



Research Article

A Prospective Study On Cost Of Illness Among Hypertensive Inpatients At A Tertiary Care Hospital In Dakshina Kannada

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ABSTRACT

Hypertension is a chronic disease that requires lifelong therapy, which may impose economic burden on patients. The objective of this study was to analyse cost of illness [using direct medical cost] among hypertensive subjects. **Materials and method:** A prospective observational study was conducted at a tertiary care hospital in Dakshina Kannada for period of 6 months. 150 hypertensive patients who were on at least one antihypertensive medication, admitted to in-patient department were included for the cost of illness study. **Result:** According to the study, 54% of hypertensive subjects were above 60- 75 years of age. The average number of drugs per prescription was 9.7 ± 3.78 and majority of total direct cost was attributed to medication and medical supplies cost (44%) followed by laboratory cost (28%). **Conclusion:** The study concludes that as medication cost was the major contributor to the healthcare expenses, reducing the cost by prescribing drugs by their generic name would not only reduce cost burden on patients, but also improve adherence.


INTRODUCTION

Hypertension is the leading contributor to the global burden of disease and a growing public health problem worldwide causing 7.5 Million deaths every year.¹ World-wide, hypertension is the most significant modifiable risk factor for both cardiovascular disease (CVD) and overall mortality. The prevalence of hypertension has increased especially in low- and middle-income countries (31.5%), than in in high-income countries (28.5%).² Inadequately treated

hypertension can cause major organ damages, especially in subjects with higher blood pressure, leading to increased disease burden.³ Cost of illness (COI), also known as Burden of Diseases (BOD), includes various aspects of impact of disease on the health outcomes in an individual, specific regions, communities, nation.⁴ Various parameters in estimating cost of illness, especially direct medical cost includes - drugs, medical supplies and devices, laboratory and diagnostic tests, health professional cost.⁵ Estimation of cost

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of illness (direct medical cost) will assist in determining the major contributor to the disease burden on the society, which would assist in developing appropriate strategies to reduce such burden on the general population.⁶

OBJECTIVE

To analyse cost of illness [using direct medical cost] among hypertensive subjects.

MATERIALS AND METHODS

Study design: This study is a prospective observational study carried out at a tertiary care teaching hospital, Dakshina Kannada

Study setting and duration: The study was conducted among inpatients of Srinivas institute of Medical Science and Research Centre, Mukka-574146 for a duration of 6 months from January 2022 to July 2022. The study protocol was approved by the Institutional Ethics Committee (IEC) of Srinivas Institute of Medical Science, Mukka, Mangalore.

Sample size: The study was limited for a sample of 150 based on the time schedule allotted for the project including other circumstances.

Study criteria: The patients were enrolled in the study as per the inclusion and exclusion criteria.

Inclusion criteria:

- Hypertensive patients above 18 years of age
- Patient with comorbid conditions: Stroke, CKD, DM, Hyperlipidemia, CHF and others
- Patient on at least one oral antihypertensive drug

Exclusion criteria:

- Out-patients
- Patients below 18 years of age

Source of data:

Data(s) for the study were collected using data collection form from the in-patient medical case files.

Study method:

- Initially 200 in-patient case files with hypertension containing equal proportions of

male and female were collected, maintaining confidentiality. This was done to avoid bias.

- Selection of case files: 150 cases were filtered out based on the inclusion and exclusion criteria
- Collection of data from selected case files: Data were collected using data collection form from the in-patient case files. It includes patient's demographic details, blood pressure level, comorbidities, final diagnosis, drug generic name, brand name, dose, frequency, route of administration, number of days of hospitalisation, cost of each medication and total medication cost. It also includes health personnel cost, laboratory cost, medical supply cost and ward cost.

Data analysis

The collected data were analysed using Microsoft Excel (Version 2208). The prescriptions were screened using WHO prescribing indicators where the number of drugs per prescription, percentage encounter with injections and percentage of generic name of the medicines prescribed were calculated and the average cost of illness that includes average cost of medicines and medical supplies, laboratory cost, health personnel cost and ward cost was determined.

RESULT

Demographic Characteristics of Participants:

Age group distribution:

The study was conducted with sample size of 150 and the subjects were all hypertensive patients above 18 years of age. Among the 150 subjects, 54% belonged to age group 61 to 75 years [N=81, Male-49, Female-32]. 30% of sample were from age group of 41 -60 years [N=45, Male-18, Female-27]. 12% of subjects were from age group above 75 years [N=18, Male-8, Female-10]. 4% of sample were of age group 18-40 years and all were male [6] as shown in Table1.

Gender and BMI:



In this study 54% of the participants were male patients among them 14.81% were underweight and 40.7% were of normal weight, 32.09% over weight, 12.34% were obese and out of 46% of the female patients, 5.79% were found to have underweight, 33.33% had normal weight, 43.47% were overweight and remaining 17.39% were obese as per Table 1.

Clinical characteristics of participants:

HTN Classification

Data showed that among male patients, 33.33% had stage 1 HTN, 23.45% had stage 2 hypertension and hypertensive crisis, 9.87% had elevated BP and the remaining had normal BP, and in female

34.78% had stage 1 hypertension, 27.53% had stage 2 hypertension , 14.49% had hypertensive crisis, 13.04% had elevated BP and the rest were normal as depicted in Table 1.

Comorbidities:

While analysing the prescriptions for comorbidities, it was found that 24.84% had Diabetes Mellitus, 12.75% had renal disease, 12.09% had other cardiovascular disease, and 8.17% were having lung disorders. CNS disorders, thyroid disorders, dyslipidemia, liver disorders and anemia constituted 5.23%, 4.90%, 3.92%, 3.27%, 2.29% respectively. 22.55% had other comorbidities as shown in Table 1.

Table 1: Demographic And Clinical Characteristics Of Hypertension

Demographic characteristics	Male n=81		Female n= 69		Total N=150	
	n	%	n	%	n	%
AGE						
18- 40 years	6	7.41%	0	0.00%	6	4.00%
41-60 years	20	24.69%	27	39.13%	47	31.33%
61-75 years	47	58.02%	33	47.83%	80	53.33%
Above 75 years	8	9.88%	9	13.04%	17	11.33%
BMI						
Under weight - <18.50kg/sq.m	12	14.81%	4	5.80%	16	10.67%
Normal weight - 18.50-24.99 kg/sq.m	33	40.74%	23	33.33%	56	37.33%
Overweight - 25.0- 29.99 kg/sq.m	26	32.10%	30	43.48%	56	37.33%
Obese - >/= 30 kg/sq.m	10	12.35%	12	17.39%	22	14.67%
Clinical characteristics						
Blood Pressure [mmHg]						
Normal <120/80	8	9.88%	7	10.14%	15	10.00%
Elevated 120-129/<80	8	9.88%	9	13.04%	17	11.33%
Stage 1 HTN 130-139/80-89	27	33.33%	24	34.78%	51	34.00%
Stage 2 HTN 140 or </90 or <	19	23.46%	19	27.54%	38	25.33%
Hypertensive Crisis 160</120<	19	23.46%	10	14.49%	29	19.33%
Comorbidities			Total		Percentage	
Diabetes Mellitus			76		24.84%	
Renal disease			39		12.75%	
Other Cardiovascular disease			37		12.09%	
Lung disorders			25		8.17%	
CNS disorders			16		5.23%,	
Thyroid disorders			15		3.92%,	
Dyslipidemia			12		4.90%,	
Liver disorders			10		3.27%,	
Anemia			7		2.29%	
Others			69		22.55%	

Analysis of prescription:

It was found that the average number of drugs per prescription was computed to 9.7 ± 3.78 [Mean \pm SD and WHO standard value is 1.6-1.8]. 81% of the prescriptions had at least one injection [where WHO standard value is 20-26.8%] and 34% of the prescriptions had drugs prescribed in generic name [WHO standard value is 100%]. All the prescriptions had at least one antihypertensive. While analysing the prescriptions for the classes of drugs prescribed other than antihypertensives, it was found that 15.42% of them were gastroprotectants, 14.01% were antibiotics, 11.31% were analgesics, 9.25% antidiabetics, It was found that out of 150 prescriptions, 29 prescriptions had fixed dose combination and the most frequently prescribed antihypertensive as monotherapy was CCB-Amlodipine (N=43) and ARB- Telmisartan (N=25)

Cost of illness (Direct medical cost):

Conforming to the study, average cost of illness was calculated using the direct medical cost where 44% (₹ 6,027.53) of the cost consisted of medication and medical supply cost, 28% (₹ 3,906.03) was due to laboratory cost followed by 19% (₹ 2,653.75) for health personnel cost and 9% (₹ 1,270.00) was due to ward cost as depicted in Figure 1.

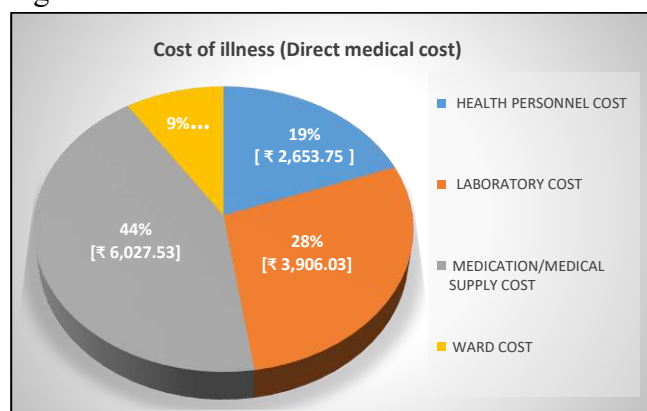


Figure: 1 Cost of illness (Direct medical cost)

When medication and medical supply mean cost was calculated, it was found that 99% of the expense was due to medication charges as shown in the figure 2. Among health personnel cost,

doctor charge accounted for about 55% and remaining 45% was due to nurse charge as depicted in figure 3.

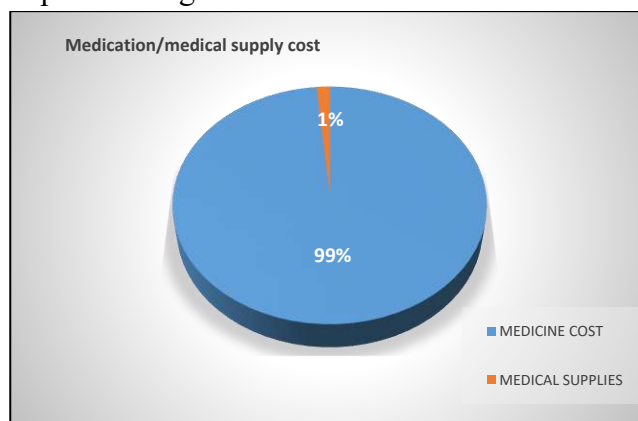


Figure: 2 Medication and medical supplies cost

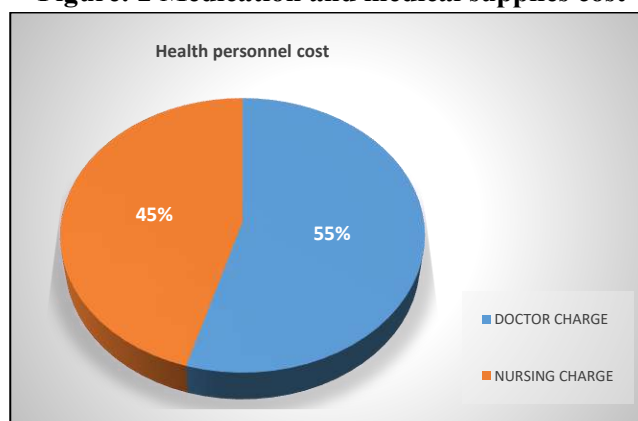


Figure: 3 Health personnel cost

From the study, it was found that the most frequently performed laboratory investigations were Biochemistry, Microbiology, ECG, Complete Blood Count, with the average cost of ₹590, ₹460, ₹250 and ₹500 respectively as shown in Table 2.

Table 2: Average Cost Of Most Frequently Performed Laboratory Investigations

Laboratory investigations	Average cost (₹)
Biochemistry	₹590
Microbiology	₹460
ECG	₹250
Complete Blood Count	₹500

DISCUSSION

A study on cost of illness is necessary to analyse the cost burden of disease on the patients.

According to the study, 66% [N=99, M=57, F=42] of hypertensive subjects were of above 60 years of age, which was similar to the study conducted by Kokiwar PR *et al.*, where prevalence increased with age; especially in those with age ≥ 60 years.⁷ The specific underlying mechanisms of HTN in older persons, increase in the aortic and large-artery wall thickness and decrease in vessel elasticity, alteration in baroreceptor sensitivity, decrease in plasma renin, Impaired renal function.⁸ As stated in the study, the prevalence of hypertension was seen more in males (54%) compared to females (46%) which corresponds to the findings of similar study performed by Gupta S *et al.*, where the prevalence of hypertension was more in men (49%) than in women (46%).⁹ In this study, prevalence of HTN within the age group of 40years in male was seen more compared to female [male- 4%[N=6], female- 0%] where all were male, but during the fourth decade of age, the rate of developing HTN in female was high. The likelihood of developing hypertension increases with the increasing age.¹⁰

The gender differences in hypertension are due to both biological and behavioural factors.¹¹ The biological factors include sex hormones, chromosomal differences, and other biological sex differences that are protective against hypertension in women.¹² The lower prevalence of hypertension in women may be attributed to the protective effects of estrogen, which is lost later in their life leading to a steep increase in developing hypertension.¹⁰

According to a study carried out by Baig M *et al.*, the prevalence of overweight based on calculated body mass index (BMI) was 29.8% while the prevalence of obesity was 10.7% and severe obesity was 7.9%.¹³ Similar results were found in the present study where 37.3% of sample were overweight and 14.67% were obese. Obesity primarily increases tubular reabsorption, which

activates the SNS and RAS to impede pressure natriuresis and produce volume expansion.¹⁴

In this study, 34% had Stage 1 HTN, 25.33% had stage 2 HTN and a similar finding was reported in a study by Shukrala F *et al.*, where out of 400 samples, most of the patients had Stage 1 hypertension (69%), followed by Stage 2 hypertension (31%).¹⁵

The most common comorbidities were 24.84% had Diabetes Mellitus, 12.75% of patients had renal disease, and 12.09% had other cardiovascular diseases. Which correlates with the study by Datta S *et al.*, where diabetes (44.7%), ischemic heart disease (27.2%), and renal parenchymal disease (20.2%) were the most common comorbidities.¹⁶

Hypertension and diabetes are common, intertwined conditions and complications. Patients with hypertension frequently have insulin resistance and have a higher risk of acquiring diabetes than people with normotension.¹⁷

A reduced number of functional nephrons, retention of sodium and volume expansion, upregulation of the sympathetic nervous system, hormonal elements like upregulation of the renin-angiotensin-aldosterone system, and endothelial dysfunction are some of the factors that interact to cause hypertension in the context of chronic kidney disease.¹⁸

This study estimated 44% of the cost consisted of medical and medication cost, 28% was due to laboratory cost followed by 19% for health personnel cost and 9% was due to ward cost, which was similar to the study reported by Solanki ND *et al.*, where cost of medication constituted 28.53%, health personnel cost constituted for 25.43% and laboratory cost constituted 11.24%.¹⁹

According to the present study, while analysing the prescription based on WHO core indicators, it was found that the mean number of drugs per prescription was computed to 9.77 ± 3.78 , 81.33% of the patients received at least one injection and

only 36% of the prescriptions had generic names. This was similar to the study done by Shrestha B *et al.*, where among 605 prescriptions analysed, the average number of drugs per prescription was 5.85 indicating polypharmacy, 71% of patients received injectable form of drugs and only 16.94% of the medicines were prescribed in generic names with the rest 83.06% of the medicines being prescribed in brand names.²⁰ As hypertension is a chronic disease requiring lifelong management and also there is a higher chance of having comorbidities and it was observed that the drugs prescribed increased with progression of disease along with different comorbid conditions.²¹ Overprescribing results in polypharmacy, which has detrimental effects like increased patient financial load and disease burden, as well as non-adherence.^{22,23,24} Prescribing drugs using generic names is a good practice as it decreases medical confusion, enhances clarity amongst healthcare professionals, assists hospital pharmacies to have an effective inventory control and allows selection of better drug alternatives.²⁵ Another factor that contributes to increased cost of treatment is overprescribing of injectables, which are costlier than other dosage forms and are also associated with problems like local irritation, phlebitis, and extravasation. This study is consistent with other studies which shows higher contribution of medication to cost burden.²⁶

CONCLUSION

As medication cost was a major contributor to healthcare expenditures among hypertensive patients, reducing the price of the drugs would not only reduce the cost burden of disease on the patients, but also provide a substantially improved adherence to the therapy and adequate blood pressure control. This can be achieved by prescribing drugs in their generic name. In this regard, healthcare professionals and the patient can opt for other branded generic or Jan Aushadhi medicines. With regard to limitations of the study

including smaller sample size and limited duration of the study, we advise cost effectiveness analysis which examines both cost and health outcomes of the interventions given and the cost minimization strategies to compare different therapies and decide on least costly alternative that would be beneficial to the general public.

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ABBREVIATIONS

CVD: Cardiovascular Diseases, **COI:** Cost of Illness, **BOD:** Burden of Disease, **WHO:** World Health Organization, **CKD:** Chronic Kidney Disease, **DM:** Diabetes Mellitus, **CHF:** Congestive Heart Failure, **HTN:** Hypertension, **BMI:** Body Mass Index, **CCB:** Calcium Channel Blocker, **ARB:** Angiotensin Receptor Blocker.

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