Cost Effectiveness of Treating Hypertension in an Urban Area of Kerala State, India

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ABSTRACT

Published on 30th December 2014

Introduction: One of the factors that may lead to poor control of blood pressure is high cost of treatment. An idea regarding the average cost of controlling hypertension in the community would help to assess the cost effectiveness of hypertension control programmes. This study aimed to estimate the Average Monthly Expenditure for treating Hypertension in an urban setting and compare the Cost-Effectiveness of Combination Drug Therapy over Mono Therapy.

Methods: This was part of a Cross Sectional Study done among 500 known hypertensive patients of age 30 years and above. Cluster Sampling Technique was used. Methods of Data Collection included Personal Interview and Measurement of Physical Parameters. JNC VII criteria was used for the classification of hypertension.

Results: The overall expenditure for the treatment of Hypertension in the study group ranged from Rs. 0 – 1,300 per month with a Mean of 247.18 (SD: 199.7). Blood Pressure control was found to be significantly associated with Total monthly treatment expenditure. Combination therapy was found to be as cost effective as mono therapy for hypertension control.

Conclusions: Doctors should make it a point to strictly adhere to the treatment guidelines. Choice of drugs and dosages should be rational, based on the patients age, blood pressure levels and co morbid conditions among other factors. Combination therapy should be advised whenever necessary.

Keywords: Cost Effectiveness Analysis, Hypertension, Blood Pressure Monitoring, Blood Pressure Control, JNC 7, Kerala

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INTRODUCTION

Among the major risk factors of cardiovascular diseases, hypertension stands out to be the most important one. Effective treatment that reduces BP changes the natural history of hypertension-related end points, especially for cerebrovascular events and, somewhat less so, for coronary events. Hypertension carries a high population-attributable risk for subsequent CHF, accounting for 39% of cases in men and 59% in women. The overall Relative Risk of CHF in 12 randomized controlled trials between 1967 and 1991 was reduced to 0.48 [95% confidence interval (CI), 0.38–0.59] among treated versus control subjects.[1] As in most situations, preventing the end organ damage is more effective than trying to reverse the changes once they are established. It has been estimated that a 5 mmHg reduction of SBP in the population would result in a 14 percent overall reduction in mortality due to stroke, a 9 percent reduction in mortality due to CHD, and a 7 percent decrease in all-cause mortality.[2]

One of the patient factors that may lead to poor patient compliance resulting in poor control of blood pressure is high cost of medication. Because hypertension is found to be fairly common among the low socioeconomic status categories of our society, treatment would become unaffordable to these patients if expensive drugs are being prescribed. It is always helpful to know if high cost of treatment is a factor that hampers effective control of blood pressure. Also an idea regarding the average cost of controlling hypertension in the community would help to assess the cost effectiveness of hypertension control programmes.

Cost-effectiveness analysis is the most common form of economic evaluation in health care because of its relative simplicity. Its use does not require benefits to be valued in money terms. Cost-effectiveness analysis deals with technical efficiency and seeks to answer the following question. Given that it has been decided that a goal is to be achieved, what is the best way of doing so or what is the best way of spending a given budget? Thus, cost-effectiveness analysis always involves comparison of at least two options with the same goal.[3] There is plenty of western

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literature available on the cost and cost effectiveness of treating various diseases including hypertension. But these are rare to come across in the Indian context.

OBJECTIVES

1. To estimate the Average Monthly Expenditure for treating Hypertension in an urban setting.
2. To compare the Cost-Effectiveness of Combination Drug Therapy over Mono Therapy in the treatment of Hypertension.

MATERIALS AND METHODS

This cost effectiveness analysis was done from a Cross Sectional Descriptive Study done by the authors in the Thiruvananthapuram City Corporation Area, Kerala State. The study population included known Hypertensives of age 30 years and above who were prescribed some form of intervention (Pharmacologic or Non-pharmacologic) at some point of time. Those Hypertensives with documented evidence of Secondary Hypertension were excluded from the Study. This is because the treatment modalities for Secondary Hypertension are markedly different from that of essential Hypertension. Also those individuals not willing to give consent were excluded.

Cluster Sampling Technique was used. 20 Clusters were selected from the 81 Wards of Thiruvananthapuram Corporation. Households were taken as Primary Sampling Units. The Wards were listed according to the 2001 census. The sampling interval was arrived at by dividing the total number of households by 20. 25 houses with one or more known hypertensives were selected from each cluster. If more than one hypertensives were present in one house, drawing of lots was done. Sample size obtained was 500.

A questionnaire which was pre-tested by doing a Pilot Study among 30 Subjects was used for data collection. Informed consent was obtained from every participant. Measurement of Blood Pressure was done at the beginning of the interview as well as at the end.

Establishment of Hypertension Control status was done by measurement of Blood Pressure using a calibrated and standardized electronic blood pressure measurement equipment – the Omron MX3 Plus. This is an equipment widely used world over, the accuracy of which has been validated according to the European Society of Hypertension International Protocol in a study published in 2005.[4]

A minimum of two blood pressure measurements were done on every participant. Criteria for blood pressure control was chosen as systolic blood pressure <140 mm Hg and diastolic blood pressure <90 mm Hg, as per the Joint National Committee VII recommendations **(Table 1)**

Analysis and Interpretation

Table 1. JNC 7 Classification of blood pressure levels

Blood Pressure Classification	SBP mmHg	DBP mmHg
Normal	<120	and <80
Prehypertension	120–139	or 80–89
Stage 1 Hypertension	140–159	or 90–99
Stage 2 Hypertension	>160	or >100

Cost effectiveness analysis was done to compare between Mono therapy and Combination drug therapy. Only direct costs for treating hypertension were included.

A ratio was calculated for the average cost of controlling Hypertension using combination therapy against that for mono therapy. The analysis was done using Microsoft Excel, Epi Info and SPSS Statistical Software.

Ethical Considerations

Ethical Clearance was obtained from the Institution Ethical Committee of Medical College, Thiruvananthapuram. Informed consent was obtained from all participants. Advises regarding treatment and lifestyle modification were given to all participants whose blood pressures were not under control. Those participants requiring emergency medical attention were referred to appropriate centres.

RESULTS

The age of the study population ranged from 30 to 90 years with a mean of 60.18 (SD.11.75). Nearly one third (31.6%) of the subjects belonged to 56 to 65 years category (95% CI - 27.6% to 35.9%). 64.8% of the subject were females (95% CI - 60.4% to 69.0%). The apparent skew in the Gender Distribution may be attributed to the fact that Hypertension is more often undetected among men in comparison to women.[5] Studies show that up to 63% of newly detected hypertensives are men.[6] 80.4% of the study subjects were Hindus (95% CI – 76.6% to 83.7%), 17.2% were Christians and 2.4% were Muslims. A Socio-economic Status Score was calculated using a modified version of the Kuppuswamy Scale. Accordingly 52.8% of the study population belonged to the middle Socio-economic class **(Figure 1).**

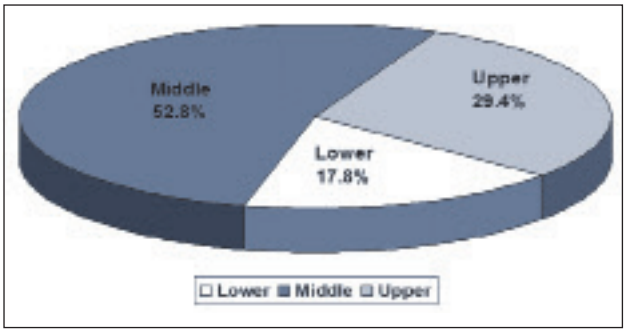

Figure 1. Distribution of Study Population by Socio-Economic Status

Table 2. Monthly Treatment Expenditure

	N	Minimum	Maximum	Mean	Std. Deviation
Expenditure for Drugs	500	0	1050	122.54	102.685
Expenditure for Consultation	500	0	1100	86.93	110.325
Incidental Expenditure	500	0	200	13.13	39.051
Expenditure for Lab	500	0	300	24.57	49.634
Total Expenditure	500	0	1300	247.18	199.742

The Systolic Blood Pressure of the study group ranged from 99mm Hg to 201mm Hg with a Mean of 149.2 (SD: 22). The Diastolic Blood Pressure ranged from 54mm Hg to 131mm of Hg with a Mean of 87.5mms (SD: 11.3). 22.8% of the subjects had Uncontrolled (Isolated) Systolic Hypertension. 202 participants out of 500 had their Blood Pressure below 140/90mm Hg. Thus the prevalence of hypertension control as per the JNC VII Criteria was 40.4%.

Treatment Expenditure

The overall expenditure for the treatment of Hypertension in the study group ranged from Rs. 0 – 1,300 per month with a Mean of 247.18 (SD: 199.7). It can be seen that this is much less in comparison to western figures. The overall Treatment Expenditure included expenditure for Drugs, Consultation, Laboratory Investigation and Incidental Expenditure **(Table 2).**

Table 3. Treatment Expenditure and Hypertension Control

		Hypertension Status		Total
		Controlled	Uncontrolled	
Total Treatment Expenditure	High	114 46.0%	134 54.0%	248 100.0%
	Low	88 34.9%	164 65.1%	252 100.0%
TOTAL		202 40.4%	298 59.6%	500 100.0%
Chi Square Value	P – Value	Odds Ratio	95 % Confidence Interval	
6.335	0.012	1.585	1.106 to 2.272	

Blood Pressure control was found to be significantly associated with Total monthly treatment expenditure **(Table 3).** The more the money spent on consultation, drugs and investigations, the better the control. This highlights the fact that those who cannot afford expensive treatment may be poorly controlled.

Cost Effectiveness Analysis

A Cost Effectiveness Analysis was done to compare between Combination and Mono Therapy. Means of Total Monthly Treatment Expenditure was taken as costs for each group. Percentage controlled was taken as the effect. Combination therapy had a mean expenditure of Rs. 365.21 (SD = 224.833) against Rs. 203.96 (SD = 170.696) for mono therapy and the difference was statistically

Table 4. Hypertension Control by Drug Combination

		Hypertension Status		Total
		Controlled	Uncontrolled	
Drug Combination	Yes	78 58.2%	56 41.8%	134 100.0%
	No	124 33.9%	242 66.1%	366 100.0%
TOTAL		202 40.4%	298 59.6%	500 100.0%
Chi Square Value	P – Value	Odds Ratio	95 % Confidence Interval	
24.113	0.000	2.718	1.812 to 4.079	

significant (P = 0.000) **(Table 4).**

Among those taking combination therapy 58.2% were controlled and among those taking mono therapy 33.9% were controlled.

Cost Effectiveness = Cost of Controlling using combination Therapy / Cost of Controlling using Mono Therapy = (365.21/58.2)/(203.96/33.9) = 6.275/6.016 = **1.04**

DISCUSSION

It can be seen that cost of controlling Hypertension using combination therapy is only marginally more than mono therapy. Taking in to account the increased control rate of combination therapy, it should be resorted to whenever necessary. Also the benefits of better hypertension control in terms of cardiovascular events averted, QUALYs and DALYs saved etc. need to be further worked out. This comes under the purview of Cost Benefit Analysis.

A study published in the American Journal of Hypertension in 2006 say that the mean incremental annual direct expenditures for an individual with hypertension in the US was $ 1,131. This amounts to around Rs. 51,000.[7]

In a Brazilian Study published in 2002, the annual mean costs of care for hypertension for an individual was 1080 Brazilian Real (Rs. 22407). The cost-effectiveness relationship was calculated as a ratio of the annual mean cost to the proportion of patients with controlled hypertension, for each pharmacological group. Overall, the cost-effectiveness relationship was more advantageous for diuretics and beta blockers than for the ACE inhibitors or calcium channel blockers.[8]

In a Japanese study looking in to the cost effectiveness of combination therapy over monotherapy found that in the combination therapy group, higher efficacy and lower incremental treatment cost were observed when compared to the monotherapy group.[9]

In a British study published in 2004, costs and cost-effectiveness of intensive blood pressure lowering in patients with hypertension was looked into. It was found that the treatment cost increases as the target for hypertension

treatment is lowered. In patients with diabetes, intensive treatment to a lower target is cost-effective.[10]

In a Spanish study that looked in to the cost effectiveness of hypertension treatment using various drugs, greatest-to-lowest cost-effectiveness of assessed treatments was as follows: hydrochlorohiazide, propranolol, nifedipine, prazosin and captopril in moderate/severe hypertension and hydrochlorothiazide, nifedipine, propranolol, prazosin and captopril in mild hypertension.[11]

A Norwegian study published in 2001 comparing the costs and cost effectiveness of amlodipine and enalapril (two very common drugs used in our setting) in the treatment of hypertension showed that the average costs per amlodipine-treated patient were consistently lower ($112.30) than for the enalapril-treated patient by week 50. Treatment with amlodipine resulted in an average cost per success of $609 per patient compared with $772 per enalapril-treated patient.[12]

The only significant study on the cost of treatment of hypertension in India was from the Department of Pharmacology, Postgraduate Institute of Medical Education and Research, Chandigarh, published in 2001. This study was conducted in patients attending the hypertension clinic of Nehru Hospital, PGI. A total of 1,076 prescriptions were evaluated. Beta-adrenoceptor-blocking agents (51%), calcium antagonists (47%) and angiotensin-converting enzyme inhibitors (46%) were the most popular drugs. The utilisation of thiazides was less than expected. Combination therapy was used more commonly than monotherapy (53.8% vs. 46.7%). Oral hypoglycaemic agents and lipid-lowering agents were commonly co-prescribed along with antihypertensive medications. About 30% of drugs were prescribed by generic name and 90% were from the national essential drugs list. Of the per capita income of the patients, 10.6% was spent on the treatment of hypertension. The mean monthly cost of various drugs ranged between US $0.8 and US $6.6. This translates to an annual cost of Rs. 440 to Rs. 3624.[13]

Thus it can be seen that the cost of treatment of hypertension is much lower than that in the developed countries. In this context it should be remembered that the control rates of hypertension in India is also very low in compared to developed countries. A clarity on the situation can be obtained only if cost effectiveness studies are carried out extensively.

CONCLUSION

Effectively controlling hypertension to recommended levels markedly reduces the chances of adverse outcomes. The average monthly expenditure for treating hypertension in the population was found to be Rs. 247/-. Combination therapy is as cost effective as mono therapy for hypertension control.

Doctors should make it a point to strictly adhere to the treatment guidelines. Choice of drugs and dosages should be rational, based on the patients age, blood pressure levels and co morbid conditions among other factors. Combination therapy should be advised whenever necessary.

Limitations of the Study

Cost effectiveness Analysis did not take into account the long term benefits of better hypertension control. A Cost Benefit Analysis can be done to account for the long term benefits of better hypertension control.

Conflict of Interest: None declared

END NOTE

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Conflict of Interest: None declared

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