EVALUATING THE COST-EFFECTIVENESS OF DIFFERENT GROUPS OF HYPERTENSION THERAPY: A PHARMACOECONOMIC STUDY

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ABSTRACT

Objective: The study objective is to evaluate among the different groups of antihypertensive for their cost-effectiveness and to provide information about the effective management of hypertensives both clinically and economically.

Methods: This study involves 81 patients aged 18–80 years on antihypertensive treatment who were enrolled from December to May with daily dose calculation. It is performed to analyze cost-effectiveness in the management of clinical condition. Data collection form to be entered with age, sex, food habits, occupational status, clinical data, and drugs was used for treatment. Incremental cost-effectiveness ratio is calculated based on the incremental cost for “per mmHg” reduction and cost for “per patient” reaching target blood pressure (BP).

Result: Angiotensin receptor blockers (ARBs) show a significant average reduction of systolic BP (SBP) and beta-blockers (BBs) show an average reduction of diastolic BP (DBP). Angiotensin-converting enzyme inhibitors (ACEIs) are cost effective in SBP and calcium channel blockers are cost effective in maintaining DBP.

Conclusion: ARBs, BBs, and ACEIs show the effective management of hypertensives both clinically and economically.

Keywords: Antihypertensive, Cost-effectiveness, Systolic blood pressure, Diastolic blood pressure.

INTRODUCTION

Hypertension (HTN) also known as high blood pressure (BP) is a condition where the BP has persistently raised in the blood vessels. Blood is carried to all parts of the body from the heart, and the heart pumps blood into the vessels. The force of blood pushing against the walls of the arteries is called as BP. If the pressure is high, it is harder to pump the blood from the heart [1]. HTN has a multifactorial etiology, which combines both environmental and genetic factors [2]. HTN is one of the risk factors for the development of all the major cardiovascular diseases such as coronary artery disease, peripheral artery disease, stroke, heart failure, and renal failure which commonly affect the elderly [3].

Treatment strategies

HTN management has two approaches, which are lifestyle modification and add-on drug therapy [4].

Pharmacoeconomics

In health care, an economic evaluation is defined as “a comparative analysis of alternative courses of action in terms of both their costs and consequences” [5]. It is a branch of health economics that deals with both the costs and benefits of the drug therapy applied to the healthcare system [6,7]. However, assessment of clinically obtained data is the part of economic evaluation and judgment. The role of new drug therapy is based mainly on the clinical evidence of drugs’ harms and benefits [8].

Specific tools in the pharmacoeconomic analysis to allow the orderly and comprehensive collection of data [9]

1. Cost-consequence analysis
2. Cost-minimization analysis
3. Cost-effective analysis
4. Cost-utility analysis
5. Cost-benefit analysis
6. Cost of illness analysis.

Need for pharmacoeconomic analysis in India

In a developing country like India, the total health expenditure is nearly 85% on drug which is a major financial burden on households. A major part of private health care spending in India goes to drug and per capita private drug estimates as USD 16. Due to limited resources and high cost of drugs, many people in India frequently face a choice buying medicines or food or other necessities. Hence, medicines and its costs do matter in India [10]. Pharmacoeconomics serves as a link between medicine and market economy [7]. Pharmacoeconomics implies the application of economic principles to evaluate pharmaceuticals [8]. The aim is to maximize health benefit for the community to be delivered considering the existing limited financial resources [7].

METHODS

A prospective cross-sectional study includes both genders of age between 18 and 80 years and excludes the patients who are pregnant and lactating women and patients with any comorbidity such as acute emergency hypertensive patients, renal transplant patients, and malignancy condition. The study group is categorized into two groups which include either monotherapy or combination therapy. Monotherapy includes angiotensin receptor blockers (ARBs), angiotensin-converting enzyme inhibitors (ACEIs), calcium channel blockers (CCBs), and beta blockers (BB). Combination therapy includes ARBs with CCBs or BBs or ACEIs. This study was approved by the Institutional Ethics Committee of VISTAS with reference number “VISTAS-SPS/IEC/1/2017/07.” Patients on antihypertensive treatment were enrolled and studied with daily dose calculation. Study was performed to analyze cost-effectiveness in the management of clinical condition. Data collection form includes age, sex, occupational status, clinical data, and drugs used for treatment. Incremental cost-effectiveness ratio is calculated based on the incremental cost for “per mmHg” reduction and cost for “per patient” reaching target BP. The values were statistically evaluated by daily dose.
calculation and incremental cost for “per mmHg” reduction and cost for “per patient” reaching target BP.

### Table 1: Data on patients enrolled for the study

| Therapy | Percentage of patients received treatment (%) |
|---------|-----------------------------------------------|
| Single-drug therapy | 79.01 |
| Two-drug combination therapy | 17.28 |
| Three-drug combination therapy | 3.71 |

### Table 2: Social and clinical parameters

| Age (in years) | Duration of treatment (in years) | BMI | Weight gain (%) | Weight loss (%) | Family history (%) | Smoking (%) | Alcoholism (%) | Stress (%) | Obese (%) | Active (%) | Non-worker (%) | Pensioner (%) |
|----------------|----------------------------------|-----|-----------------|-----------------|-------------------|------------|---------------|-----------|-----------|-----------|--------------|--------------|
| 18–30          | 0                                | 0   | 0               | 0               | 0                 | 0          | 0             | 0         | 0         | 0         | 0            | 0            |
| 31–50          | 1–5                              | 1.11| 26.19           | 32.01           | 35.80             | 17.28      | 0.93          | 25.92     | 11.11     | 0         | 18.52        | 24.6         |
| 51–70          | 6–10                             | 51–70| 2.83           | 1.22            | 1.7               | 0          | 0             | 24.69     | 11.11     | 0         | 24.6         | 4.93         |
| 71–80          | 9–15                             | 35.80| 1388.35        | 25.34           | 420.54            | 1192.80    | 423.24        | 25.82     | 80        | 0         | 31012.83     | 17.28        |

### Table 3: Therapy provided to selected patients (n=81)

| Therapy                  | Percentage of patients treated (%) |
|--------------------------|-----------------------------------|
| Single-drug therapy      | 79.01                             |
| Two-drug combination therapy | 17.28                            |
| Three-drug combination therapy | 3.71                             |

### Table 4: Cost-effectiveness of anti-hypertensive drugs based on DBP

| Therapy | Annual cost (Rs.) | Average reduction (mmHg) | Percentage of patients with target DBP | Cost/average reduction (Rs.) | Cost/target reduction (Rs.) |
|---------|-------------------|--------------------------|----------------------------------------|-----------------------------|------------------------------|
| ARB     | 777.45            | 4.3                      | 100                                    | 1808.02                     | 77.74                       |
| BB      | 3978.5            | 4.74                     | 100                                    | 839.34                      | 39.78                       |
| ACE     | 967.25            | 1                        | 70                                     | 967.25                      | 13.78                       |
| CCB     | 854.1             | 1.22                     | 67                                     | 700.08                      | 12.74                       |
| ACE+CCB | 8336.6            | 1.7                      | 100                                    | 4903.88                     | 83.36                       |
| ARB+BB  | 5551.65           | 2.82                     | 80                                     | 1966.67                     | 69.39                       |
| ARB+ACE | 3412.75           | 3.4                      | 100                                    | 1003.75                     | 34.12                       |
| ARB+CCB | 3869.00           | 5.09                     | 100                                    | 760.11                      | 38.69                       |
| BB+ACE  | 5354.55           | 2.6                      | 100                                    | 2059.44                     | 53.54                       |
| ARB+CCB+BB | 9303.85        | 0.3                      | 100                                    | 31012.83                    | 93.03                       |
| ARB+BB+ACE | 11245.65       | 1.4                      | 100                                    | 8032.60                     | 112.45                      |

### Table 5: Cost-effectiveness of antihypertensive drugs based on SBP

| Therapy | Annual cost (Rs.) | Average reduction (mmHg) | Percentage of patients with target SBP | Cost/average reduction (Rs.) | Cost/target reduction (Rs.) |
|---------|-------------------|--------------------------|----------------------------------------|-----------------------------|------------------------------|
| ARB     | 7774.5            | 10.4                     | 84                                     | 747.54                      | 92.55                       |
| BB      | 3978.5            | 9.4                      | 90                                     | 423.24                      | 44.20                       |
| ACE     | 967.25            | 9.5                      | 85                                     | 101.81                      | 11.37                       |
| CCB     | 854.1             | 7                        | 80                                     | 122.01                      | 10.67                       |
| ACE+CCB | 8336.6            | 7                        | 67                                     | 1190.94                     | 124.42                      |
| ARB+BB  | 5551.65           | 10.5                     | 100                                    | 528.72                      | 55.51                       |
| ARB+ACE | 3412.75           | 8.6                      | 100                                    | 396.83                      | 34.12                       |
| ARB+CCB | 3869.00           | 9.2                      | 100                                    | 420.54                      | 38.69                       |
| BB+ACE  | 5354.55           | 8.5                      | 100                                    | 629.94                      | 53.54                       |
| ARB+CCB+BB | 9303.85       | 7.8                      | 100                                    | 1192.80                     | 93.03                       |
| ARB+BB+ACE | 11245.65       | 8.1                      | 100                                    | 1388.35                     | 112.45                      |
• CCBs hold the lowest cost among the single-drug therapy (Table 4).
• ARBs with ACEIs hold the lowest cost among two-drug combination therapy (Table 5).
• ARBs with BBs and CCBs hold the lowest cost among three-drug combination therapy.
• Cost-effectiveness of anti-HTN drugs based on the cost/average reduction and cost/patients with target BP.
• ARBs with CCBs show a significant reduction in BP. ACEIs show cost effective in the reduction per mmHg reduction of SBP. CCBs show the cost effective in the reduction per mmHg reduction of DBP. CCBs shows the cost effective to maintain the target BP (Tables 4 and 5).

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AUTHORS’ CONTRIBUTIONS

Concept, data collection, statistical analysis, and writing of article - Roobena Parveen A. Drafting with valuable corrections and guidance - Dr. Vara Prasanna Rao M.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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