Original Research Article

Cost analysis study of antihypertensive agents available in India

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ABSTRACT

Aim: Hypertension is a global public health problem. To decrease its morbidity and mortality it needs lifelong treatment. There is a wide range of variation in the prices of antihypertensive drugs marketed in India. Thus, a study was planned to evaluate the difference in cost of different brands of same active drug by calculating percentage variation of cost.

Materials and Methods: The cost of different brands of commonly used antihypertensive drugs was sorted out by referring latest CIMS, MIMS and Drug Today. The cost of 10 dosage forms (Tablets/Capsules) in INR of each brand, cost Ratio and percentage Cost Variation were calculated.

Results: The percentage variation in the cost was above 100% with most of single drug therapy for hypertension and is 42 out of 69. It’s found maximum in Atenolol (12.5mg) 880%, Amlodipine (5mg) 460%, Nifidipine (30mg) 456.29% and Diltiazem (90mg) 407.02%. Among the combination therapy percentage variation in the cost was above 100% in 16 out of 26. It’s found maximum in Lisinopril+Hydrochlorothiazide (5mg+12.5mg) 926%, Telmisartan+Hydrochlorothiazide (40mg+12.5mg) 254.75%, Amlodipine+Losartan (5mg+50mg) 246.96% and Amlodipine+Enalapril (5mg+5mg) 217.20%.

Conclusion: The average percentage price variation of the same molecules of antihypertensive drugs manufactured by different pharmaceuticals company in India is very wide. So, government, pharmaceutical company, marketing manager and prescribing doctors should think about variation of cost and do needful for providing maximum benefits to the patients receiving antihypertensive drugs.

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1. Introduction

Hypertension is one of the major chronic diseases resulting into high mortality and morbidity. Cost of drug is one of the factors of Poor control of HTN in our Country and it can lead to development of Ischemic heart disease, stroke and chronic renal failure. Worldwide nearly 1 billion adults (more than a quarter of world’s population) had hypertension in 2010 and this is predicted to increase 1.56 billion by 2025. Prevalence of hypertension in India is reported to vary from 17-21%.1-3 Reviews of Epidemiological studies suggest that the prevalence of hypertension in the last six decades has increased from 2% to 25% among urban residents and from 2% to 15% among the rural residents in India.4 Hypertension is ranked as the third most important risk factor for attributable burden of disease in South Asia (2010).5 Hypertension is directly responsible for 57% of all stroke death and 24% of all coronary heart disease (CHD) in India.6 Hypertension as one of the most important cause of premature death worldwide.7 Hypertension accounts for 10% of worldwide healthcare expenditure underlining the considerable economic implications to resource constrained health systems.8

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Table 1: Percentage cost variation of commonly used antihypertensive drugs as a single drug therapy

| Drug                   | Doses  | Minimum cost (INR) | Maximum cost (INR) | Cost Ratio | % Cost variation |
|------------------------|--------|--------------------|--------------------|------------|------------------|
| Calcium channel blockers |        |                    |                    |            |                  |
| Amlodipine             | 2.5mg  | 6.50               | 27.60              | 4.24       | 324.61           |
|                        | 5mg    | 12.50              | 70                 | 5.6        | 460              |
|                        | 10mg   | 16                 | 75.60              | 4.72       | 372.5            |
|                        | 5mg    | 3.18               | 12.03              | 3.78       | 278.30           |
|                        | 10mg   | 5.12               | 19.39              | 3.78       | 278.71           |
| Nifidipine             | 20mg   | 7.50               | 29.10              | 3.88       | 288              |
|                        | 30mg   | 18.42              | 102.47             | 5.56       | 456.29           |
|                        | 5mg    | 41.50              | 64.50              | 1.55       | 55.42            |
| Clinidipine            | 10mg   | 55                 | 94.20              | 1.71       | 71.27            |
|                        | 30mg   | 10.02              | 29.27              | 2.92       | 192.11           |
|                        | 60mg   | 20.03              | 50.40              | 2.51       | 151.62           |
| Diltiazem              | 90mg   | 29.19              | 148                | 5.07       | 407.02           |
|                        | 120mg  | 36.13              | 173.05             | 4.78       | 378.96           |
| Beta blockers          |        |                    |                    |            |                  |
| Atenolol               | 2.5mg  | 2                  | 19.60              | 9.8        | 880              |
|                        | 25mg   | 6.30               | 24.10              | 3.82       | 282.53           |
|                        | 50mg   | 6.77               | 23                 | 3.39       | 239.73           |
|                        | 100mg  | 25.70              | 36.60              | 1.42       | 42.41            |
|                        | 12.5mg | 33.30              | 54                 | 1.62       | 62.16            |
| Metoprolol             | 25mg   | 18.01              | 46.60              | 2.58       | 158.74           |
|                        | 50mg   | 32.80              | 70.50              | 2.14       | 114.93           |
|                        | 100mg  | 67                 | 152.90             | 2.28       | 128.20           |
|                        | 2.5mg  | 32                 | 77.20              | 2.41       | 141.25           |
| Nepivolol              | 5mg    | 50                 | 109                | 2.18       | 118              |
| Alpha blocker          |        |                    |                    |            |                  |
| Prazosin               | 2.5mg  | 94.60              | 125.80             | 1.32       | 32.98            |
|                        | 1mg    | 39.80              | 150.63             | 3.78       | 278.46           |
| Terazosin              | 2mg    | 69.50              | 223.20             | 3.21       | 221.15           |
|                        | 5mg    | 201.50             | 406                | 2.01       | 101.48           |
| Alpha+Beta blockers    |        |                    |                    |            |                  |
| Labetalol              | 100mg  | 100                | 137                | 1.37       | 37               |
|                        | 3.125mg| 9                  | 32                 | 3.55       | 255.55           |
|                        | 6.25mg | 17.93              | 52                 | 2.90       | 190.01           |
| Carvedilol             | 12.5mg | 30                 | 87                 | 2.9        | 190              |
|                        | 25mg   | 52                 | 145                | 2.78       | 178.84           |
| Central Sympatholytic  |        |                    |                    |            |                  |
| Methyldopa             | 250mg  | 24.14              | 24.15              | 1.00       | 0.04             |
| ACE inhibitors         |        |                    |                    |            |                  |
| Enalapril              | 2.5mg  | 10.40              | 20.30              | 1.95       | 95.19            |
|                        | 5mg    | 17.95              | 33.71              | 1.87       | 87.79            |
|                        | 10mg   | 27.75              | 66.40              | 2.39       | 139.27           |
| Ramipril               | 1.25mg | 25.87              | 69.75              | 2.69       | 169.61           |
|                        | 2.5mg  | 26.75              | 66.73              | 2.49       | 149.45           |
|                        | 5mg    | 48.25              | 82.43              | 1.70       | 70.83            |
|                        | 10mg   | 166                | 255.60             | 1.53       | 53.97            |
|                        | 2.5mg  | 20.10              | 36.50              | 1.81       | 81.59            |
| Lisinopril             | 5mg    | 36.93              | 76.80              | 2.07       | 107.96           |
|                        | 10mg   | 66.50              | 108.50             | 1.63       | 63.15            |

Continued on next page
|                  | ARB     | 25mg | 50mg | 20mg | 10mg | 40mg | 80mg | 150mg | 300mg | 40mg | 80mg | 40mg | 80mg | 150mg | 300mg | 100mg |
|-----------------|---------|------|------|------|------|------|------|-------|-------|------|------|------|------|-------|-------|-------|
| **Losartan**    |         |      |      |      |      |      |      |       |       |      |      |      |      |       |       |       |
| 16.50           | 25mg    |      |      |      |      |      |      |       |       |      |      |      |      | 132.42 | 190.84 |       |
| 29.50           | 50mg    |      |      |      |      |      |      |       |       |      |      |      |      | 196.29 | 190.84 |       |
| 15              | 20mg    |      |      |      |      |      |      |       |       |      |      |      |      | 180    | 190.84 |       |
| 65.43           | 80mg    |      |      |      |      |      |      |       |       |      |      |      |      | 234.23 | 190.84 |       |
| 65.20           | 10mg    |      |      |      |      |      |      |       |       |      |      |      |      | 282.03 | 190.84 |       |
| 27              | 40mg    |      |      |      |      |      |      |       |       |      |      |      |      | 205.49 | 190.84 |       |
| 34              | 20mg    |      |      |      |      |      |      |       |       |      |      |      |      | 36.57  | 190.84 |       |
| 54              | 40mg    |      |      |      |      |      |      |       |       |      |      |      |      | 25.67  | 190.84 |       |
| 27.81           | 4mg     |      |      |      |      |      |      |       |       |      |      |      |      | 36.57  | 190.84 |       |
| 34.95           | 4mg     |      |      |      |      |      |      |       |       |      |      |      |      | 25.67  | 190.84 |       |
| 45.25           | 8mg     |      |      |      |      |      |      |       |       |      |      |      |      | 36.57  | 190.84 |       |
| 78.56           | 150mg   |      |      |      |      |      |      |       |       |      |      |      |      | 205.49 | 190.84 |       |
| 199.65          | 300mg   |      |      |      |      |      |      |       |       |      |      |      |      | 1.17   | 190.84 |       |
| 24.70           | 40mg    |      |      |      |      |      |      |       |       |      |      |      |      | 82.18  | 190.84 |       |
| 41              | 40mg    |      |      |      |      |      |      |       |       |      |      |      |      | 109.75 | 190.84 |       |
| 70              | 40mg    |      |      |      |      |      |      |       |       |      |      |      |      | 117.85 | 190.84 |       |
| 130             | 80mg    |      |      |      |      |      |      |       |       |      |      |      |      | 53.07  | 190.84 |       |
| **Diuretics**   |         |      |      |      |      |      |      |       |       |      |      |      |      |       |       |       |
| **Hydrochlorothiazide** | 12.5mg |      |      |      |      |      |      |       |       |      |      |      |      | 35.52  | 190.84 |       |
| 25mg            | 25mg    |      |      |      |      |      |      |       |       |      |      |      |      | 23.92  | 190.84 |       |
| **Torasemide**  |         |      |      |      |      |      |      |       |       |      |      |      |      |       |       |       |
| 15.95           | 5mg     |      |      |      |      |      |      |       |       |      |      |      |      | 86.20  | 190.84 |       |
| 23.52           | 10mg    |      |      |      |      |      |      |       |       |      |      |      |      | 104.93 | 190.84 |       |
| 44.28           | 20mg    |      |      |      |      |      |      |       |       |      |      |      |      | 89.47  | 190.84 |       |
| 154.20          | 40mg    |      |      |      |      |      |      |       |       |      |      |      |      | 5.93   | 190.84 |       |
| 148.50          | 100mg   |      |      |      |      |      |      |       |       |      |      |      |      | 112.59 | 190.84 |       |
| **Indapamide**  |         |      |      |      |      |      |      |       |       |      |      |      |      |       |       |       |
| 37.50           | 1.5mg   |      |      |      |      |      |      |       |       |      |      |      |      | 267.20 | 190.84 |       |
| 88.50           | 2.5mg   |      |      |      |      |      |      |       |       |      |      |      |      | 10.16  | 190.84 |       |
Antihypertensive drug treatment often has elevated cost, a limitation that has not always been taken into account in clinical practice. High cost of medicines has economic implications for the patients. Prices of prescription can affect users, suppliers and most importantly payers in health care system. Several studies have indicated that therapeutic compliance is influenced by drug prices. In developing country like India cost of drugs play an important role in compliance of treatment of any chronic disease. Pharmaceutical industry has many branded formulation of the same drug with large difference in selling price. This may affect the patient’s finance adversely if costly brand is prescribed specially in disease like hypertension which needs treatment for longer duration. The purpose of present study was to assess the cost-effectiveness of antihypertensive drugs in hypertensive patients.

2. Materials and Methods

Cost of a particular antihypertensive drug (cost per 10 tablets/capsules) in the same strength and dosage forms being manufactured by different companies was obtained from latest “Current Index of Medical Specialties” July-October 2019. The cost of drugs was also crosschecked at pharmacy or retail drug store. Cost ratio between the maximum and minimum cost of the same drug manufactured by different pharmaceutical companies was calculated as follows:

Cost ratio= Maximum cost / Minimum cost.

Percentage cost variation was calculated as follows:

\[
\% \text{ cost variation}= \frac{\text{Maximum cost} – \text{Minimum cost}}{\text{Minimum cost}} \times 100
\]

The drug formulation being manufactured by only one company was excluded.

3. Results

The prices of a total of 41 drugs (25 single and 16 combination preparation), available in 95 different formulations were analyzed. All formulation is manufactured by different pharmaceutical companies.

Table 1 shows the price variation of commonly used antihypertensive drugs used as a single drug therapy. Overall Atenolol (12.5mg) shows maximum price variation of 880%, while Methylldopa (250mg) shows minimum variation 0.04%. The maximum and minimum percentage price variation respectively for CCBs: Amlodipine (5mg) 460% and Cinepidine (5mg) 55.42%; Beta blockers: Atenolol (12.5%) 880% and Atenolol (100mg) 42.41%; Alpha and Beta blockers: Terazosin (1mg) 278.46% and Prazosin (2.5mg) 32.98%; ACE inhibitors: Ramipril (1.25mg) 169.61% and Ramipril (10mg) 53.97%;ARBs: Olmesartan (40mg) 282.03% and Irbesartan (300mg); Diuretics: Indapamide (1.5mg) 267.20% and Torasemide (40mg) 1.05%.

Table 2 Shows price variation in some combination form of antihypertensive drugs out of 16 commonly used drugs maximum variation found in Lisinopril+Hydrochlorothiazide (5mg+12.5mg) 926%, Telmisartan+Hydrochlorothiazide (40mg+12.5mg) 254.75%, Amlodipine+Losartan (5mg+50mg) 246.96% and Amlodipine+Elnalapril (5mg+5mg) 217.20%.

4. Discussion

Pharmaceuticals Company in Indian market commonly sells a particular drug under different brand names apart from the innovator company. Hence, the number of products available in the market is very high in the range of 60,000-70,000. This situation has led to greater price variation among drugs marketed.

In our study findings showed a very high fluctuation in the minimum and maximum price of antihypertensive drugs (Figures 1 and 4). The cost ratio was also observed to be very high (Figures 2 and 5). The percentage variation in the cost was above 100% with most of the commonly used antihypertensive drugs (Figure 3) and also with combination form of antihypertensive drugs (Figure 6). Similar study done by Kamath. L. et al. in 2015; Karve A V et al. in 2016 and Limaye. D. et al. in 2017 also showed significant higher price variations in different brands of the same antihypertensive drug.

In such situation Patients have to pay more price if costly brands are prescribed. Whereas the costly brand of same generic drug is scientifically proved to be in no way superior to its economically cheaper counterpart. In India patients have to pay from their pockets due to very less use of mediclaim policies in comparison to developed countries.

The reason behind this price variation could be as follows: Government regulation and pricing policies.

1. Government regulation and pricing policies.

2. The existing market structure of pharmaceutical industry.

3. Cost of raw supplies, distribution and promotion.

4. Asymmetry of information or imperfect information.

5. Economic goals of the parent company, target return on investment.

Under NMLM 2015 the prices of a total 376 drugs and 857 formulations are under price control. IN the DPCO list 2015 only few antihypertensive drugs (Amlodipine, Atenolol, Enalapril, Losartan, Methylldopa, Nifidipine and Hydrochlorothiazide) were included.

5. Conclusion

According to result of our studies and previous various studies over cost analysis, there is a strong need to...
Table 2: Percentage cost variation of commonly used antihypertensive drugs in combination form

| Drug                        | Doses           | Minimum cost (INR) | Maximum cost (INR) | Cost Ratio | %Cost variation |
|-----------------------------|-----------------|--------------------|--------------------|------------|-----------------|
| Amlodipine + Atenolol       | 5mg + 25mg      | 44                 | 55.36              | 1.25       | 25.81           |
|                            | 5mg + 50mg      | 16.80              | 96.60              | 5.75       | 475             |
| Amlodipine + Metoprolol    | 5mg + 25mg      | 55                 | 79.20              | 1.41       | 32              |
|                            | 5mg + 50mg      | 46                 | 111                | 2.41       | 141.30          |
| Amlodipine + Enalapril     | 5mg + 5mg       | 25                 | 79.30              | 3.17       | 217.20          |
| Amlodipine + Lisinopril    | 5mg + 5mg       | 76                 | 101.50             | 1.33       | 33.55           |
| Amlodipine + Losartan      | 5mg + 25mg      | 39                 | 68                 | 1.74       | 74.35           |
|                            | 5mg + 50mg      | 33                 | 114.50             | 3.46       | 246.96          |
| Amlodipine + Telmisartan   | 5mg + 40mg      | 47.43              | 112.51             | 2.37       | 137.21          |
|                            | 5mg + 80mg      | 59.20              | 208.45             | 3.33       | 133.68          |
| Clinidine + Telmisartan    | 10mg + 40mg     | 87.80              | 210                | 2.39       | 139.86          |
| Chlorothalidone + Telmisartan | 12.5mg + 40mg | 37.50              | 126                | 3.36       | 236             |
|                            | 12.5mg + 80mg   | 92                 | 195                | 2.11       | 111.95          |
| Metoprolol + Telmisartan   | 25mg + 40mg     | 114                | 142.95             | 1.25       | 25.39           |
|                            | 50mg + 40mg     | 136.90             | 182.52             | 1.33       | 33.32           |
| Losartan + Telmisartan     | 25mg, 12.5mg    | 28.50              | 50                 | 1.75       | 75.43           |
| Hydrochlorothiazide        | 50mg + 12.5mg   | 36                 | 105.70             | 2.93       | 193.61          |
| Telmisartan + Telmisartan  | 40mg + 12.5mg   | 40                 | 141.90             | 3.54       | 254.75          |
| Hydrochlorothiazide        | 80mg + 12.5mg   | 69.50              | 202.45             | 2.91       | 191.29          |
| Olmesartan + Telmisartan   | 20mg + 12.5mg   | 69                 | 143.55             | 2.08       | 108.04          |
| Hydrochlorothiazide        | 40mg + 12.5mg   | 120                | 200.75             | 1.67       | 67.29           |
| Enalapril + Telmisartan    | 10mg + 25mg     | 32                 | 34.50              | 1.07       | 7.81            |
| Hydrochlorothiazide        | 2.5mg + 12.5mg  | 47.5               | 111.30             | 2.47       | 147.33          |
| Hydrochlorothiazide        | 5mg + 12.5mg    | 100                | 181.24             | 1.81       | 81.24           |
| Lisinopril + Hydrochlorothiazide | 5mg + 12.5mg | 10                 | 102.60             | 10.26      | 926             |
| Telmisartan + Amlodipine + Hydrochlorothiazide | 40mg + 5mg + 12.5mg | 73.20 | 152.90 | 2.08 | 108.87 |

Fig. 1: Cost difference (Minimum and Maximum) commonly used antihypertensive drugs used as a single drug therapy
Fig. 2: Cost ratio of commonly used antihypertensive drugs used as a single drug therapy

Fig. 3: Cost ratio of commonly used antihypertensive drugs used as a single drug therapy

Fig. 4: Percentage cost variation of commonly used antihypertensive drugs used as a single drug therapy
Fig. 5: Cost ratio of antihypertensive drugs in combination form

Fig. 6: Percentage cost variation of antihypertensive drugs in combination form
create awareness in public, healthcare providers and even in prescriber regarding huge cost variation of same molecules of different brands. It should also highlighted among concerned government agencies, policy makers, pharmaceuticals company for taking appropriate consideration and action to reduce the huge cost variation of antihypertensive drugs.

6. Source of Funding
None.

7. Conflict of Interest
None.

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