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RESEARCH ARTICLE

Evaluation of Cost and Different Treatment Alternatives for Hypertensive Patients in a Tertiary Care Teaching Hospital, Davangere

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ABSTRACT

Hypertension is a prevalent chronic disease strongly related to the development of cerebrovascular, cardiovascular diseases leading to increased morbidity and mortality. This study aims to review the antihypertensive use, the cost of the antihypertensives, and implications on management in our local setting. A prospective review of the annual cost of antihypertensive medications was undertaken at a Tertiary care teaching hospital, Davangere. Seventy eight case records of the patients were identified, assessed, evaluated and analyzed for the cost of antihypertensives for a period of 1 month, 3 months and 1 year. The comparative studies of the drugs prescribed were also done to find the effectiveness of the antihypertensive regimen. The majority of patients were either on 2 (50%) or 3(29.49%) antihypertensive drugs. The mostly prescribed medications were Calcium Channel Blockers (33.84%), Angiotensin Receptor Blockers (15.38%), Diuretics (14.61%) followed by other drugs. In terms of cost, α-adrenergic blockers were the most costly drugs followed by ARB's, ACE's, and CCB's. Diuretics were the preferred first line antihypertensive regimen and the most cheapest drug of all the classes. Comparative studies shows that ARB's (Telmisartan) were the most efficacious drug of all the classes and the drug combination of ARB's plus CCB's were considered more effective than a combination of ARB'S or CCB's with a diuretic. The cost has huge monetary implications as they represent a large proportion of the annual antihypertensive allocation. There may be a need to reverse the trend in developing world due to cost restrictions.

KEYWORDS

Hypertension, Evaluation, Blood Pressure, Cost

INTRODUCTION

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 mm Hg when the heart relaxes (diastolic). When systolic blood pressure is equal to or above 140 mm Hg and/or a diastolic blood pressure equal to or above 90 mm Hg the blood pressure is considered to be raised or high.[1]

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National Scenario of Hypertension

In India, hypertension is the leading non-communicable disease risk and estimated to be attributable for nearly 10% of all deaths. Adult

hypertension prevalence has risen dramatically over the past three decades from 5% to between 20-40% in urban areas and 12-17% in rural areas. The number of hypertensive individuals is anticipated to nearly double from 118 million in 2000 to 213 million by 2025.[2]

International Scenario of Hypertension

Hypertension is currently the leading risk resulting in considerable death and disability worldwide and accounted for 9.4 million deaths and 7% of disability adjusted life years (DALYs) in 2010.[2] Prevalence of hypertension worldwide in the year 2000 was estimated to be 26.6% in men and 26.1% in women. This was estimated to rise to 29.0% in men and 29.5% in women by 2025. It was estimated that around two-thirds of those people with hypertension worldwide were living in developing countries (639 million) in 2000, and that this would rise to three-quarters living in developing countries (1.15 billion) by 2025.[3]

Diseases associated with hypertension are not only of chronic disabling nature but require frequent hospitalization with expensive drug treatment and management.[4]. Antihypertensive drug treatment often has elevated costs, a limitation that has not always been taken in account in clinical practice.[5]

Global Economic Burden of Hypertension

In 2001, it accounted for 10% of global healthcare expenditure underlining the considerable economic implications to resource constrained health systems, particularly those in low and middle income countries. In 2004, the annual income loss from non-communicable diseases among working adults in India was 251 billion (about US$ 50 billion) and that due to hypertension alone amounted to 43 billion.[2]

Treatment of hypertension is costly, and estimating the cost of hypertension treatment is of significant importance to determine the monetary impact of disease treatment on the society.[9] Given the increasing prevalence of hypertension and the continually rising expense of its treatment, measures that influence prescribing patterns could have a considerable impact on health expenditure.[6]

In general the health gains and related cost savings achieved by optimizing treatment in hypertensive patients is highly important. Thus the present project is aimed at finding out which treatment option is the most considerable in Hypertensive patients so that the economic burden on the patients can be reduced.

Objectives

General Objective

- Identification, Evaluation and Assessment of various antihypertensive treatments that the patients are receiving in a Tertiary Care Teaching Hospital.

Specific Objectives

- To classify the stages of hypertension according to JNC 7.
- To classify and compile the antihypertensive drugs collected from the medication charts according to JNC 7.
- To record the expenses involved in prescribed antihypertensive drugs of different classes for 1 month, 3 months and 1 year.
- To categorize the hypertensive patients according to their economic status.
- To categorize the antihypertensives prescribed according to cost and prescribing patterns of the hypertensive class of drugs.
- To compare the prescribed antihypertensive drugs with the standard published literature on comparative studies of different classes of antihypertensive.

MATERIAL AND METHODS

The study has been approved by the Institutional Ethical Committee of Bapuji Pharmacy College, Davangere. This is a prospective observational study conducted in medicine wards of a tertiary care teaching hospital in Davangere. The patients were selected and assessed for the evaluation of cost and different treatment alternatives for hypertensive patients by following the inclusion and exclusion criteria. The inclusion criteria had

patients diagnosed with hypertension as well as hypertension related complications such as diabetes mellitus, cerebrovascular disorders, cardiac problems (myocardial infarction, CCF, cardiac arrhythmia, angina pectoris) admitted to the medicine ward. Paediatric and pregnant patients were excluded. The data about the patients were collected from the in-patient case sheets.

Development of Patient Data Collection Form

A suitably designed patient data collection form was developed based on literature survey. The information included; patient demographic details, occupation and income, BP reading, diagnosis, co-morbidities, standard JNC classification of hypertension, the complete drug therapy, JNC 7 pharmacological classification of antihypertensive drugs, estimation of cost and pharmacist assessments for proving the superiority of antihypertensive drug class.

Study Procedure

- The investigators attended the ward rounds on daily basis in the medicine wards of a tertiary care teaching hospital and collected the details of hypertensive patients from the case sheets.
- The investigators collected the patient demographic details, diagnosis, co-morbidities, BP reading and complete drug therapy of the hypertensive patients.
- Hypertensive cases were classified according to the standard JNC 7 classification.
- Antihypertensive drugs were selected from the medication chart and these were categorized according to the JNC 7 pharmacological classification.
- The collected data was evaluated for recording and analyzing the cost of antihypertensive therapy for 1 month, 3 months and for a year.
- The superiority of prescribed antihypertensive drug classes concerning the efficacy was assessed on basis of review of comparative studies of different classes of antihypertensive in published journals.

RESULTS

The case records of 78 patients who were diagnosed with hypertension and also known case of hypertension were collected. Of the 78 patients, majority of patients were either on one 16(23.08%), two 39 (50%) or three 23(29.49%) antihypertensives. 40 (51.28 %) were male and 38 (48.72%) were female.

Age Group Details of Hypertensive Patients (n= 78)

Age group (years)	Total (n=78)
35-45 yrs	10 (12.84%)
46-55 yrs	16(20.51%)
56-65 yrs	31(39.74%)
66-75 yrs	16(20.51%)
76-85 yrs	04(5.12%)
86-95 yrs	1(1.28%)

The occupational status of the individuals was analyzed based on the following criteria: 47(61.55%) patients were agriculturist, 9 (11.53%) were business men, 10 (12.82%) were government employees, 12(15.10%) belonged to other group. The income of the patient was categorized as: 38(48.71%) were 1000-5000, 35 (44.87%) were 5000-10000 and 5(6.42%) were 10000-15000.

Details of Hypertension Duration and Position in the Patients (n=78)

Hypertension duration (years)	Hypertension (n=78)
Just found	10(12.82%)
< 1 yr	12(15.38%)
1-5 years	41(52.56%)
6-10 years	12(15.38%)
More than 10 years	03 (3.86%)

Details of Systolic Blood Pressure Position in the Patients (n=78)

Systolic Blood pressure classification (mmHg)	Hypertension (n=78)
Normal <120	00
Pre-HTN (120-139)	14 (17.94%)
Stage-1 HTN (140-159)	45 (58.99%)
Stage-2 HTN (≥160)	18 (23.07%)

Details of Diastolic Blood Pressure Position in Patients (n=78)

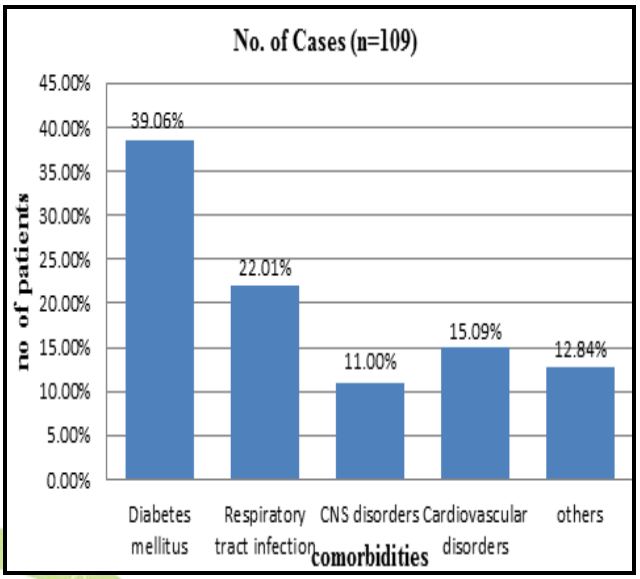
Diastolic Blood pressure classification (mmHg)	Hypertension (n=78)
Normal <80	04(5.12%)
Pre-HTN (80-89)	15(19.23%)
Stage-1 HTN (90-99)	37 (47.45%)
Stage-2 HTN (≥100)	22(28.20%)

Co Morbidities Associated with Hypertension

42 (39.06%) of the patients had diabetes mellitus, 24 (22.01%) had respiratory tract infections (RTI'S), 12(11%) had CNS disorders, 17(15.09%) had Cardiovascular diseases and 14 (12.84%) had other co-morbidities.

Antihypertensive Frequently Prescribed

Of the 78 patients, 44(33.84%) were prescribed with calcium channel blockers, 10(7.96%) with α+β adrenergic blockers, 16(12.30%) with β-adrenergic blockers, 20(15.38%) with ARB's, 19(14.61%) with diuretics, 8(6.15%) with α-adrenergic blockers, 9(6.96%) with ACE inhibitors, 4(3.07%) with central sympatholytic.



Drug Class	Antihypertensive (n= 130)
Calcium channel blockers	44(33.84%)
α+β adrenergic blockers	10(7.69%)
β- adrenergic blockers	16(12.30%)
ARBs	20(15.38%)
Diuretics	19(14.61%)
α- adrenergic blockers	8(6.15%)
ACE inhibitors	9(6.96%)
Central sympatholytics	4(3.07%)

Combinations of Antihypertensive Mostly Prescribed

14(38.88%) were prescribed with ARB + diuretic, 5(13.88%) with CCB'S + β-Blockers, 5(13.88%) with ARB + CCB, 11(30.59%) with diuretics and 1 (2.77%) with CCB's + diuretics.

Details of the Cost of Antihypertensive Regimen

Drug class	Dose	Frequency	1month	3month	1year
Angiotensin receptor blocker					
Tab.Telma	40mg	1-0-1	510.6	1531.8	6127.2
	40mg	1-0-0	255.3	765.9	3063.6
Tab.Telma	20mg	1-0-0	139.8	419.4	1676.6
Tab.Losartan	5mg	1-0-0	219	657	2628
α+β-adrenergic blocker					
Tab.Carvistar	3.125mg	1-0-1	207	621	2484
Tab.carvedilol	3.125mg	1-0-0	103.5	310.5	1242
Diuretics					
Tab.Aldactone	25mg	1-0-0	51.76	155.5	621.12
	25mg	1-0-1	103.58	310.56	1242.24
	50mg	0-0-1	101.13	303.39	1213.56
Tab.lasix	40mg	1-0-0	20.13	60.39	241.56
Tab.frusemax	50mg	1-0-0	14.25	42.75	171
Tab.Tideplus	10mg	1-0-0	61.23	183.69	734.76
Calcium channel blockers					
Tab.Amlokind	5mg	1-0-0	15.08	45.24	180.96
		1-0-1	192.76	578.28	2313.12
Tab.Amlong	5mg	1-0-0	96.38	289.14	1156.56
		1-0-1	385.52	1156.56	4626.14
Tab. Amlodac	5mg	1-1-1	267.48	802.44	3209.76
Tab.Eslo	2.5mg	0-0-1	235.5	706.5	2826
Tab.Nicardia R	10mg	1-0-1	89.46	268.38	1073.4
B-blockers					
Tab.Aten	50mg	1-0-0	100	300	1200
Tab.Cardibeta XR	25mg	1-0-0	117.51	352.53	1410.12
Tab.Metolar	25mg	1-0-0	126	378	1512
Tab.ProlometXL	12.5mg	0-0-1	81	243	972
Angiotensin converting enzyme inhibitors					
Tab.Envas	2.5mg	1-0-0	56.08	108.24	672.96
	5mg	1-0-1	186.48	559.44	2237.76
	10mg	0-0-1	164.04	493.02	1118.88
Tab.Ramistar	5mg	0-1-0	303	909	3636
Tab.Cardace	2.5mg	1-0-0	239.4	718	2872.8

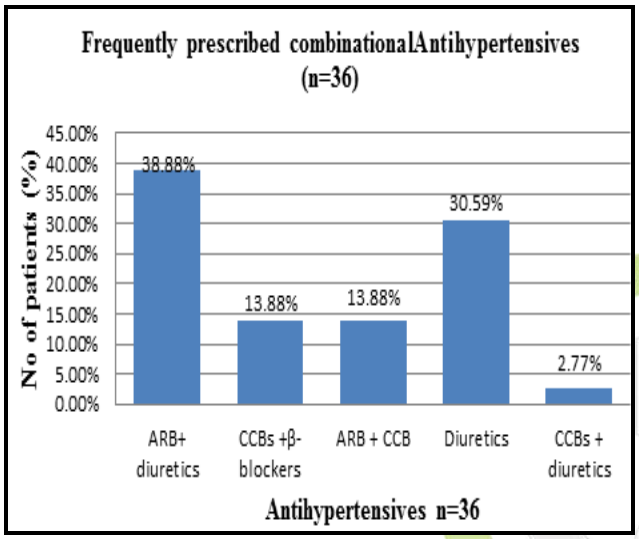
α-adrenergic blocker					
Tab.PazopressXL	5mg	1-0-0	381	1143	4572
Tab.Minipress XL	5mg	1-0-0	376	1128	4512
	5mg	1-0-1	752	2256	9024
Central sympatholytics					
Tab.Arkamin	100mcg	1-0-0	34.5	103.5	414
	100mcg	1-1-1	103.5	310.5	1242
Tab.Cilacar	10mg	0-0-1	174.31	552.23	2090
	10mg	1-0-1	348.42	1045.26	4181.04

Details of cost of Combinational Antihypertensive Therapies

Drug class	dose	frequency	1month	3month	1year
Tab.cilamet XL	10mg	1-0-1	450	1350	5400
Tab.telmistat H	40mg	1-0-0	255.3	765.9	3063.6
Tab.amlosure AT		0-0-1	81	243	972
Tab.telzy	40mg	1-0-0	262.8	788.4	3513.6
Tab.tesart H	40mg	1-0-0	285	855	3420
Tab.metpure	25mg	1-0-0	282.6	847.8	3391.2
Tab.Amlong H		1-0-0	236.4	709.2	2836.2
Tab.telmikind H		1-0-0	117	351	1404
Tab.lasilactone		1-1-0	137.52	412.56	1650.2
Olmet H		1-0-0	276	828	3312
Tab.fruselac		0-0-1	40.74	122.22	488.88
		1-1-0	136.44	409.32	1637.28
Tab.telista AH	20mg	1-0-0	273	819	3276
Tab.dytor plus	10mg	1-0-0	84.54	253.62	1014.4
	10mg	1-1-0	169.08	507.2	2028
	20mg	1-0-0	61.23	183.69	734.76
	20mg	1-1-0	223.08	669.24	2676.96

Cost of Antihypertensive

A total of 78 case records were assessed in which α –adrenergic blockers like Tab Pazopress XL, Tab Minipress XL were the most costliest drugs followed by ARBs like Tab Telma 40mg, Tab Losartan 5mg ; ACE inhibitors like Tab Ramistar 5mg ; CCBs Tab Eslo 2.5mg, Tab amlodac 5mg ; β blockers like Tab Metolar 25mg ; Tab Cardibeta XR 25mg and the least costly group of diuretics like Tab frusemax 50mg, Tab Lasix 40mg and Tab Tideplus 10mg.



Cost of Combinational Antihypertensive

A total of 78 case records were assessed and the cost of each combinational drug class with different dose and frequency for a period of 1 month, 3 months and 1 year were calculated.

DISCUSSION

Seventy eight patients who were diagnosed with hypertension and also were known cases of hypertension along with their co-morbidities were identified after considering the inclusion and exclusion criteria. Thorough details on the patient disease state and drug therapy was obtained from the nurse, who is in charge of the patient. The prevalence of hypertension is more in males than in females considering the age, life style, stress and social habits like smoking and alcoholism leading to the increased risk of hypertension and their related co-morbidities. The maximum no. of patients with hypertension were from 56-65 yrs- 31(39.74%), may be because most of them were retired from their work, less physical activity, stress, family burden, financial tension, ignorance about the disease, irregular medical screening. . The prevalence of hypertension is very less in the age group of 76-85 yrs - 04 (5.12%) and 86 - 95 yrs- 1 (1.28%) may be due to age, increased mortality rates of hypertension and their related complications, ignorance and carelessness of family members to bring the patient to regular health screening and treatment. The occupational status was found to be more in agriculturist 47(61.55%) who come from the nearby villages for the health screening and get admitted for hypertension, related complications along with the co morbidities. The majority of patients 38 (48.71%) had an income of 1000-5000, who were mostly agriculturist and who were working on daily wages including some businessmen.

The patients were prescribed mostly with – one 16 (20.51%), two 39 (50%) and three 23 (29.49%) antihypertensives. And the mostly prescribed drug in the tertiary care teaching hospital was calcium channel blockers 44 (33.84%) like amlodipine, Nifidipine and clinidipine followed by 20 (15.38%) of ARB's like Telmisartan, Losartan, and rarely Olmesartan, 19 (14.61%) patients were prescribed with diuretics like furosemide and spironolactone, 16 (12.30%) with β-adrenergic blockers like atenolol, metoprolol and propranolol, 10 (7.69%) with α+β adrenergic blockers like carvedilol, 9 (6.96%) with ACE inhibitors like enalapril and ramipril, 8 (6.15%) with α- adrenergic blockers like prazosin, 4(3.07%) with central sympatholytics like clonidine and rarely moxonidine.

The mostly prescribed combinational drug in the tertiary care teaching hospital with 14 (38.88%) were prescribed with combination of ARB + diuretic like Telmisartan / Losartan with hydrochlorothiazide, followed by 11(30.59%) with diuretic combination of furosemide and spironolactone, 5(13.88%) were prescribed with ARB + CCB like Telmisartan and amlodipine, 5(13.88%) were CCB'S + β-Blockers like metoprolol / atenolol with amlodipine and very less combination of 1(2.77%) of CCB's + diuretics like amlong and hydrochlorothiazide.

By comparison of the cost of different class of antihypertensives it was concluded that, the costliest drugs were α-adrenergic blockers followed by ARB's, ACE inhibitors, CCB's and β-Blockers. While nominally ARBs are more expensive when drug cost are considered they only provide substantial cost saving and may prevent cardiovascular morbidity and mortality based on the more complete antihypertensive coverage. This makes ARBs an attractive choice for long term treatment of hypertension[7]. In studies conducted by Pedro Marques-Vidal it is shown that Diuretics was the least costliest drug as compared to others. In monotherapy, using thiazides as a first line treatment for mild to moderate uncomplicated hypertension considerable savings can be generated for health-care system.[8]

The combination of Telmisartan and hydrochlorothiazide was the costliest drug and the combination of diuretics was the cheapest compared to other classes. This result correlates to the study conducted by Olayinka Stephen Ilesanmi, et al. which shows that Diuretics as a Fixed Dose Combinations also emerged as one of the most effective treatment option.[9] Among the combinational therapies with ARBs, Calcium antagonists and Diuretic, the most suitable combination for antihypertensive patients with concomitant diabetes is ARB plus additional calcium antagonist, from the pharmacoeconomical point of view.[10]

Comparative Studies of Different Drug Classes

Literature review of various articles and journals regarding the comparative studies of various classes of antihypertensive drugs shows that ARB's like Telmisartan has greater efficacy and tolerability than other classes of antihypertensive drugs. Telmisartan provided greater decrease in mean hourly systolic and diastolic blood pressure throughout the 24 hrs dosing interval as compared to ACE inhibitors and calcium antagonists. The antihypertensive efficacy of ARB's results from their ability to specifically antagonize binding of Angiotensin II to the AT_1 receptor. ARBs was better tolerated than calcium antagonist and ACE inhibitors, with a lower incidence of all adverse events and treatment related edema compared with the calcium antagonists.[11] Diuretics were considered the first line therapy and were mostly prescribed but has not proved much efficacious in complicated stages of hypertension and were switched to ARB's and other drugs. By comparative studies between the ACE inhibitors and β-blockers it was found that both the drugs are equally effective in lowering BP and preventing cardiovascular events for patients whose BP is not control with the thiazides diuretics alone and who have no compelling indication for a specific second line agents. This suggest the both ACE inhibitors and β-blockers are a reasonable choice for add-on therapy for patients with essential HTN.[12] The comparative studies between ACE inhibitors and CCBs suggest that ACE inhibitors are superior to CCBs and diuretics in protection against cardiovascular events and renal diseases. It can be concluded that the use of CCBs in the routine therapy of HTN cannot be recommended by wider use of ACE inhibitors along with low dose diuretics and β-blockers appears justified.[13]

The comparative studies of the combination drugs suggests that the combination of ARB or ACE inhibitor with a CCB, is considered the best two drug combination and most effective drug combination for cardiovascular events. Patients who are insufficiently responsive to two antihypertensive agents are increasingly likely to be "water retainers" and therefore use of a diuretic is recommended.[14, 15]

Strengths

- Assessment and review of the antihypertensive drugs was achieved.
- The evaluation of the cost incurred in different antihypertensive treatment regimens.
- The comparison of the prescribed antihypertensive drugs with the similar comparative studies in published literature was done for implication of management and to assess the effectiveness of antihypertensive in the Tertiary Care Teaching Hospital.

- The data generated can be utilized in pharmacoeconomical evaluations for assessing the cost and effectiveness.

Limitations

- There are no definite prescribing guidelines followed for comparison of prescribed antihypertensive drugs.
- The influence of patient's compliance and persistence with treatment was not considered for the period of one month, three months and one year.
- Small number of patients was included in the study which has the limitation that all the drugs or their combinations may not be recorded and evaluated for the cost.
- A thorough pharmacoeconomical evaluation is to be considered to ascertain the same level of blood pressure control could be achieved with cheaper alternatives.
- Titration of each drug to assess the effectiveness which could not be done in a limited period.

CONCLUSION

In conclusion, the most costliest drugs in this clinical settings were the α-adrenergic blockers followed by the Angiotensin receptor blockers. The combination of ARB's and Diuretics were more costly than other combination of β-blockers and CCB's and the diuretic combination which are mostly prescribed in this hospital. These medications however, take up the majority of our annual hypertensive budget and a true cost effectiveness analysis need to be undertaken to ascertain the sustainability of this trend, its macro-economic implications and whether the same level of blood pressure control could be achieved with cheaper alternatives.

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