation. (cited 2015 sep 29) available from statisticstimes.com/ economy/gdp-capita-of-india.php
5. Lopert R. Cost-effectiveness analysis—A technique for decision-making at the margin. *J Clin Pharm Ther*, 28, 2003, 243-9.
6. Neaton J D et al. Treatment of mild hypertension study (TOMHS)-Final results. *JAMA*, 270, 1993, 713–724.
7. Lopert R. Cost-effectiveness analysis—A technique for decision-making at the margin. *J Clin Pharm Ther*, 28, 2003, 243-9.
8. Shanableh S, Abdulkerim A, Shamssain M, Sarhan F. Quality of Life of Hypertensive Patients on Different Types of Antihypertensive medications. *ISOR Journal of Pharmacy*, 4(5), 2014, 23-28.
9. Gupta R, Sharma AK, Kapoor A, Prakash H. Epidemiological studies and treatment of hypertension. *J Assoc Phys Ind*, 45, 1997, 863–864.
10. Kasper D, Fauci A. Harrison's principles of internal medicine.19th edition.New York: McGraw-Hill Education, 2015. p.1616
11. Rimoy GH, Justin-Temu M and Nilay C. Prescribing Pattern and Cost of Antihypertensive Drugs in Private Hospital in Dar es Salaam, Tanzania. *East and Central African Journal of Pharmaceutical Sciences*, 11, 2008, 69-73.
12. De Gusmão JL, Mion Jr D, Geraldo Pierin AM. Health Related Quality of Life and Blood Pressure Control in Hypertensive Patients With and Without Complications. *CLINICS*, 64(6), 2009, 619-29.
13. Tsuji RG, Da Silva GV, Ortega KC and Berwanger O . An economic evaluation of antihypertensive therapy based on clinical trials. *CLINICS*, 67(1), 2012, 41-48.
14. Mishchenko O, Lakovlieva L and Adonkina V. Pharmacoeconomic evaluation of fixed-dose triple combination for antihypertensive therapy in Ukraine. *JHPOR*, 1, 2014, 66-75
15. Ikuo S, Kobayashi M, Matsushita Y and Saruta T. Pharmacoeconomic Evaluation of Combination Therapy for Lifetime Hypertension Treatment in Japan. *JMAJ*, 48(12), 2005, 574-85.