

## Evaluation of prescribing patterns in diabetic and hypertensive patients in a South Delhi Hospital

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### ABSTRACT

**Background:** Drug utilization studies (DUS) defined by World Health Organization as the marketing, distribution, prescription and use of drugs in a society, considering its consequences, either medical, social, and economic. The increasing importance of DUS as a valuable investigation resource in pharmacoepidemiology has been linking it with other health related areas, such as public health, pharmacovigilance, pharmacoconomics, and pharmacogenetics.

**Methods:** The study was a prospective DUS carried out in medicine OPD of Indian Institute of Technology Hospital, New Delhi, India in which a total of 595 prescriptions of hypertensive and diabetic patients were reviewed. All diabetic and/or hypertensive patients; irrespective of age, gender; who had least one drug in the prescription were included. Data were collected by screening of physician's prescribing record and patient medication profile.

**Results:** A total of 595 prescriptions were recorded. 57.31% were males as compared to 42.69% females. 54.62% patients were hypertensive (325 prescription); 14.78% patients were diabetic (88 prescription) whilst 30.58% had both the diseases. Of 507 prescriptions having antihypertensive drugs, combination therapy was utilized (40.8%) in the prescriptions and out of 270 prescriptions having antidiabetic drugs, 143 (52.96%) prescription were of combination therapy. Among antihypertensive drugs, angiotensin-converting enzyme inhibitors were the most frequently prescribed class of drugs (19.18%). The combination most commonly prescribed was amlodipine and atenolol (14.05%). Antidiabetic drugs made up for 11.05% of the total drugs prescribed. 28.78% of all hypoglycemic agents were sulfonylurea. Glimepiride and metformin combination was the most prescribed anti-diabetic drugs combination (16.16%).

**Conclusion:** Both hypertension and diabetes are considered to be lifestyle diseases. Hence, apart from optimal and appropriate prescribing, there is a need for lifestyle modification to obtain improved outcomes. Combination therapy was observed in a high percentage of prescriptions. Though monotherapy is associated with improved compliance and fewer side effects, combination therapy is desirable for synergistic actions and to overcome complications.

**Keywords:** Drug utilization study, Anti-hypertensive, Anti-diabetic

### INTRODUCTION

The main aim of drug utilization studies (DUS) are to evaluate the factors related to the prescribing, dispensing, administration and consumption of medicines, and its associated events (either beneficial or adverse). DUS defined by the World Health Organization as the marketing, distribution, prescription and use of drugs in a society, considering its consequences, either medical, social, and economic.<sup>1</sup> DUS began in the early 60's basically with

market-only purposes, then for evaluating the quality of medical prescription so that rational use of drugs could be promoted and patterns of use of specific drugs could be compared. Presently DUS are an evolving area. Their scope is to evaluate the present state and future trends of drug usage, to estimate disease prevalence, drug expenditures, appropriateness of prescriptions and adherence to evidence-based recommendations. The increasing importance of DUS as a valuable investigation resource in pharmacoepidemiology has been linking it

with other health related areas, such as public health, pharmacovigilance, pharmaco-economics, eco-pharmacovigilance or pharmacogenetics.

The present DUS was a prospective DUS carried out in the medicine OPD of IIT Hospital, New Delhi in which a total of 595 prescriptions of hypertensive and diabetic patients were reviewed. This kind of medical audit highlights the lacunae in the present prescribing practice of physicians and help in improving the patient health care further.

Diabetes mellitus is a chronic disease caused by inherited/acquired deficiency in insulin production or ineffectiveness of insulin produced. This deficiency results in increased glucose concentration in the blood, which then damages many of the body systems, in particular blood vessels and nerves.<sup>2</sup> Data suggest that it is affecting nearly 6% of the world population.<sup>3</sup> In Australia, Type 2 diabetes is the sixth major cause of death, and its presence can shorten the normal lifespan of an individual by up to one-fifth.<sup>4</sup> A changing lifestyle in developing countries like India has enormously increased prevalence of chronic diseases like diabetes mellitus. A survey states that 4% of the adults in India suffer from diabetes in the year 2000, and it is expected to increase to 6% by the year 2025.<sup>5</sup> Metabolic control in diabetes depends on patient adherence to the therapy. DUS are useful to identify treatment adherence problems and hence design interventions to improve the use in diabetes.

One of the most frequent chronic conditions and the most common risk factor for cardiovascular diseases, hypertension (HT) has been estimated to account for 6% of deaths worldwide.<sup>6</sup> It is one of the major chronic diseases resulting in high mortality and morbidity in today's world.<sup>7,8</sup> Various population-based studies conducted in developing countries have shown that its prevalence ranges from 9% to 30% among adults aged 40-55 years.<sup>9</sup> Socioeconomic, nutritional and lifestyle modifications, have also led to increase in cardiac disease throughout the world. Introduction of new drug have improved quality of life for these patients. A number of drugs in various combinations<sup>10-12</sup> are generally used for effective long-term management. Therefore, drug utilization studies, which evaluate, analyze the medical, social and economic outcomes of the drug therapy, are more meaningful and observe the prescribing attitude of physicians with the aim to provide drugs rationally, and play a pivotal role in formulating and implementing such strategies.<sup>13-15</sup>

## METHODS

### *Study design and methodology*

The study was a prospective drug utilization review carried in medicine outpatient of IIT Hospital in which a total of 595 prescriptions of hypertensive and diabetic patients

were reviewed. The study protocol was approved by Jamia Hamdard Institutional Review Board. Prescriptions from newly registered patients were included in the study. After consultation with the physician was over, prescriptions were copied, and the patients were interviewed for medical history, allergies, side-effects and their height and weight were recorded. The identities of patients were kept confidential, and records of patients were by a unique individual code for early retrieval.

All diabetic and/or hypertensive patients; irrespective of age, gender; who had least one drug in the prescription or no previous prescription were included. Data were collected by screening of physician prescribing record and patient medication profile.

A standard data entry format was used to evaluate the prescriptions prospectively. The format was filled for details, which included the diagnosis, medical history, known allergies, drug name (branded/generic), drugs prescribed, route of administration, and patient details such as age, gender, and body mass index (BMI). An informed consent was obtained before the participation of the subjects in the study. Results were analyzed by calculating percentage for each parameter.

## RESULTS

### *Distribution characteristics among the study population*

A total of 595 prescriptions were recorded during data collection. Among the study population, the proportion of males was on the higher side as compared with females. There were 57.31% males as compared to 42.69% females. Of the total, 30.9% of males had HT as compared to 23.70% female subjects. Diabetic males were 7.73%, and diabetic females were 7.05%. Males having both HT and diabetes were 18.65%, and such females were 11.93% (Table 1).

Upon classifying the population in terms of morbidity, 54.62% patients were hypertensive (325 prescription); 14.78% patients were diabetic (88 prescription) while 30.58% had both the diseases (Figure 1). All the patients fell in the age category of 41-90 years. Among these, the majority of patients (45.54%) fell in the age group of 51-60, followed by the age group of 61-70 where we recorded 34.95% of the total patients (Figure 2). Of the total 29.57%

**Table 1: Gender distribution of the study population.**

	Males (%)	Females (%)	Total (%)
Hypertension	184 (30.92)	141 (23.70)	325 (54.62)
Diabetes	46 (7.73)	42 (7.05)	88 (14.78)
Both	111 (18.65)	71 (11.93)	182 (30.58)
Total	341 (57.31)	254 (42.69)	595

%Calculated from a total of 595 prescriptions

of the hypertensive patients were in the overweight category, 15.29% of the diabetic patients were overweight, and 7.56% of the patients having both diseases were overweight (Figure 3).

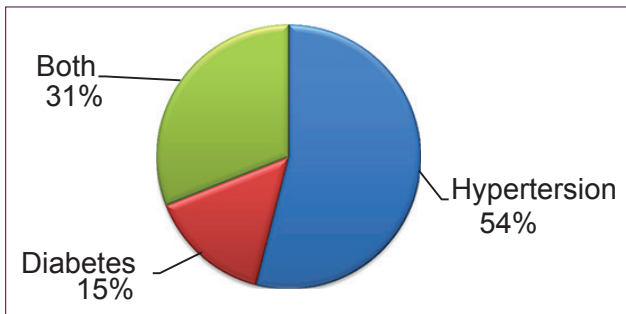


Figure 1: Morbidity distribution of the study population.

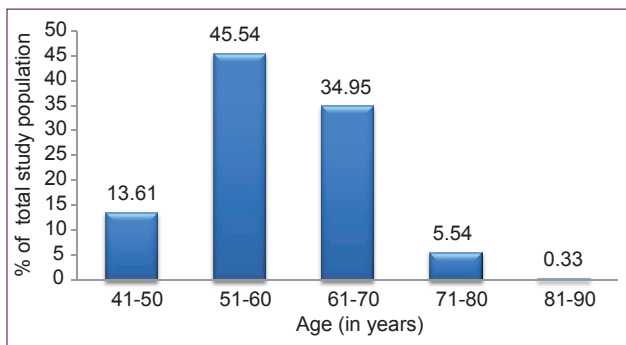


Figure 2: Age distribution of the study population.

**Drug use pattern in hypertensive patients**

Of the total 54.62% prescriptions consisted of only hypertensive patients and 85.21% prescriptions carried at least one anti-hypertensive drug (this includes prescriptions having anti-diabetic drugs as well). Antihypertensive drugs made up for 20.66% of all the drugs prescribed. Six categories of anti-hypertensive drugs were used, which in total had 23 drugs. Among antihypertensive drugs, angiotensin-converting enzyme (ACE) inhibitors were the most frequently prescribed class of drugs (19.18%). Ramipril (12.29%) was the most prescribed ACE inhibitor followed by enalapril (3.5%). Beta-blockers were the next most prescribed class (17.56%) wherein atenolol (10.94%)

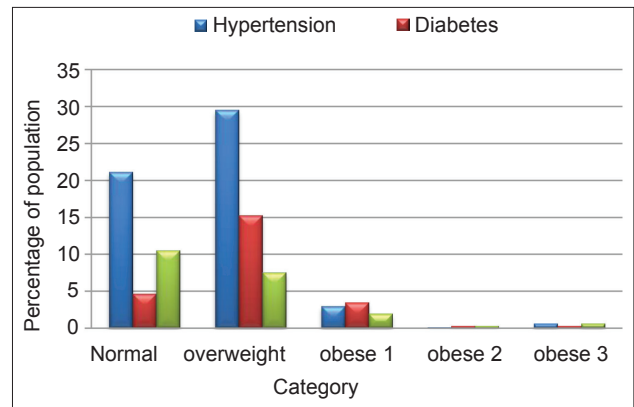


Figure 3: Body mass index distribution of the study population on the basis of morbidity.

Table 2: Antihypertensive drug utilization in hypertensive patients.

Class	Drug	Frequency of prescription	% consumption
ACE Inhibitors	Ramipril	91	12.29
	Enalapril	26	3.5
	Perindopril	11	1.48
	Lisinopril	14	1.89
Angiotensin receptor blockers	Losartan	49	6.62
	Telmisartan	1	0.13
Diuretics	Indapamide	86	11.62
	Frusemide	15	2.02
	Hydrochlorothiazide	10	1.35
	Triamterine	1	0.13
Beta-blockers	Atenolol	81	10.94
	Metoprolol	25	3.37
	Nebivolol	15	2.02
	Carvedilol	5	0.65
	Propranolol	3	0.39
	Bisoprolol	1	0.13
Calcium channel blockers	Amlodipine	111	15
	Lercanidipine	2	0.26
	Nitrendipine	1	0.13
Vasodilators	Isoxsuprine	1	0.13

%Consumption out of 740 prescriptions, ACE: Angiotensin-converting enzyme

was the most prescribed drug, followed by metoprolol (3.37%). Among the individual drugs, amlodipine, a calcium channel blocker had the highest prescriptions (15%) followed by ramipril (12.29%) (Table 2). The combination most commonly prescribed was amlodipine and atenolol (14.05%). The next most prescribed combination was that of atenolol and chlorthalidone (4.59%) (Table 3).

**Drug use pattern in diabetic patients**

Of the total 14.78% prescriptions consisted of only diabetic patients. 45.37% of all prescriptions carried at least one hypoglycemic agent (this includes prescriptions having antihypertensive drugs as well). Anti-diabetic drugs made up for 11.05% of the total drugs prescribed. Five categories of drugs were used, which in total had nine drugs. The sulfonylureas were prescribed the most, 28.78% of all hypoglycemic agents were sulfonylureas. This class was followed by thiazolidinediones, which made for 23.23% of all hypoglycemic drugs. In terms of individual drugs, pioglitazone was the most commonly used drug (14.89%)

**Table 3: Fixed dose combinations used in hypertensive patients.**

Combinations used	Frequency of prescription (%)
Ramipril+hydrochlorothiazide	10 (1.35)
Perindopril+losartan	1 (0.13)
Perindopril+indapamide	4 (0.52)
Losartan+hydrochlorothiazide	20 (2.7)
Furosemide+amiloride	2 (0.26)
Hydrochlorothiazide+amiloride	1 (0.13)
Spironolactone+furosemide	15 (2.02)
Atenolol+chlorthalidone	34 (4.59)
Atenolol+amlodipine	104 (14.05)

%Consumption out of 740 prescriptions

**Table 4: Fixed dose combinations of antidiabetic drugs used in diabetic patients.**

Combinations used	Frequency of prescription
Glibenclamide+metformin	25 (6.31)
Gliclazide+metformin	9 (2.27)
Glimepiride+metformin	64 (16.16)

%Consumption out of a pool of 396 drugs

**Table 5: Prevalence of dyslipidemia in diabetic and hypertensive patients.**

Disease	Number of patients (%)
Hypertension	100 (16.80)
Diabetes	21 (3.5)
Hypertension and diabetes	79 (13.27)

%Calculated out of 595 patients

followed by glimepiride (12.37%) (Table 4). Among the combinations prescribed, the glimepiride and metformin combination was the most prescribed one (16.16%) (Table 5). Insulin comprised of 6.31% of all hypoglycemics drugs prescribed. This suggests that a majority of diabetic patients were of Type 2.

Associated dyslipidemia was fairly prevalent in the study population. In HT patients, it was present in 30.67% of all HT patients; in patients having diabetes, it was present in 23.59% of all diabetic patients and in patients and in patients having both diseases, it was present in 43.64% of cases. The prevalence of dyslipidemia is shown in Table 5. Hypolipidemic drugs made up for 6.03% of the total drugs prescribed. Statins and fibrates were the classes used with statins (4.94%) being prescribed in much larger proportion than fibrates (1.08%).

Anti-anginals made up for 2.93% of the total drugs prescribed. Nitrates and calcium channel blockers were the anti-anginal classes prescribed. Anti-platelet drugs were prescribed in 195 of 507 prescriptions having anti-hypertensive drugs, i.e. a good 38.46%. Aspirin was the main drug of this class prescribed, followed by clopidogrel. The combination of these two drugs was also used frequently. Anti-platelet drugs made for 5.44% of the total drugs prescribed.

Anti-arrhythmic drug, amiodarone was prescribed in 5 cases and made for 0.13% of the pool of drugs. The drug use of associated classes is shown in Table 6.

Of 507 prescriptions having antihypertensive drugs, combination therapy was utilized in 207 (40.8%) prescriptions. Similarly, in case of drugs prescribed for diabetes, out of 270 prescriptions, 143 (52.96%) prescriptions were of combination therapy.

**Table 6: Associated classes of drugs used in diabetics and hypertensives.**

Class	Drugs	Frequency of prescription (%)
Hypolipidemics	Statins	177 (4.94)
	Fibrates	39 (1.08)
Anti-angina agents	Nitrates	94 (2.63)
	Calcium channel blockers	11 (0.30)
Anti-arrhythmic agents	Amiodarone	5 (0.13)
Anti-Platelet agents	Aspirin	158 (4.41)
	Clopidogrel	11 (0.30)
	Aspirin+ clopidogrel	26 (0.72)

%Consumption out of a pool of 3581 drugs



## DISCUSSION

A total of 595 prescriptions were recorded during data collection. Among the study population, the proportions of males were on the slightly higher side as compared to females.

In terms of morbidity, 54.62% patients were hypertensive (325 prescription); 14.78% patients were diabetic (88 prescription) whilst 30.58% had both the diseases and the majority of patients (45.54%) fell in the age group of 51-60, followed by the age group of 61-70 where we recorded 34.95% of the total patients.

Among antihypertensive drugs, ACE inhibitors were the most frequently prescribed class of drugs (19.18%). Ramipril (12.29%) was the most prescribed ACE inhibitor followed by enalapril (3.5%). Beta-blockers were the next most prescribed class (17.56%) wherein Atenolol (10.94%) was the most prescribed drug, followed by metoprolol (3.37%). This pattern has been reported in some other studies as well.<sup>16,17</sup> The combination most commonly prescribed was amlodipine and atenolol (14.05%). The physician's preference for this combination has been reported in earlier studies as well.<sup>18,19</sup>

Among the combinations prescribed, the glimepiride and metformin combination was the most prescribed one (16.16%). This has been reported in earlier studies also, which reported highest prescription for sulfonylureas and metformin combination.<sup>20,21</sup> Associated dyslipidemia was fairly prevalent in the study population. In HT patients, it was present in 30.67% of all HT patients; in patients having diabetes, it was present in 23.59% of all diabetic patients and in patients and in patients having both diseases, it was present in 43.64% of cases. Statins and fibrates were the classes used for dyslipidemia and statins used were in much proportion than fibrates. Anti-anginals made up for 2.93% of the total drugs prescribed. Nitrates and calcium channel blockers were the anti-anginal classes prescribed. Aspirin was the main antiplatelet drug prescribed, followed by clopidogrel. The combination of these two drugs was also used frequently.

### Limitations of the study

The study was carried out for 6 months in one hospital only.

## CONCLUSION

Both HT and diabetes are considered to be lifestyle diseases. Hence, apart from optimal and appropriate prescribing, there is a need for lifestyle modification to obtain improved outcomes. Combination therapy was observed in a high percentage of prescriptions. Though monotherapy is associated with improved compliance and fewer side-effects, combination therapy is desirable for synergistic actions and to

overcome complications. Patients should be made aware of non-medical factors like BMI, food habits which contribute to their well-being and should be educated about the importance of being aware of their medical history, drug allergies. Future management of HT and diabetes should involve not only more efficient use of existing agents but hopefully future agents that will provide enhanced efficacy and clinical efficiency.

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*Conflict of Interest: None*

*Ethical Approval: Approval obtained from Jamia Hamdard, Institutional Review Board*

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