DRUG USAGE PATTERN AND EFFECTIVENESS OF ANTIHYPERTENSIVES AND ORAL HYPOGLYCEMICS IN A TERTIARY CARE HOSPITAL

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Abstract

Background: Regular evaluation of antihypertensive and oral hypoglycemic prescribing patterns is crucial due to the rising prevalence of hypertension and diabetes and the continuous introduction of new drugs and combinations.

Materials and Methods: A drug utilization study was conducted to analyze the prescribing patterns of oral hypoglycemics and antihypertensives in hypertensive and diabetic patients. Data were collected from the General Medicine and Cardiology departments using inpatient case history forms and recorded in a specially designed data entry form. Drug usage was assessed using the ATC classification system and DDD, and drug effectiveness was monitored through lab values. The Chi-square test assessed the association between medication effectiveness with age, and the number of medicines.

Results: The study provides an overview of antihypertensive and oral hypoglycemic usage. Common antihypertensives prescribed include Cilnidipine and Clonidine, with CCBs and ARBs favored for monotherapy, and Amlodipine + Telmisartan for combination therapy. Vildagliptin and Metformin are commonly prescribed oral hypoglycemics, with DPP-4 inhibitors preferred for monotherapy and Glimepiride + Metformin for combination therapy. Drug usage was measured in DDD, with Cilnidipine and Glimepiride being the most utilized. The drugs lowered blood pressure in most hypertensive patients and reduced FBS levels to pre-diabetic ranges in diabetic patients, with values remaining stable in most cases.

Conclusion: The study helps to find out the most commonly prescribed antihypertensives and oral hypoglycemics and helps to know about their effectiveness in improving the disease condition which leads to rational drug use.

Keywords: ATC, Antihypertensives, DDD, Oral hypoglycemics.

Introduction

Non-communicable diseases (NCDs) are among the most significant global health challenges, accounting for 71% of all deaths annually, according to the World Health Organization (WHO).[1] Diabetes mellitus (DM) and hypertension are two of the most prevalent NCDs worldwide. In 2019, global diabetes prevalence was 9.3% (463 million), projected to rise to 10.9% (700 million) by 2045[2], while hypertension in adults was 26.4% in 2000, expected to increase to 29.2% (1.56 billion) by 2025.[3] The ICMR-INDIAB study underscores this global

burden, revealing a weighted prevalence of diabetes in India at 11.4% and hypertension at 35.5%. These conditions are more prevalent in urban areas and are rising in states with lower human development indexes.[4]

High systolic blood pressure (SBP) and fasting plasma glucose are among the leading contributors to global attributable deaths.[5] Diabetes mellitus and hypertension are interrelated diseases that increase the risk of atherosclerotic cardiovascular disease. Their prevalence is higher in older adults and is rising in industrialized nations due to aging populations. Hypertension is twice as common in diabetics, and having both conditions increases complications and doubles cardiovascular disease-related mortality.[6]

Drug Utilization Research (DUR) was defined by the WHO in 1977 as "The study of the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social, and economic implications". The main goal of drug utilization research is to ensure medicines are used rationally, maximizing benefits and minimizing harm.[7] Drug Utilization Research (DUR) employs the Anatomical Therapeutic Chemical (ATC) classification system and Defined Daily Dose (DDD) as measures. The ATC system categorizes drugs based on the organ or system they act upon and their therapeutic, pharmacologic, and chemical properties. The DDD is the assumed average daily maintenance dose for a drug's main indication in adults. The ATC/DDD system is designed to monitor and improve drug use quality.[8]

The current study aims to evaluate the drug usage pattern and the effectiveness of antihypertensives and oral hypoglycemics.

Methods

Study design and setting

A prospective observational study was conducted for 10 months in the general medicine and cardiology department of a 450-bed tertiary care hospital.

Inclusion and exclusion criteria

The study enrolled 97 patients at a tertiary care hospital, meeting specific inclusion criteria. Inclusion criteria consisted of patients above 20 years of age, patients admitted to the general medicine and cardiology department, patients diagnosed with hypertension and diabetes, and patients receiving antihypertensives or oral hypoglycemics. Exclusion criteria included ventilated and intensive care patients, emergency visits, pregnant women, and patients not receiving antihypertensives and oral hypoglycemics.

Ethical clearance

The study was approved by the Institutional Ethics Committee (IEC) with Approval No. SJPCEC/P25/PP/2019/001 of the St James' College of Pharmaceutical Sciences, Chalakudy, Kerala, India.

Study procedure

Inpatients diagnosed with hypertension and/ or diabetes who were willing to participate in the study and signed the consent form were included. The whole data was collected from the general medicine ward and cardiology department through inpatient case records and patient

interviews, and data was recorded in a specially designed data entry form the data entry format was used to enter all patient details like socio-demographic and clinical characteristics, provisions were given in the format to enter laboratory investigations like blood pressure, blood glucose levels, drugs prescribed, ATC and DDD levels. The drug usage pattern will be determined regarding the anatomical therapeutic chemical classification system (ATC) and defined daily dose (DDD). The DDD was calculated by using the formula

$$\text{Drug usage (in DDDs)} = \frac{\text{Items issued} \times \text{amount of drug per item}}{\text{DDD}}$$

The effectiveness of antihypertensives was determined based on blood pressure monitoring and oral hypoglycemics from the blood glucose level.

Statistical analysis

The documented data were analyzed using simple statistical methods. The chi-square test was done to find out the association between medication effectiveness with age and number of medications for both hypertension and diabetes. A P-value less than 0.05 was considered to be statistically significant.

Results

Distribution based on Age group

In our study on the use and effectiveness of antihypertensive and oral hypoglycemic agents (OHAs) among diabetic patients, we analyzed data from 143 participants (46 males and 97 females). The age distribution showed that the largest group of participants was aged 61-70 years (23.71%), followed by those aged 51-60 years and 71-80 years, both at 20.62%. Smaller age cohorts included participants aged 20-30 and 31-40 years, each making up 4.12% of the total population. This distribution indicates a higher prevalence and need for antihypertensive and OHA treatment among older diabetic patients (Table 1).

Table 1: Distribution based on Age group

Age group	Male (n=46)	Female (n=97)	Total (N=97)	Percentage (%)
20-30	2	2	4	4.12
31-40	3	1	4	4.12
41-50	8	5	13	13.4
51-60	9	11	20	20.62
61-70	6	17	23	23.71
71-80	13	7	20	20.62

Distribution based on frequency of disease among the study population

In our study of 143 participants (46 males and 97 females), we found that 51.55% of the population had hypertension, with a higher prevalence among males (58.70%) compared to females (45.10%). Diabetes was present in 19.59% of the participants, slightly more common in females (21.57%) than males (17.39%). Additionally, 28.87% of the participants had both hypertension and diabetes, with a higher occurrence in females (33.33%) compared to males

(23.91%). These results highlight a significant burden of hypertension and its co-occurrence with diabetes, particularly among female patients (table 2).

Table 2: Distribution based on frequency of disease among the study population

Condition	**Male (n=46)**	**Female (n=97)**	**Total**
Hypertension	27(58.70%)	23(45.10%)	50(51.555)
Diabetes	8(17.39%)	11(21.57%)	19(19.59%)
Hypertension + diabetes	11(23.91%)	17(33.33%)	28(28.87%)

List of the antihypertensive drugs prescribed

Out of 78 patients diagnosed with hypertension, the most significant drug classes are Beta Blockers at 28.61%, Calcium Channel Blockers (CCB) at 21.65%, and Angiotensin II Receptor Blockers (ARB) at 14.19%. The most commonly prescribed antihypertensive drugs included Cilnidipine (10 mg) at 14.93%, Clonidine (100 mcg) at 13.43%, Bisoprolol (5 mg) and Metoprolol (25 mg) each at 11.19%, and Telmisartan (40 mg) at 10.45%. These medications were the primary choices for managing hypertension among the participants. Other frequently used medications included Prazosin (5 mg) at 6.72%, and Torsemide (20 mg) at 5.97%. Lesser-prescribed drugs included Furosemide (40 mg), Nifedipine (10 mg), and Ramipril (2.5 mg), each at 4.48%, with several others such as Carvedilol (3.125 mg) and Losartan (50 mg) being less common (table 3).

Table 3: List of the antihypertensive drugs prescribed

Sl no	**Drug**	**Frequency (n=134)**	**Percentage (%)**
1	**Calcium Channel Blocker (CCB)**	**29**	**21.65**
	Cilnidipine (10 mg)	20	14.93
	Nifedipine (10 mg)	6	4.48
	Amlodipine (5 mg)	3	2.24
2	**Alpha-2 Agonist**		
	Clonidine (100 mcg)	18	13.43
3	**Beta Blocker**	**38**	**28.61**
	Bisoprolol (5 mg)	15	11.19
	Metoprolol (25 mg)	15	11.19
	Carvedilol (3.125 mg)	5	3.73
	Labetalol (300 mg)	1	0.75
	Nebivolol (2.5 mg)	1	0.75
	Propranolol (40 mg)	1	0.75
4	**Angiotensin II Receptor Blocker (ARB)**	**19**	**14.19**
	Telmisartan (40 mg)	14	10.45
	Losartan (50 mg)	3	2.24
	Olmesartan medoxomil (20 mg)	1	0.75
	Azilsattan medoxomil (40 mg)	1	0.75
5	**Alpha-1 Blocker**		
	Prazosin (5 mg)	9	6.72
6	**Diuretic**	**15**	**11.19**
	Torsemide (20 mg)	8	5.97

	Furosemide (40 mg)	7	5.22
7	**ACE Inhibitor** Ramipril (2.5 mg)	6	4.48

Antihypertensives combination therapy

In our study of antihypertensive combination therapies, Telmisartan + Amlodipine (40 + 5 mg) was the most commonly prescribed, comprising 36.84% of the total prescriptions. This was followed by Clinidipine + Telmisartan (10 + 40 mg), which made up 26.32% of the prescriptions. Other fixed-dose combinations were less common, each accounting for 5.26% of the prescriptions. These included combinations such as Olmesartan medoxomil + Metoprolol succinate (20 + 50 mg), Hydrochlorothiazide + Olmesartan medoxomil (12.5 + 20 mg), Clinidipine + Metoprolol succinate (10 + 50 mg), Telmisartan + Hydrochlorothiazide (40 + 12.5 mg), Telmisartan + Chlorthalidone (40 + 12.5 mg), and Telmisartan + Metoprolol succinate (40 + 50 mg) (table 4).

Table 4: antihypertensives combination therapy

Sl no	**Fixed dose combination**	**Frequency (n=19)**	**Percentage**
1	Telmisartan + Amlodipine (40 +5 mg)	8	36.84
2	Clinidipine + Telmisartan (10 +40 mg)	5	26.32
3	Olmesartan medoxomil + Metoprolol succinate (20 +50 mg)	1	5.26
4	Hydrochlorthiazide + Olmesartan medoxomil (12.5 +20 mg)	1	5.26
5	Clinidipine + Metoprolol succinate (10 +50 mg)	1	5.26
6	Telmisartan + Hydrochlorthiazide (40 +12.5 mg)	1	5.26
7	Telmisartan + Chlorthalidone (40 +12.5 mg)	1	5.26
8	Telmisartan + Metoprolol succinate (40 +50 mg)	1	5.26

Distribution of antihypertensives based on number of medications per prescription

In our study, antihypertensive treatments were primarily prescribed as monotherapy in 39.74% of cases and dual therapy in 35.90% of cases. Triple therapy was used in 16.66% of prescriptions, and polytherapy were prescribed in 7.69% of cases. CCBs and ARBs were the most prescribed in monotherapy. Among fixed-dose combinations, the most common was ARB + CCB, used in 68.42% of cases, followed by ARB + Diuretic (15.79%) and ARB + Beta Blocker (10.53%). This highlights a preference for ARB-based combinations, particularly with CCBs, for managing hypertension (table 5).

Table 5: Distribution of antihypertensives based on number of medications per prescription

Types of therapy	No of prescriptions (n=78)	Percentage
Monotherapy	**31**	**39.74**
CCBs	8	10.26
ARBs	8	10.26
Beta-blockers	4	5.13
Alpha 2 agonist	3	3.85
Diuretics	3	3.85
Others	6	6.39
Dual therapy	**28**	**35.90**
Beta-blocker + ARB	4	5.13
Beta-blocker + ACEI	3	3.85
Beta-blocker + CCB	3	3.85
Diuretics + CCB	3	3.85
Others	15	19.22
Triple therapy	**13**	**16.66**
Beta-blocker + ARB+CCB	2	2.56
Diuretic+ ARB+ alpha blocker	1	1.28
Beta-blocker + ACEI+ diuretic	1	1.28
Beta-blocker + CCB+ diuretic	1	1.28
Others	8	10.26
Polytherapy	6	7.69
Fixed dose combinations (n=19)		
ARB+ CCB	13	68.42
ARB + Diuretic	3	15.79
ARB+ Beta blocker	2	10.53
CCB+ Beta blocker	1	5.26

List of the Antihypertensives along with the ATC and DDD

In our study, the usage of antihypertensive drugs relative to the World Health Organization's Defined Daily Dose (DDD) recommendations varied significantly. Cilnidipine (10 mg) was the most frequently used, with 139 DDDs, precisely matching its recommended dose. Torsemide (20 mg) followed with 89.3 DDDs, well above its recommended 15 mg dose. Telmisartan (40 mg) was also frequently used, with 79 DDDs, aligning with its recommended dose. Clonidine (100 mcg) and Prazosin (5 mg) showed 45.7 and 56 DDDs, respectively, consistent with their recommended dosages. In contrast, drugs like Carvedilol (3.125 mg) and Labetalol (300 mg) were used less frequently, with 2.25 and 1 DDDs, respectively, compared to their recommended doses. This highlights a preference for Cilnidipine, Torsemide, and Telmisartan in hypertension management, while other medications showed more variable usage patterns (table 6).

Table 6: List of the Antihypertensives along with the ATC and DDD

Sl.no	Drug	ATC code	WHO recommended DDD	Drug usage (in DDD'S)
1	Cilnidipine (10 mg)	C08CA14	10 mg	139
2	Clonidine (100 mcg)	C02AC01	0.45 mg	45.7
3	Bisoprolol (5 mg)	C07AB07	10 mg	36.5

4	Metoprolol (25 mg)	C07AB02	0.15 g (150 mg)	22
5	Telmisartan (40 mg)	C09CA07	40 mg	79
6	Prazosin (5 mg)	C02CA01	5 mg	56
7	Torsemide (20 mg)	C03CA04	15 mg	89.3
8	Furosemide (40 mg)	C03CA01	40 mg	19
9	Nifedipine (10 mg)	C08CA05	30 mg	15
10	Ramipril (2.5 mg)	C09AA05	2.5 mg	32.5
11	Carvedilol (3.125 mg)	C07AG02	37.5 mg	2.25
12	Losartan (50 mg)	C09CA01	50 mg	12
13	Amlodipine (5 mg)	C08CA01	5 mg	16
14	Labetalol (300 mg)	C07AG01	0.6 g (600 mg)	1
15	Olmesartan medoxomil (20 mg)	C09CA08	20 mg	2
16	Nebivolol (2.5 mg)	C07AB12	5 mg	6
17	Azilsattan medoxomil (40 mg)	C09CA09	40 mg	8
18	Propranolol (40 mg)	C07AA05	0.16 g (160 mg)	1

Effectiveness of Antihypertensives in hypertensive patients

The effectiveness of antihypertensives was determined based on the blood pressure monitoring and it was found appropriate as 47.44%of the hypertension patients got improvement from their disease condition 34.62% were reduced to the pre-hypertension range and in 17.95% the condition remained the same (table 7).

Table 7: Effectiveness of Antihypertensives in hypertensive patients

Stage at discharge	**No of patients (n=78)**	**Percentage (%)**
Reduced to normal (120/80 mmHg)	37	47.44
Reduced to prehypertension stage (140/90 mmHg)	27	34.62
Remained same	14	17.95

Table 8: Association of hypertensive medication effectiveness with age and number of medications

Our study found that age significantly influenced the effectiveness of antihypertensive medication (P=<0.05), with younger patients showing more improvement. Specifically, those under 50 years had the highest rate of achieving normal blood pressure. However, the number of medications did not significantly impact treatment outcomes (table 8).

Table 8: Association of hypertensive medication effectiveness with age and number of medications

Age (yrs)	Stage at discharge			X^2 value	P value	Number of medications	Stage at discharge			X^2 value	P value
	Reduced to normal	Reduced to pre-hypertension	Remained same				Reduced to normal	Reduced to pre-hypertension	Remained same		
<50	6	2	5	16.910	0.031*	**1**	14	11	6	1.881	0.930
51-60	10	6	1			**2**	14	8	6		
61-70	5	13	2			**3**	6	6	1		
71-80	10	3	4			**>3**	3	2	1		
>80	6	3	2								

*X^2 at 0.05 level of significance

List of the OHA drugs prescribed

In our study of oral hypoglycemic agents (OHAs), DPP-4 Inhibitors constitute 37.93% (11 out of 29) of the total prescriptions, Biguanides account for 20.69% (6 out of 29), Sulfonylureas make up 24.14% (7 out of 29), and SGLT2 Inhibitors represent 13.79% (4 out of 29). Vildagliptin (50 mg) was the most frequently prescribed drug, making up 27.59% of prescriptions. Metformin (500 mg) and Glimepiride (2 mg) were each prescribed 20.69% of the time. Dapagliflozin (10 mg) was used in 10.34% of cases, while Sitagliptin (50 mg) was prescribed in 6.89% of instances. Less frequently, Pioglitazone (15 mg), Gliclazide (40 mg), Empagliflozin (25 mg), and Linagliptin (5 mg) were each used in 3.45% of prescriptions (table 9).

Table 9: List of the OHA drugs prescribed

Sl no	Drug	Frequency (n=29)	Percentage (%)
1	**DPP-4 Inhibitors**	**11**	**37.93**
	Vildagliptin (50mg)	8	27.59
	Sitagliptin (50mg)	2	6.89
	Linagliptin (5 mg)	1	3.45
2	**Biguanides**		
	Metformin (500mg)	6	20.69
3	**Sulfonylureas**	**7**	**24.14**
	Glimepiride (2 mg)	6	20.69
	Gliclazide (40mg)	1	3.45
4	**SGLT2 Inhibitors**	**4**	**13.79**
	Dapagliflozin (10mg)	3	10.34
	Empagliflozin (25mg)	1	3.45
5	**Thiazolidinediones**		

	Pioglitazone (15mg)	1	3.45
6	**Gliclazide (40mg)**	**1**	**3.45**

OHA combination therapy

In our study of OHA combination therapies, the most commonly prescribed was Glimepiride combined with Metformin (2+500 mg), used in 62.07% of cases. Vildagliptin and Metformin (2+500 mg) was the second most common, at 13.79%. Other combinations included Sitagliptin + Metformin (50+500 mg) at 6.89%, and less frequently used combinations such as Metformin + Teneligliptin, Linagliptin + Metformin, Rapaglinide + Voglibose, Empagliflozin + Linagliptin, and Glimepiride + Metformin + Voglibose, each at 3.45% (table 10).

Table 10: OHA combination therapy

Sl no	**Fixed dose combination**	**Frequency (n=29)**	**Percentage**
1	Glimepiride + Metformin (2+500 mg)	18	62.07
2	Vildagliptin + Metformin (2+500 mg)	4	13.79
3	Sitagliptin + Metformin(50+500 mg)	2	6.89
4	Metformin + Teneligliptin (500 + 20 mg)	1	3.45
5	Linagliptin + Metformin (2.5+500 mg)	1	3.45
6	Rapaglinide + Voglibose (1+0.3 mg)	1	3.45
7	Empagliflozine + Linagliptin (10+5 mg)	1	3.45
8	Glimepiride + Metformin+ Voglibose (2+500 +0.2 mg)	1	3.45

Distribution of OHA based on number of medications per prescription

In our study, the majority of oral hypoglycemic agent (OHA) prescriptions were for monotherapy, accounting for 80.85% of cases. Dual therapy was used in 14.89% of prescriptions, while triple therapy was prescribed in 4.26% of cases. DPP4 I are the most commonly used monotherapy. Among fixed-dose combinations, the most common was Sulfonylurea + Biguanide, used in 62.07% of cases. Other combinations included DPP4 Inhibitor + Biguanide at 27.59%, SGLT2 Inhibitor + DPP4 Inhibitor, Sulfonylurea + Biguanide + Alpha-glucosidase Inhibitor, and Meglitinide + Alpha-glucosidase Inhibitor, each at 3.45%. This indicates a strong preference for monotherapy and the Sulfonylurea + Biguanide combination in diabetes management (table 11).

Table 11: Distribution of OHA based on number of medications per prescription

Types of therapy	**No of prescriptions (n=47)**	**Percentage (%)**
Monotherapy	**38**	**80.85**
DPP4 I	7	14.89
Sulphonyl urea	6	12.77
Biguanides	4	8.51
SGLT2I	2	4.26
Others	19	40.43
Dual therapy	**7**	**14.89**
SU + Biguanide	2	4.26

DPP4 I + Thiazolidine diones	1	2.13
Others	4	6.38
Triple therapy	**2**	**4.26**
SGLT2 I + Biguanide+ DPP4 I	1	2.13
Others	1	2.13
Fixed dose combinations (n=29)		
SU + Biguanide	18	62.07
DPP4 I + Biguanide	8	27.59
SGLT2 I + DPP4 I	1	3.45
SU + Biguanide + Alpha	1	3.45
glucosidase I	1	3.45
Meglutinide + Alpha-glucosidase I		

List of the OHA along with the ATC and DDD

Our study showed varied adherence to the World Health Organization's Defined Daily Dose (DDD) recommendations for oral hypoglycemic agents (OHAs). Glimepiride (2 mg) was used closely to its recommended dose, while Vildagliptin (50 mg) and Sitagliptin (50 mg) were prescribed at lower than recommended levels. Metformin (500 mg) and Dapagliflozin (10 mg) were also used below their recommended doses. Empagliflozin (25 mg), Gliclazide (40 mg), Pioglitazone (15 mg), and Linagliptin (5 mg) showed similar deviations, indicating a general variability in adherence to the DDD guidelines (table 12)

Table 12: List of the OHA along with the ATC and DDD

Sl.no	Drug	ATC code	WHO recommended DDD	Drug usage (in DDD'S)
1	Vildagliptin (50mg)	A10BH02	0.1 g (100mg)	17.5
2	Metformin (500mg)	A10BA02	2g (2000 mg)	7
3	Glimepiride (2 mg)	A10BB12	2mg	32.5
4	Dapagliflozin (10mg)	A10BK01	10mg	9.75
5	Sitagliptin (50mg)	A10BH01	0.1g (100 mg)	5
6	Pioglitazone (15mg)	A10BG03	30 mg	2.5
7	Gliclazide (40mg)	A10BB09	60 mg	4
8	Empagliflozin (25mg)	A10BK03	17.5 mg	3.57
9	Linagliptin (5 mg)	A10BH05	5 mg	3

Effectiveness of OHA in diabetes patients

The effectiveness of oral hypoglycemic was determined based on the fasting blood glucose levels and only 27.66% got reduced to normal condition, 40.43% were reduced to pre-diabetic range and 31.91% remained the same (table 13)

Table 13: Effectiveness of OHA in diabetes patients

Stage at discharge	No of patients (n=47)	Percentage (%)
Reduced to normal (100 mg/dl)	13	27.66
Reduced to prediabetic range (120 mg/dl)	19	40.43
Remained same	15	31.91

Association of OHA medication effectiveness with age and number of medications

Our study highlighted that the number of medications significantly affected the effectiveness of oral hypoglycemic agents (OHAs), with patients on a single medication showing better outcomes. Specifically, those on one medication had a notable improvement, with 13 achieving normal glucose levels and 11 reducing to pre-diabetic status (P=<0.05). Age influenced effectiveness significantly only in the 51-60 age group, while other age groups did not show a significant association with treatment outcomes (table 14).

Table 14: Association of OHA medication effectiveness with age and number of medications

Age (yrs)	Stage at discharge			X^2 value	P value	Number of medications	Stage at discharge			X^2 value	P value
	Reduced to normal	Reduced to pre-diabetic	Remained same				Reduced to normal	Reduced to pre-diabetic range	Remained same		
<50	2	3	4	3.703	0.717	**1**	13	11	14	11.234	0.024*
51-60	2	6	5			**2**	0	6	1		
61-70	4	4	4			**3**	0	2	0		
>70	5	6	2								

*X^2 at 0.05 level of significance

Discussion

This prospective study assessed antihypertensive and oral hypoglycemic drug use in general medicine and cardiology departments, focusing on treatment patterns and effectiveness by monitoring BP and FBS levels in 97 patients. Hypertension was more common in males, while diabetes was more prevalent in females. Similar trends were reported by Singh et al. (2020)[9] and Narkar et al. (2021)[10], while Pushpa et al. (2020)[11] found a higher diabetes prevalence in females.

In our study, Beta Blockers (28.61%) were the most prescribed antihypertensives, followed by CCBs (21.65%) and ARBs (14.19%), aligning with Liao KM et al. (2023)[12] and Raima et al. (2021)[13]. While some studies reported higher CCB usage, we found cilnidipine, clonidine, bisoprolol, metoprolol, and telmisartan commonly used. The most frequent fixed-dose combination was ARB + CCB (68.42%), with Telmisartan + Amlodipine (36.84%) and Cilnidipine + Telmisartan (26.32%) being predominant, consistent with findings by Suthar et

al. (2020)[14] and Susmitha et al. (2020)[15]. Other studies reported variable trends in combination preferences.

In our study, cilnidipine had the highest Defined Daily Dose (DDD) at 139, followed by torsemide (89.3 DDD) and telmisartan (79 DDD), differing from G. Susmitha et al. (2020)[15], who reported higher telmisartan use. Effectiveness analysis showed BP normalization in 47.44% of patients, 34.62% reduced to prehypertension, and 17.95% remained unchanged. Susmitha et al. reported 85% improvement, and Raima et al. (2021)[13] found target BP achievement in 211 of 260 patients by follow-up.

Additionally, ages 51-60 showed greater improvement in maintaining normal blood pressure, while the number of medications did not significantly impact effectiveness. A nationwide population-based study found that adherence to antihypertensive medications is highest with 3 to 4 medications and in patients aged 60 to 69 years, but significantly decreases with 9 or more medications, regardless of age.[16] The SPRINT trial further demonstrated that in adults aged 75 years or older, treating to a systolic blood pressure (SBP) target of less than 120 mm Hg significantly reduced rates of major cardiovascular events and all-cause mortality compared to a target of less than 140 mm Hg.[17]

In our study, DPP-4 inhibitors were the most commonly prescribed antidiabetic class, followed by sulfonylureas and biguanides, aligning with a nationwide Japanese study[18]. Vildagliptin (50 mg) was the most prescribed drug (27.59%), followed by metformin (500 mg) and glimepiride (2 mg) at 20.69% each, and dapagliflozin (10 mg) at 10.34%. Vildagliptin, both as monotherapy and in combination with metformin, was frequently used due to its effectiveness in reducing HbA1c with minimal hypoglycemia and no weight gain. Other studies reported varying trends in the use of biguanides, sulfonylureas, and DPP-4 inhibitors[19,20,21,22].

In our study, monotherapy accounted for 80.85% of oral hypoglycemic prescriptions, with dual and triple therapies at 14.89% and 4.26%, respectively. The most common fixed-dose combination (FDC) was sulfonylurea + biguanide (62.07%), followed by DPP-4 inhibitor + biguanide (27.59%). Glimepiride + Metformin (2+500 mg) was the most prescribed FDC (62.07%), followed by Vildagliptin + Metformin (13.79%) and Sitagliptin + Metformin (6.89%). These findings align with studies by Karelia et al. (2021)[23], Rathod et al. (2020)[24], all reporting similar trends. Triple therapy commonly involved sulfonylurea + biguanide + alpha-glucosidase inhibitor (3.45%), consistent with Gupta et al. (2021)[25].

In our study, glimepiride had the highest oral hypoglycemic drug usage at 32.5 DDD, followed by vildagliptin at 17.5 DDD. A study by A. Alti et al. (2015)[26] reported DDD/1000 inhabitants/day for metformin (10.5), glimepiride (9.3), and glibenclamide (7.91). In terms of effectiveness, 40.43% of patients reduced to pre-diabetic ranges, while most others showed no change. G. Susmitha et al. (2020)[15] reported 84% improvement in diabetic patients based on FBS levels. A significant association was observed between the number of medications and the effectiveness of therapy, indicating the prescriptions were effective in lowering FBS.

Conclusion

The present study aimed to analyze drug use patterns in hypertensive and diabetic patients, focusing on the effectiveness of antihypertensives and oral hypoglycemics. Results showed that hypertension was more prevalent in males, while diabetes was more common in females, who also had a higher incidence of coexisting hypertension.

Among hypertensive patients, Cilnidipine was the preferred monotherapy, with Amlodipine + Telmisartan being the most common combination therapy, followed by Cilnidipine + Telmisartan. Antihypertensives were effective, with 47.44% of patients showing improvement, 34.62% reaching pre-hypertension levels, and 17.95% seeing no change. In diabetic patients, vildagliptin was the favored monotherapy, while Sulfonylurea + Biguanide and DPP4 Inhibitor + Biguanide were common combinations. Oral hypoglycemics achieved normal fasting blood glucose in 27.66% of patients, pre-diabetic levels in 40.43%, and no change in 31.91%. Cilnidipine had the highest drug usage (DDD) among hypertensives, followed by torsemide. For oral hypoglycemics, glimepiride was used more than vildagliptin.

Effective management of chronic diseases like diabetes and hypertension demands a blend of intensified treatment, lifestyle modifications, and proper patient education. Enhanced education on diet, exercise, and medication adherence is crucial for achieving optimal disease control and improving overall quality of life. Moreover, appropriate drug use—guided by treatment guidelines and tailored to individual needs—ensures maximum therapeutic benefit and minimizes potential side effects.

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