



ASSESSMENT OF PRESCRIPTION PATTERNS IN PATIENTS WITH HYPERTENSION AND DIABETES MELLITUS IN A TERTIARY CARE HOSPITAL IN SOUTH INDIA

Lakshmi Suresh^{1*}, Neeraja S. Muraleedharan², Suhail M.³, Swathi M.⁴, Dr. Anilasree B.P.⁵ and Dr. G. Babu.⁶

^{1,2,3,4}Department of Pharm D., ⁵Assistant Professor, Department of Pharmacy Practice.

⁶Principal, Devaki Amma Memorial College of Pharmacy, Malappuram, Kerala.

***Corresponding Author: Lakshmi Suresh**

Department of Pharm D., Department of Pharmacy Practice, Malappuram, Kerala.

Article Received on 01/06/2021

Article Revised on 22/06/2021

Article Accepted on 12/07/2021

ABSTRACT

Objective: To analyze the prescription pattern of diabetic and hypertensive patients, ADRs, drug-drug interactions of anti-hypertensive and anti-diabetic drugs. Assess whether mono therapy or combination therapy used in prescription. **Methods:** A prospective observational study conducted during a study period of 6 months among 107 inpatients with hypertension and diabetes mellitus. **Results:** Among the data of 107 patient with both hypertension and diabetes 59 (55.14%) were male and 48 (44.85%) were female. Commonly prescribed antihypertensive was telmisartan which was prescribed 44 times in patients prescription (41%), amlodipine prescribed 23 times (21.4%). Commonly prescribed antidiabetic drug was metformin which was prescribed 77times (71.9 %), Insulin injection Human Actrapid prescribed 20 times (18.6%). The least prescribed drugs is Vildagliptin 1 time (0.9 %). Moderate drug-drug interactions were found to be 28, Minor drug-drug interactions is 12 in number. Commonly seen adverse drug reactions like hypoglycemia and hypotension were observed. The number of prescriptions with antihypertensive drugs given as combination therapy was 61 and monotherapy was 46 and in antidiabetic drugs given as combination therapy was 67 and monotherapy was 40. **Conclusion:** This study has analyzed the prescription pattern and the most common therapeutic treatment given to the patients with hypertension and diabetes mellitus along with drug- drug interactions, ADR, combination and mono therapy of hypertension and diabetes mellitus.

KEYWORDS: Hypertension, Diabetes Mellitus, Drug- Drug Interaction, Adverse Drug Reaction, Combination Therapy, Mono Therapy, Antihypertensive, Anti-Diabetics Drugs.

INTRODUCTION

Prescription pattern assessment in patients with hypertension and diabetes mellitus was done in order to improve the rationality of drug use, to observe the various drug related problems such as ADR and drug-drug interactions of both anti diabetic and antihypertensive drugs when administered together.

Now a days in majority of human populations, DM and hypertension frequently co exists leading to additive increases in the risk of life threatening cardiovascular events. Hypertension is a common co morbid condition in patients with DM. So there is a need to assess and analyze the prescription patterns of the drugs which helps in resolving the ADRs, Drug-Drug Interactions and other drug related problems, thereby improving the outcome of therapy.

The main aim of the study is to analyze the prescription pattern and the most common therapeutic treatment given to the patients with hypertension and diabetes mellitus. This study shows the prescribing patterns of

antihypertensive drugs in hypertension patients with diabetes mellitus and vice versa as well enough to analyze the common trend followed in the area of research which includes demographic character, medication history, drug- drug interactions, ADR identified, most commonly prescribed combination and mono therapy of hypertension and diabetes mellitus.

Prescription analysis and Prescription audit is a quality improvement process that seeks to improve patient care. The parameters which has to analyze in the process of prescription auditing are, Patient demographics, Clinical diagnosis, Department, Prescribing standards, Doctors name and signature. These analysis of prescriptions patterns are done in order to gives a clear idea about the commonly used medications among an area of research and its efficacy.

Many analyses have shown that concurrent use of thiazide diuretics (TD) and β blockers (BB) is able to increase risk for DM, meanwhile angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor

blockers (ARBs) are to reduce DM risk. When drugs from different antihypertensive classes are administered together, it can result in drug–drug interactions that can change the glucose modifying effects of individual agents. Such drug–drug interactions could increase or decrease the risk of DM. Studying the effects of combination antihypertensive and anti-diabetics helps in understanding the importance of effectiveness of combination therapy among the patients. It also gives an insight about number of individuals who require combination therapy and monotherapy.

MATERIALS AND METHODS

A prospective observational study conducted during a study period of 6 months from October 2019 to April 2020 at PVS Hospital (P) Ltd. A 350 bedded tertiary care hospital, Calicut, South India among 107 inpatients attending the hospital with hypertension and diabetes mellitus.

The Inclusion Criteria includes, Patient with age above 35, Diabetic patients treated with at least one anti-diabetic drugs with or without comorbidities and Hypertensive patients treated with at least one antihypertensive drug with or without co morbidities. Whereas, the exclusion criteria includes pregnant women and Pediatric patients. The study materials included case sheet of inpatients with both hypertension and diabetes mellitus of various wards in the study site. Literatures details of antihypertensive and anti-diabetics relevant to the study was taken in for reference. The relevant details from the case sheet was noted down into the Data collection form which included the demographic details, past medication history, diagnosis, comorbidities, present medication, the progress of the patients, the duration of medications taken for antihypertensive and anti-diabetics.

The medications for hypertension and diabetes mellitus was noted and most commonly used medications was analyzed and recorded. The drug-drug interaction between antihypertensive and hypoglycemic and ADRs in the prescription was checked. The drug prescribing patterns including types of therapy (monotherapy / combination therapy) and the category of the drug used in the treatment was recorded and all the data from the study was statistically analyzed and converted into percentage format. The analyzed data's are then presented in graphs, pie chart and tabular columns.

RESULTS

1 Demographic Characteristics

A data of 107 patient with both hypertension and diabetes were collected and among that 59 (55.14%) were male and 48 (44.85%) were female. Fig.1 shows demographic characteristics of patients.

Patients with history of hypertension for 0-10 years were 101(94.3%), for 11-20 years were 4(3.73%), and for 21-30 years were 2(1.86%).

Patients with history of diabetes mellitus for 0-10 years were 94(87.85%), for 11-20 years were 10(9.34%) and for 21-30 years were 3(2.80%).

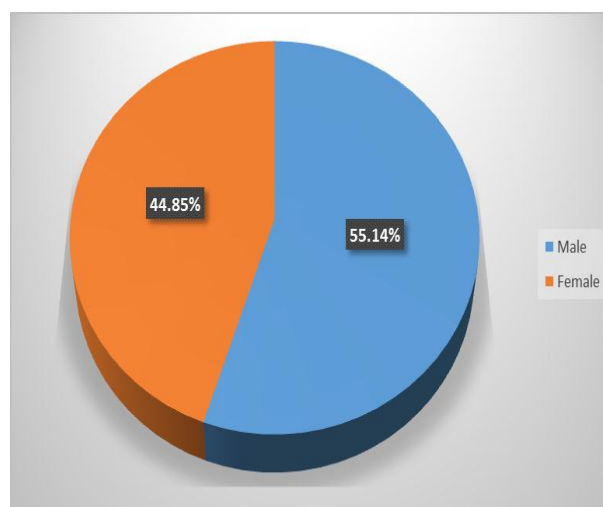


Fig.1: Demographic data indicates the gender informations.

2 Commonly prescribed antihypertensive drugs in patients with diabetes mellitus

Among 107 cases analyzed during the study, the most commonly prescribed antihypertensive drug belongs to the class of Angiotensin II receptor blockers (Telmisartan) followed by Calcium channel blocker.(Fig.2)

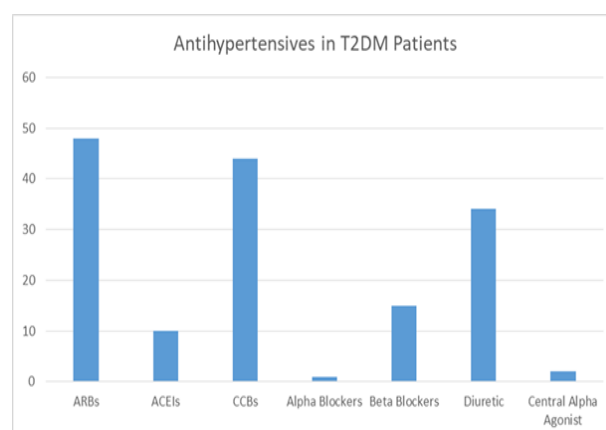


Fig. 2: The commonly prescribed antihypertensive drugs in T2dm patients.

Most of the antihypertensive drugs was given as monotherapy. (Fig 3)

- ❖ The number of antihypertensive drugs given as combination therapy was 19
- ❖ The number of antihypertensive drugs given as monotherapy was 154.

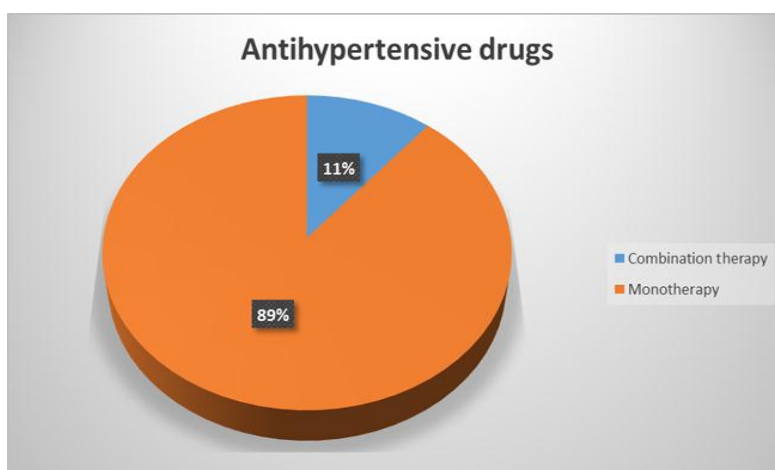


Fig 3: Types of antihypertensive therapy.

Table 1. Commonly used Antihypertensive drugs.

Class	Drugs	Number of patients.
ARBs	Telmisartan	44
	Losartan	3
	Irbesartan	1
ACEIs	Ramipril	10
Calcium Channel Blockers	Amlodipine	23
	Cilnidipine	20
	Nifedipine	1
Diuretics	Furosemide	18
	Spiranolactone	6
	Torsemide	7
	Metolazone	1
	Chlorthalidone	2
Beta blockers	Metoprolol	6
	Atenolol	2
	Carvedilol	2
	Nebivolol	2
	Bisoprolol	3
Alpha Blockers	Prazosin	1
Centrally acting alpha blockers	Clonidine	2

3 Commonly prescribed antidiabetic drug in patients with hypertension

- ❖ Among 107 cases analyzed the most commonly prescribed antidiabetic drug belongs to Biguanides (Metformin) followed by insulin. (Fig 4)

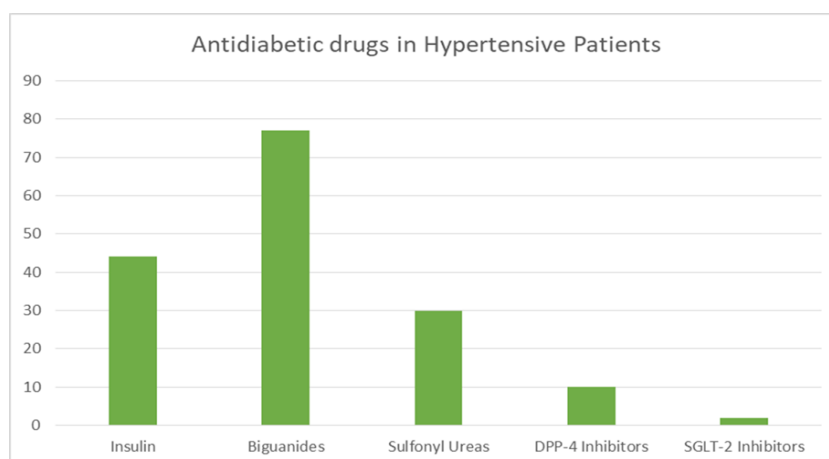


Fig. 4: The commonly prescribed antidiabetic drugs in hypertension.

Most of the antidiabetic drugs was given as monotherapy.(Fig 5)

- ❖ The number of antidiabetic drugs given as combination therapy was 23.

- ❖ The number of antidiabetic drugs given as monotherapy was 143.

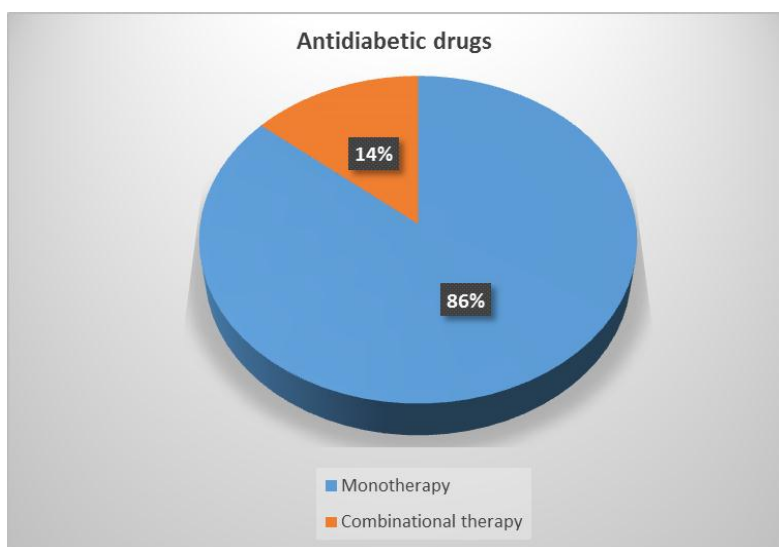


Fig. 5: Types of antidiabetic therapy.

Table 2: Commonly prescribed antidiabetic drug.

Class	Drugs	Number of patients.
Insulin	Very rapid acting (HA)	20
	Rapid acting	3
	Intermediate (HM)	21
Biguanides	Metformin	77
	Glimepride	17
Sulfonyl Ureas	Glipizide	4
	Glibenclamide	5
	Gliclazide	4
DPP-4 Inhibitors	Tenagliptin	4
	Vildagliptin	1
	Sitagliptin	5
SGLT2 Inhibitors	Dapagliflozin	2

4 Common Drug-Drug Interactions between antidiabetic and antihypertensive drugs

The drug-drug interaction among antihypertensive and antidiabetic drugs were analyzed. No major interactions were found. Although various moderate interactions were detected. (Fig.6)

- ❖ Majority of antihypertensive drugs moderately induce hypoglycemia when combined with antidiabetic agents.
- ❖ When furosemide given with Metformin, it increases the effect of Metformin resulting in lactic acidosis.
- ❖ The effect of Telmisartan may be increased when given along with Furosemide.
- ❖ The total number of moderate drug-drug interactions were found to be 28.
- ❖ The total number of minor drug-drug interactions were found to be 12.

- ❖ The total number of prescriptions with no drug-drug interactions were found to be 48.

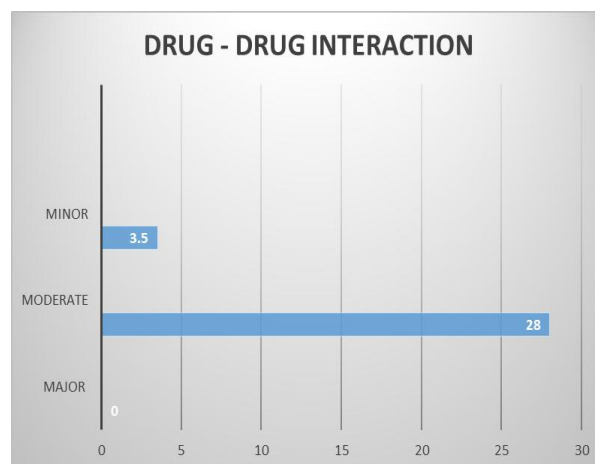


Fig. 6: Drug-Drug interactions found in the study.

5. Types of therapy used – Combination therapy or Mono therapy

- Combination therapy was most frequently seen in the treatment of both hypertension & diabetes mellitus. (Fig.7)
- The number of prescriptions with antihypertensive drugs given as combination therapy was 61.
- The number of prescriptions with antihypertensive drugs given as monotherapy was 46.
- The number of prescriptions with antidiabetic drugs given as combination therapy was 67.
- The number of prescriptions antidiabetic drugs given as monotherapy was 40.

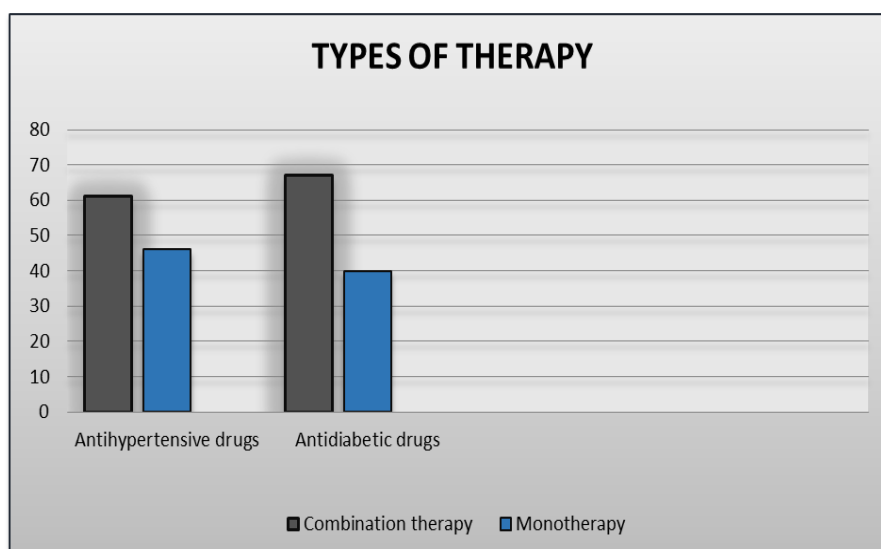


Fig.7.Types of therapy.

5.1 Most commonly prescribed antihypertensives in combination form: (Fig 8)

Sl no	Drugs	Number
1	Telmisartan + Amlodipine	5
2	Telmisartan + Hydrochlorothiazide	4
3	Furosemide + Spiranolactone	3
4	Telmisartan + Chlorthiazide	1
5	Cilnidipine + Telmisartan	1

5.2 Most commonly prescribed antidiabetics in combination form: (Fig 9)

Sl no	Drugs	Number
1	Metformin + Glimepiride	12
2	Metformin + Glipizide	8
3	Metformin + Glibenclamide	4
4	Metformin + Teneligptin	1

DISCUSSION

The study was conducted on inpatient unit of PVS hospital (P) Ltd a 350 bedded tertiary care hospital. A prospective study on analysis of prescription pattern of antihypertensive and antidiabetic drugs was conducted. A total number of 107 patient data were collected and analyzed during the period of October 2019 to April 2020.

Among the data collected with both hypertension, 59 (55.14%) were male and 48 (44.85%) were female. Patients with history of hypertension for 0-10 years were 101(94.3%), for 11-20 years were 4(3.73%), and for 21-30 years were 2(1.86%). Patients with history of diabetes mellitus for 0-10 years were 94(87.85%), for 11-20 years were 10(9.34%) and for 21-30 years were 3(2.80%).

In this study, a total of 7 classes of antihypertensive drugs were used (Tab.1). Most commonly prescribed antihypertensive was ARBs, telmisartan which was prescribed 44 times in patient's prescription which accounts to 41% followed by calcium channel blockers

which was amlodipine prescribed 23 times in patients which corresponds to 21.4%.

The least prescribed drugs from the study was found to be Prazosin, Metolozone, Nifedipine, Irbesartan prescribed 1 time in prescription which accounts to 0.9%.

In this study, a total of 5 classes of antidiabetic drugs were used. (Tab.2)

Most commonly prescribed antidiabetic drug was Biguanides (metformine) which was prescribed to 77 times in patients prescription which accounts to 71.9 % followed by Insulin which was injection Human Actrapid prescribed to 20 times in patients prescription which corresponds to 18.6%.

The least prescribed drugs from the study was found to be Vildagliptin prescribed 1 times in prescription which accounts to 0.9%.

The drug drug interaction among antihypertensive and antidiabetic drugs were analysed. No major interactions were found. Although various moderate interactions were detected. (Fig.4)

Majority of antihypertensive drugs moderately induce hypoglycemia when combined with antidiabetic agents. When furosemide given with Metformin, it increases the effect of Metformin resulting in lactic acidosis. The effect of Telmisartan may be increased when given along with Furosemide. The total number of moderate drug-drug interactions were found to be 28. The total number of minor drug-drug interactions were found to be 12. The total number of prescriptions with no drug-drug interactions were found to be 67.

In the study, there were no major adverse drug reactions observed in patients receiving antidiabetic and

antihypertensive drug. Although some commonly seen adverse drug reactions include hypoglycemia and hypotension which was due to the additive effect of combination drugs of DM and hypertension respectively.

Combination therapy was most frequently seen in the treatment of both hypertension & diabetes mellitus. (Fig.7). The number of prescriptions with antihypertensive drugs given as combination therapy was 61 and the number of prescriptions with antihypertensive drugs given as monotherapy was 46. The number of prescriptions with antidiabetic drugs given as combination therapy was 67 and the number of prescriptions antidiabetic drugs given as monotherapy was 40.

The most commonly prescribed antihypertensive in combination form was found to be the combination of Telmisartan and Amlodipine which was seen in 5 prescriptions, and followed by Telmisartan and Hydrochlorthiazide seen in 4 prescriptions, Furosemide + Spiranolactone was seen in combination form in 3 prescriptions and other drugs such as Telmisartan + Chlorthiazide, Cilnidipine + Telmisartan was seen in 1 prescriptions each among the 107 prescriptions. (Fig 8)

The most commonly prescribed antidiabetics in combination form was found to be the combination of Metformin + Glimepride among 12 prescriptions, followed by Metformin + Glipizide in 8 prescriptions. The drugs such as Metformin + Glibenclamide was seen in 4 prescriptions and the combination of Metformin + Teneligptin was seen in 1 prescription among the 107 prescriptions. (Fig 9)

CONCLUSION

This study is prospective observational study with limited number of patients about 107 but it provides reasonable view of anti-diabetic drugs prescribing pattern in diabetic patients with hypertension and it also shows the prescribing patterns of antihypertensive drugs in hypertension patients with diabetes mellitus as well. This study showed that ARBs were the most prescribed antihypertensive agents while Biguanides were the most prescribed antidiabetic agents. The assessment of the existing prescribing pattern helps to identify specific drug use problems which need to be understood before any meaningful intervention taken. There are moderate drug – drug interactions found in this study. This Study revealed that most of the patients with Type 2 Diabetes mellitus and Hypertension are treated with combination therapy of anti-diabetics and antihypertensives respectively. There were no major adverse drug reactions observed in patients receiving antidiabetic and antihypertensive drug. Some commonly seen ADRs include hypoglycemia and hypotension, due to the additive effect of combination drugs of Diabetes mellitus and hypertension respectively.

ACKNOWLEDGEMENT

We express our sincere gratitude to our Principal Dr G Babu Devaki, Amma Memorial College of Pharmacy, Chelembra and to our HOD Dr. Siraj Sundaran, Department of Pharmacy Practice, Devaki Amma Memorial College of Pharmacy, Chelembra for his guidance, monitoring and constant encouragement throughout the course of this research project. Also, PVS Hospital, (P) LTD, Calicut, Kerala for patient case files collection.

REFERENCES

1. Johnson ML, Singh H. Patterns of Antihypertensive Therapy among Patients with Diabetes. *J Gen Intern Med.*, 2005; 20: 842-6.
2. Tripathi KD. Insulin, oral hypoglycaemic drugs and glucagon. In: *Essentials of Medical Pharmacology*, 7th ed. Jaypee Brother's Medical Publishers (P) Ltd, New Delhi, 2013; 258-281.
3. Vanathi Elenchezhiyan, Sachidananda Moorthy, Sagar M. K, Bheemesh Naidu Mattam, Suresh Babu Sayana. Study of prescribing pattern of antihypertensive drugs in diabetic patients in a tertiary care centre, Vizianagaram, India. *International Journal of Basic & Clinical Pharmacology*, Jun, 2019; 8(6): 1192-1195.
4. Prasanna Dahal, Laxman M Maharaj, Bibek Dahal, Kissan Gupta. Assessment of prescription data in hypertensive and diabetic patient visiting private tertiary care hospital of Dharan municipality, Nepal. *Sansari technical journal*, 2015; 2(1): 44-47.
5. Ethiraj Dhanaraj, Amit Raval, Rajbharan Yadhav, Anil Bahansali and Pramila Tiwari. Prescription pattern of antihypertensive agents in T2DM at visiting tertiary care centre in north India, *International journal of hypertension*, 2012; 5(2): 41-49.
6. Padala Srikanth, D. Karthik Kumar, G. Narender Mallapuraju Rahul, Sama Tabassum, Dr. P. Sneha pharma. D. Prescription pattern of diabetes mellitus with comorbid condition. *IJRPP*, July– Sep, 2017; 6(3): 2278-2648.
7. Vikas Pandey, Ubeidul Hoda, M Aqil, M Sharma, M Akhtar, R Khandelwal, Abdul Kalam Najmi. Evaluation of prescribing pattern in diabetic and hypertensive patient in a south Delhi hospital. *International journal of basic and clinical pharmacology*, 2014; 3(3): 82-90.
8. Rajesh Kumar Jangir, Akhtar Ali, Javed Ahammed, Ansuya Gehlot, Archana Vyas, Kamal Kumar Batar. A prospective study of prescription pattern of antihypertensive patient at a tertiary care hospital. *Journal of medical science and clinical research*, 2019; 7(3): 1146-1157.
9. Arauz-Pacheco C, Parrott MA, Raskin P, for the American Diabetes Association. Hypertension management in adults with diabetes. *Diabetes Care.*, 2004; 27(1): S65–S67.
10. Hansson L, Zanchetti A, Carruthers SG, et al. Effects of intensive blood-pressure lowering and

low-dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment (HOT) randomised trial. HOT Study Group. *Lancet*, 1998; 351(9118): 1755–1762.

11. Effects of ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: results of the HOPE study and MICRO-HOPE substudy. Heart Outcomes Prevention Evaluation Study Investigators [published correction appears in *Lancet*. 2000; 356(9232):860]. *Lancet*, 2000; 355(9200): 253–259.
12. Dr. Shikha Sharma¹, Dr. Parag Sharma², Dr. Manuj Sharma. Prescribing pattern in patients with type 2 diabetes mellitus and hypertension: a prospective study. *International Journal of Medicine Research*, April, 2018; 3(2): 67-69.