

Pharmacological Communication

Pharmacoeconomic Evaluation of Anti-Hypertensive Therapy

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ABSTRACT

This study aimed to analyse the price variation between various prescribed brands of anti-hypertensives and the direct medical costs involved in the treatment of hypertension. A retrospective study was conducted at a super specialty hospital over a period of eight months from September 2019–April 2020. Ethical approval was obtained from the institutional ethics committee before initiating the study. A total of 400 hypertensive patients of either gender, aged above 18 years, prescribed with at least one antihypertensive agent were enrolled in the study. All relevant information was collected from the concerned patient treatment charts and patient hospital bills. Patient details such as age, gender, occupation, body mass index, domiciliary status, social habits (smoking and alcohol), family history of hypertension, co-morbid conditions and duration of hypertension were collected. All the data obtained were then analysed using SPSS (version 20.0). The majority of the patients were males, n=234 (58.5%) and n=166(45.5%) were females. A total of n=285 (71.25) were prescribed with more than one antihypertensive agent and only n=115(28.75%) patients were on monotherapy. In monotherapy, prazosin 25 mg was found to have the maximum price variation of 7.76, followed by spironolactone 50 mg with a price variation of 7.73. The least variation was observed with telmisartan 80 mg. In case of multiple drug therapy, maximum variation was seen with metoprolol 50 mg. Lab charges, being the highest median medical cost has resulted in the maximum burden for the patients. The average lab charges were found to be 4997.33 INR (64.46USD). The least median direct medical cost was accounted to antihypertensives. The cost of antihypertensives was found to be 134.48 INR (1.96 USD).

KEY WORDS: ANTI-HYPERTENSIVES, CLINICAL PHARMACIST, METOPROLOL, PRAZOSIN, PRICE VARIATION.

INTRODUCTION

Hypertension is associated with an increased morbidity, mortality and economic impact on both the individuals and the society. It is surprising to know that 1 billion individuals around the globe have already been diagnosed with hypertension and 7.1 million deaths per year account to this cardiovascular condition (Bakare et al., 2016; Mishra et al., 2017). High healthcare costs associated with the management of uncontrolled hypertension has imposed a heavy economic burden on the society. The cost of medication and diagnosis has increased proportionately with the increase in comorbidities associated with hypertension (Dipiro et al., 2017; Kostova et al., 2020).

Pharmacoeconomic studies provide us with insights on the economic burden of this disease, associated comorbidities, arising the need for chronic medications (Paul et al., 2020; Sunny et al., 2020). Various existing studies has highlighted the utilization and prescription pattern to help us understanding the clinical trends of this disease. Enabling us to design the most effective, safe, and economical therapy which clinical pharmacists are competent enough to carry out such studies (Al-Jabri et al., 2019; Mohammed 2020; Voora et al., 2020). Keeping this existing need in mind, this study was carried out with the objective of analyzing the price variation between different brands of antihypertensives prescribed and the direct medical costs involved in the treatment of hypertension.

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Table 1. Distribution of antihypertensive agents prescribed			
S. No	Class of drug	Antihypertensive drugs	Number of drug prescribed (n)
#Monotherapy			
1	Calcium channel blockers	1.Amlodipine 2.Diltiazem 3.Verapamil 4.Nifedipine 5.Clinidipine	19 8 1 7 10
2	ACE Inhibitors	1. Enalapril 2. Ramipril	8 6
3	Angiotensin receptor blocker	1. Losartan 2. Telmisartan	7 6
4	α -adrenergic blockers	1. Prazosin	3
5	Central sympatholytic	1. Clonidine	2
6	β -adrenergic blockers	1. Propranolol 2. Metoprolol 3. Atenolol 4. Nebivolol	8 7 3 3
7	Diuretics	1. Hydrochlorothiazide 2. Furosemide 3.Torsemide	3 3 11
Total #Multidrug therapy			115
1	Calcium channel blockers	1. Amlodipine 2. Diltiazem 3. Verapamil 4. Nifedipine 5. Clinidipine	166 36 6 34 73
2	ACE Inhibitors	1. Enalapril 2. Ramipril	46 6
3	Angiotensin receptor blocker	1. Losartan 2. Telmisartan	26 35
4	α -adrenergic blockers	1. Prazosin	21
5	Central sympatholytic	1. Clonidine	10
6	α + β adrenergic blockers	1. Labetalol 2. Carvedilol	5 1
7	β -adrenergic blockers	1. Propranolol 2. Metoprolol 3. Atenolol 4. Nebivolol	50 25 18 4
8	Diuretics	1. Hydrochlorothiazide 2. Furosemide (IV) 3. Spironolactone 4. Amiloride 5. Torsemide 6. Mannitol (IV)	27 36 1 3 63 24
Total			716

MATERIAL AND METHODS

A retrospective study of eight months was conducted in a super specialty teaching hospital located in Dakshina Kannada, South India. The ethical approval

was obtained from the institutional ethics committee before initiating the study. This study included inpatients of both genders, aging more than 18 years who were diagnosed with hypertension, prescribed with at least one antihypertensive agent and admitted to the hospital

for at least two days. The patient data collection form was designed as per the need of the study. All relevant information was collected from the concerned patient treatment charts and patient hospital bills. Patient details such as age, gender, occupation, body mass index, domiciliary status, social habits (smoking and alcohol), family history of hypertension, co-morbid conditions and duration of hypertension were collected. Characteristics of drug therapy like generic and brand name of the drugs, dosage form, frequency, route of administration and number of drugs per prescription were recorded in the data collection form. All costs in Indian rupees were converted into U.S. dollars and all the values were represented in median with inter-quartile range (IQR) (Sunny et al. 2020). Descriptive statistics was applied

for analysing the collected data using Statistical Package for Social Science (SPSS) 20.0 for windows (Kim et al., 2021).

RESULTS AND DISCUSSION

Demographic characteristics of the study population: Out of 400 patients enrolled in the study, the majority were n=234(58.5%) males and the remaining n=166(41.5%) were females. A majority of the patients were found in the age group of 60-79 years, n=222(55.5%), followed by the age group of 40-59 years, n=153(38.25%) and a smaller number of patients belonged to the age group of 20-39 years, n=25(6.25%). The mean age of the study population was 58.93±11.14 years.

Table 2. Analysis of direct medical cost among the hypertensive patients

Cost category	Hypertension with and without comorbidity(INR)		Hypertension with and without comorbidity(USD)	
	Median	IQR(Q3-Q1)	Median	IQR(Q3-Q1)
Medication cost	136.48	307.06-72.65	1.96	4.40-1.04
Comorbidity medication cost	1781.50	3000.50-953.00	25.53	43-13.66
Laboratory cost	4497.33	7122.5-2540.0	64.46	102.08-36.41
Consultation charge	657.68	1270.57-356.88	9.43	18.21-5.12
Nursing charge	331.12	580.12-185.34	4.75	8.31-2.66
Treatment charge	300.00	500-200	4.3	7.17-2.66
Surgical charge	738.465	1022.25-538.50	10.58	7.17-2.66
Hospital charge	2000.00	3430-1100	28.66	14.65-7.72
Miscellaneous charges	397.77	616.89-212.99	5.70	8.84-3.05
Total	10840.345	16560.18-6574.53	155.37	237.35-94.23

Distribution based on number of antihypertensive drugs per prescription: A total of 831 antihypertensives were prescribed to 400 patients, with an average of 2.07±1.01 antihypertensives per prescription. Out of them, monotherapy was noted among n=115(28.75%) patients, and in multidrug therapy, the majority were prescribed with 2 drugs, n=141(35.25%), followed by 3 drugs n=103(25.75%). The remaining, n=41(10.25) were prescribed with more than 3 anti-hypertensive drugs.

Distribution of anti-hypertensive agents prescribed: In monotherapy, the majority of antihypertensive drugs prescribed were from the category of calcium channel blockers, n=45. This was followed by β-adrenergic blockers, n=20 and diuretics, n=18. Similarly, in multiple drug therapy, the category of drugs prescribed the highest was found to be calcium channel blockers, n=315, followed by diuretics n=154, and β- adrenergic blockers n=97. The details are shown in Table: 1.

Price variation: Among the various agents prescribed to the patients as monotherapy, prazosin 25 mg was found to have the maximum price variation. There were six brands of prazosin which showed a price variation of 7.76. This was followed by spironolactone 50 mg,

which had three brands with a price variation of 7.73. The least variation was observed with telmisartan 80 mg (0.05), which had only two brands. Within the multidrug therapy section, maximum price variation was found with metoprolol 50 mg. Metoprolol had four brands and it showed a price variation of 10.69 which was followed by prazosin 25 mg, having six brands and a price variation of 7.76. The least variation in prize was shown with propranolol 10 mg, (0.04) which had only two brands.

Analysis of direct cost: The total cost of illness (COI) includes consultation, laboratory, medication, nursing and hospital charges. Table 2 summarizes the annual median cost spent by hypertensive patients with and without complications. The highest median direct medical cost was found to be of laboratory charges (INR 4497), followed by hospital (INR 200) and comorbidity medication charges (INR 1781.50). The least median medical cost (INR136.48) was for the treatment associated with hypertension.

A total of 400 patients were evaluated during the study period. In the current study, males (58.5%) were more than the females (41.5%). Similar results were

obtained in a study conducted by (Malpani et al. 2018). Based on the prescription pattern, most of the patients were prescribed with calcium channel blockers and among patients who received monotherapy as well as multiple drug therapy, amlodipine was prescribed the maximum. This was consistent with the study conducted by (Forouzanfar et al., 2017). Prazosin 10 mg showed maximum price variation among various antihypertensive drugs prescribed as monotherapy. The funds spent on laboratory tests accounted for Rs. 4497.33. This, when converted to U.S. dollars equals to 64.46 USD. The median total annual direct cost was Rs 10840.35 which in U.S. dollars amounts to 155.37 USD. These results were in contradiction to a similar study conducted in 2019 (Oyando et al., 2019). The cost was less than the study conducted in 2021 (Bryant et al., 2021).

CONCLUSION

In direct medical cost, laboratory charges were found as the most prominent factor contributing to the increased burden on the patients. Along with the hospital stay charges, medication cost may further increase the burden. Significant price variation was also noted in each drug used for the management of hypertension. So, there is always a possibility to prescribe the drugs which are at low costs to reduce the overall healthcare expenditure and the economic burden on the patients.

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Ethical Statement: The Institutional Ethics Committee (IEC) members have approved to carry out this study during the meeting held on 2nd August 2019 at NGSM Institute of Pharmaceutical Science. RefNo NGSMUPS/IEC/09/2019-20 Date 08/08/2019.

Conflicts of Interests: There were no conflicts among the interests of the participating authors.

REFERENCES

- Al-Jabri, M. M., Shastry, C. S., and Chand, S. (2019). Assessment of drug utilization pattern in chronic kidney disease patients in a tertiary care hospital-based on who core drug use indicators. *Journal of Global Pharma Technology*, 11(9):1-9.
- Bakare, O. Q., Akinyinka, M. R., Goodman, O., Kuyinu, Y. A., Wright, and O. K. (2016). Antihypertensive use, prescription patterns, and cost of medications in a Teaching Hospital in Lagos, Nigeria. *Niger J Clin Pract.*, 19(5):668-72.
- Bryant, K.B., Moran, A.E., Kazi, D.S., Zhang, Y., Penko, J., and Ruiz-Negrón, N., (2021). Cost-effectiveness of Hypertension Treatment by Pharmacists in Black Barbershops. *Circulation*. doi: 10.1161/CIRCULATIONAHA.120.051683.
- Dipiro, J. T, Talbert, R. L, Yee, G. C, and Matzke, G. R, (2017). 10th ed. McGraw Hill Education: New York: 13-77.
- Forouzanfar, M, H., Liu, P., Roth, G. A., Ng, M., Biryukov, S., and Marczak, L., (2017). Global burden of hypertension and systolic blood pressure of at least 110 to 115 mm Hg, 1990–2015. *JAMA*, 317(2):165-82.
- Kim, W., Lee, S. A., and Chun, S.Y. (2021). A cost-effectiveness analysis of the Chronic Disease Management Program in patients with hypertension in Korea. *Int J Qual Health Care*, 33(2):mzab073. doi: 10.1093/intqhc/mzab073.
- Kostova, D., Spencer, G., Moran, A. E., Cobb, L. K., Husain, M. J., and Datta, B. K., (2020). The cost-effectiveness of hypertension management in low-income and middle-income countries: a review. *BMJ Glob Health*, 5(9):e002213. doi: 10.1136/bmjgh-2019-002213.
- Malpani, A. K., Waggi, M., Panja, P., and Christien, T. M. (2018). Study of Prescribing Pattern of Antihypertensive Drugs and Evaluation of the Prescription with JNC 8 Guidelines in North Karnataka Hospital. *IJPP*, 11(4):193.
- Mishra, R., Kesarwani, P., and Keshari, S. S. (2017). Prescription pattern of antihypertensive drugs in a tertiary care teaching hospital. *Int J Med Sci Public Health*, 6(4): 684-86.
- Mohammed, H. A. R., Babu, N., Chand, S., Nandakumar, U. P., and Bharathraj. K. C. (2020). Study on prescription pattern for osteoarthritis in a tertiary care teaching hospital: a retrospective study. *Biomedicine*, 40(03): 353-356.
- Oyando, R, Njoroge, M., Nguhiu, P., Kirui, F., Mbui, J., and Sigilai, A (2019). Patient costs of hypertension care in public health care facilities in Kenya. *IJHPM*, 34(2):1166-78.
- Paul, F., Babu, N., and Chand, S. (2020). Drug utilization evaluation and price variability study of non-steroidal anti-inflammatory drugs in the orthopedic department of a tertiary care hospital. *Plant Archives*, 20(Spl. 02): 1696-1701.
- Sunny, S., Shastry, C. S., Mateti, U. V., Chand, S., and Sharma, R. (2020). Pharmacoeconomic evaluation on treatment of diabetic patients in a charitable hospital. *Indian Journal Pharmaceutical Sciences*, 82(3): 532-537.
- Voor, L., Sah, S. K., Bhandari, R., Shastry, C. S., Chand, S., and Rawal, K.B et al. (2020). Doctor of pharmacy: boon for healthcare system. *Drug Invention Today*, 14(1):153-158.