WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 16, 702-722. Research Article ISSN 2277–7105

A STUDY ON IMPACT AND OUTCOMES OF CLINICAL PHARMACIST ON ASSESSEMENT OF MEDICATION ADHERENCE, DRUG UTILIZATION PATTERN AND DRUG RELATED PROBLEMS IN TYPE-2 DIABETES MELLITUS WITH HYPERTENSION IN A TERTIARY CARE HOSPITAL

Dr. Md. Anbarul Rain*, Dr. Kishor M. R., Dr. Saraswathi C. D., Dr. Aditya V.

India.

Article Received on
26 June 2024,

Revised on 16 July 2024,
Accepted on 05 August 2024

DOI: 10.20959/wjpr202416-33457

***Corresponding Author**
Dr. Md. Anbarul Rain
India.

ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disorder which requires long term therapy. The study highlights the critical need for effective management of diabetes with hypertension in individuals with type 2 diabetes, as adherence to anti-diabetic medication is crucial for glycemic control and overall health. Understanding and addressing these DRPs, considering problems and causes are essential to optimize treatment outcomes and reduce complications. The study aims to assess the prescribing pattern of type-2 anti-diabetic drugs and antihypertensive drugs and align them with established respective treatment guidelines, emphasizing the significance of integrated care for individuals dealing the condition diabetes with hypertension.

Methods: The study involved evaluating 50 outpatient prescriptions in a tertiary care setting. Data collection was conducted by reviewing medication therapy charts of patients in the outpatient department. The collected information encompassed patient demographics, lab investigations, prescribed and administered medications, progression chart details, and utilized designed data collection forms such as informed consent forms and pharmacist patient documentation forms. Medication information from patients was gathered via questionnaires, and drug utilization and evaluation were systematically executed through various steps. **Results:** The present study provides a thorough analysis of drug utilization patterns, medication adherence, and drug-related problems (DRPs) among 50 patients with type 2 diabetes mellitus (T2DM) and hypertension. The demographic characteristics revealed a predominance of males (62%) and patients over 40 years of age (82%). Various anti-

diabetic agents and antihypertensive drugs were prescribed, with Metformin and Amlodipine being the most prevalent. The study identified 142 DRPs, with the most common being related to patient/psychological factors (48.72%). Medication adherence assessment using the MMAS-8 questionnaire indicated that a significant proportion of patients exhibited low adherence (94%). Additionally, glycemic control was achieved in only 30% of patients. The drug utilization pattern showcased prevalent use of two-drug therapy for both T2DM and hypertension. Metformin was the most frequently prescribed anti-diabetic drug, and Amlodipine was the dominant antihypertensive drug. Fixed drug combinations were widely utilized, emphasizing the need for effective therapeutic strategies. This comprehensive study sheds light on the complex interplay of drug utilization, medication adherence, and DRPs in patients with T2DM and hypertension. Addressing these factors is vital for improving patient outcomes and optimizing treatment approaches for this population. **Conclusion:** The conclusions from these studies highlight the hurdles in managing medications for individuals with type 2 diabetes and hypertension. Drug-related problems (DRPs) are prevalent, encompassing challenges in drug selection, dosing, and usage often influenced by psychological factors and resistance to lifestyle changes. Pharmacists are essential in addressing these issues, but further research is crucial to optimize drug therapy outcomes. Commonly prescribed medications include oral anti-diabetic drugs like metformin and glimepiride, alongside a dominance of amlodipine in antihypertensive prescriptions. Although prescriptions mostly adhere to treatment guidelines, larger studies are needed for a more comprehensive understanding. Medication adherence poses a significant challenge, primarily due to forgetfulness and inconvenience. Interventions are necessary to improve adherence, especially given the low proportion of patients demonstrating high adherence. Despite drug therapy, many individuals struggle with uncontrolled blood glucose levels, highlighting the need for improved adherence and glycemic control strategies.

KEYWORDS: Type-2 DM, Hypertension, DRPs, Medication adherence, Drug utilization pattern, MMAS-8.

INTRODUCTION

Hypertension (HTN) and diabetes (DM) present significant challenges to global public health. They stand as major risk factors for cardio-cerebrovascular diseases, being prominent causes of both mortality and morbidity among adults3. Research indicates that individuals dealing with both HTN and DM face a notably elevated risk of cardio- cerebrovascular

diseases compared to those dealing with either condition in isolation5. Furthermore, HTN and DM present substantial challenges to the healthcare systems in lower- and middle-income countries, a consequence of shifts in dietary patterns, lifestyle alterations, and an increase in sedentary behaviours. Notably, HTN and DM share common comorbidities and risk factors. The complications associated with these conditions have a profound impact on the overall quality of life and productivity. This includes an increased risk of stroke, cardiovascular diseases, end-stage renal disease, retinopathy, depression, impaired health- related quality of life, and escalated healthcare expenses.

The coexistence of HTN and type 2 diabetes (T2DM) has been extensively documented in previous studies. Epidemiological evidence suggests that DM predisposes individuals to HTN. For instance, in the USA, it was found that up to 75% of adults with diabetes also suffer from hypertension. Similarly, in China, around 15 million individuals grapple with both HTN and DM. In Ethiopia, it was estimated that approximately 1.7 million cases of DM and 23,157 related deaths occurred in 2019. Additionally, available data indicates a pooled prevalence of HTN at 21.8% in the country, with the highest prevalence recorded in Addis Ababa at 25.4%, and the lowest in the Tigray region at 15.4%. Within Ethiopia, specific reports have highlighted varying prevalence rates, such as 13.9% among university employees and 27.3% among civil servants in Addis Ababa for HTN, and 4.7% and 3.9% for DM among university employees and governmental civil servants in Guji Zone, respectively. Furthermore, the coexistence of HTN and T2DM was observed in a substantial percentage of patients, ranging from approximately 40% to 75%. While the prevalence of HTN and T2DM co-occurrence is believed to be substantial among university employees in Ethiopia, empirical evidence is limited. Hence, the primary objective of this study was to assess the prevalence of concurrent HTN and T2DM among university employees in Eastern Ethiopia.

AIM AND OBJECTIVES

Aim: To Study the Impact and Outcomes Of Clinical Pharmacist On Assessement Of Medication Adherence, Drug Utilization Pattern And Drug Related Problems In Type-2 Diabetes Mellitus With Hypertension In Tertiary Care Hospital.

Objectives

- To assess and analyse the patterns of drug-related problems (DRPs) in patients concurrently managing Type 2 Diabetes Mellitus with hypertension.

- To assess and provide crucial baseline data regarding the occurrence and nature of medication adherence in this specific patient group.
- To enhance treatment outcomes and overall well-being of patients with Type 2 Diabetes Mellitus with hypertension by addressing and mitigating drug utilization pattern effectively.

METHODOLOGY

A prospective study was carried out for the assessment of medication adherence, drug utilization pattern and drug related problems in tertiary care hospital, Bangalore. With the objective of assessing, enhancing and analysing the medication adherence, drug utilization pattern and drug related problems.

STUDY DESIGN: It was a prospective study conducted in General Medicine outpatient department.

ETHICAL CLEARANCE: Institutional Ethical Committee, Gautham College of Pharmacy, Bangalore, Karnataka, India approved the study.

STUDY DURATION: The study would be conducted over a period of six months.

SAMPLE SIZE: 50 outpatient prescriptions were evaluated.

SOURCE OF DATA

- The details collected in data collection form include patients demographic, lab investigation, medication prescribed and administered and progression chart details and designed data collection forms like informed consent form, pharmacist patient documentation forms.
- The patients medication information is collected through questionnaire.

STUDY SITE: Study was conducted in General Medicine Out-Patient Department in tertiary care hospital, Bangalore, Karnataka, India.

INCLUSIVE CRITERIA

- Patients who are above 18 years, adult and geriatrics.
- Patients who are willing to participate in the study.
- Patients who is having type-2 diabetes mellitus with hypertension diseases.

- Patients who are conscious and able to communicate.

EXCLUSIVE CRITERIA

- Patients who are not willing to participate in the study.
- Patients unable to fill questionnaire due to pain or other problems.
- Patients who are below 18 years of age.
- Patients with breastfeeding, pregnancy and paediatrics

METHOD OF COLLECTION OF DATA

The newly out patients cases was randomly collected on daily basis and follow up for the assessing, enhancing and analysing the medication adherence, drug utilization pattern and drug related problems.

STATISTICAL ANALYSIS

The data obtained from the observation was categorized and tabulated in terms of number and percentage on a spreadsheet software similar to Microsoft Excel. The analysis was conducted using statistical software, specifically a tool like the International Business Machines with Statistical Package for the Social Sciences (IBM-SPSS) version 29.0. The final results obtained from the analysis were analyzed using descriptive statistics and visually represented through graphical elements such as bar charts, column charts, and pie charts as needed for the study to calculate P – Value to state the level of significance.

RESULTS

PATIENT DEMOGRAPHICS

Age wise distribution of the study population

The dataset presents age distribution for 50 subjects across six groups (20-30, 30-40, 40-50, 50-60, 60-70, and 70-80). The majority falls in the 40-50 age range (32%), followed by 50-60 (28%) and 30-40 (16%). The youngest group (20-30) comprises 2% of the subjects, while the 60-70 and 70-80 groups each represent 18% and 4%, respectively (Table-1).

Table 1: Age Wise Distribution.

Age	No of subjects	Percentage (%)
20-30	1	2
30-40	8	16
40-50	16	32
50-60	14	28
60-70	9	18

70-80	2	4
Total	**50**	**100%**

Gender distribution of the study population

The data depicts the gender distribution of 50 subjects, with 31 being male (62%) and 19 being female (38%). Overall, the study comprised a total of 50 subjects, highlighting a gender imbalance with a higher representation of males (Table-2).

Table 2: Gender Distribution.

Gender	No of subjects	Percentage (%)
Male	31	62
Female	19	38
Total	**50**	**100**

BMI of the study population

The data illustrates the distribution of subjects based on their obesity classification. Among 50 subjects, none were underweight. The majority fell into the overweight category (44%), followed by normal weight (38%), and obese (18%) (Table-3).

Table 3: BMI.

Type of Obesity	No of subjects	Percentage (%)
Under weight	0	0
Normal	19	38
Over weight	22	44
Obese	9	18

Exercise status of the study population

The data outlines the exercise status of the subjects in the study. Among the 50 subjects, 11 (22%) reported regular exercise, 12 (24%) engaged in exercise irregularly, and the majority, 27 (54%), did not engage in any form of exercise. The majority of the subjects did not have aregular exercise routine, highlighting a significant portion of the population with a sedentary lifestyle (Table-4).

Table 4: Exercise Status.

EXERCISE STATUS	No of subjects	Percentage (%)
Regular	11	22
Irregular	12	24
No	27	54

Marital status of the study population

The data presents the marital status of the subjects in the study. Among the 50 subjects, a significant majority of 44 (88%) were married, while a smaller portion of 6 (12%) were unmarried. This indicates that a substantial proportion of the study population was in a married marital status, underscoring the dominance of this demographic in the sample (Table-5).

Table 5: Marital Status.

MARITAL STATUS	No of subjects	Percentage (%)
Married	44	88
Unmarried	6	12
Total	**50**	**100**

Meal habits of the study population

The data delineates the meal habits of the subjects in the study. Among the 50 subjects, 34 (68%) maintained regular meal habits, while 16 (32%) exhibited irregular meal patterns. This indicates that a majority of the subjects followed a regular meal routine, underscoring the prevalence of regular meal habits in the study population (Table-6).

Table 6: Meal Habits.

MEAL HABITS	No of subjects	Percentage (%)
Regular	34	68
Irregular	16	32
Total	**50**	**100**

Tobacco status of the study population

The data showcases the tobacco usage among the subjects in the study. Out of the 50 subjects, 23 (46%) reported using tobacco, while 27 (54%) did not. This highlights that asubstantial portion of the study population does not engage in tobacco use, revealing a significant proportion of non-tobacco users in the sample (Table-7).

Table 7: Tobacco Status.

Tobacco	No of subjects	Percentage (%)
Yes	23	46
No	27	54
Total	**50**	**100**

Smoking status of the study population

The data provides insights into the smoking habits of the subjects in the study. Among the 50 subjects, 24 (48%) reported being smokers, while 26 (52%) were non-smokers. This indicates that a slight majority of the subjects did not smoke, portraying a significant proportion of non- smokers within the study population (Table-8).

Table 8: Smoking Status.

Smoking	No of subjects	Percentage (%)
Yes	24	48
No	26	52
Total	**50**	**100**

Alcoholic status of the study population

The data illustrates the alcohol consumption habits of the subjects in the study. Out of the 50 subjects, 17 (34%) reported consuming alcohol, while the majority of 33 (66%) did not. This indicates that a significant portion of the study population does not engage in alcohol consumption, underscoring a notable proportion of non-alcohol consumers within the sample (Table-9).

Table 9: Alcoholic Status.

Alcoholic	No of subjects	Percentage (%)
Yes	17	34
No	33	66
Total	**50**	**100**

MEDICATION ADHERENCE

A total of 50 subjects with type-2 DM with Hypertension were included and analyzed for the study. The mean age of the sample was 50.6 (±11.105) years and male:female ratio was 31:19 (Table). Responses of the study participants to individual items of MMAS-8 are summarized in Table 10.

Table 10: Responses of the participants to individual items of MMAS-8.

Sl.No	Questionnaire	Yes (%)	No (%)
1	Did you sometimes forget to take your Antidiabetic & Antihypertensive medications?	56	44
2	People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past 2 weeks, were there any days when you did not take your Antidiabetic & Antihypertensive medicine?	54	46
3	Have you ever cut back or stopped taking your antidiabetic medication without telling your doctor, because you felt worse when you look it?	34	66
4	When you travel or leave home, do you sometimes forget to bring along your Antidiabetic & Antihypertensive medications?	64	36
5	your Antidiabetic & Antihypertensive medications yesterday?	94	6
6	en you feel like your diabetes is under control, do you sometimes stop taking your medicine?	14	86
7	Taking Antidiabetic & Antihypertensive medications every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your Antidiabetic & Antihypertensive treatment plan?	72	28
8	How often do you have difficulty remembering to take all your Antidiabetic & Antihypertensive medications?		
	Never	8%	
	Rarely	22%	
	Once in while	22%	
	Sometimes	24%	
	Usually	14%	
	All the time	10%	

Responses of patients were analysed; 94% said they take their medicines in the previous day; 72% complained of inconvenience and difficulty in adhering to medication plan; 56% said they just forget to take medicines. In this study, based upon the total MMAS score, only 1 had perfect/high medication adherence, while 2 had moderate and 47 had low medication adherence (Table 11).

Table 11: Level of medication adherence among type II diabetic patients.

Medication adherence level (as per MMAS)	N=50	Percentage	P value
Low adherence (score> 2)	47	94%	<0.001*
Moderate adherence (score 1 or 2)	2	4%	
High adherence (score 0)	1	2%	

***P value <0.001 by using student *t*-test**

Type II diabetic patients were further analysed based upon glycemic status. Significance difference between glycemic controlled and uncontrolled status.

We found that only 30% were having controlled blood glucose, whereas 70% were having uncontrolled blood glucose despite being on drug therapy.

DRUG UTILIZATION PATTERN

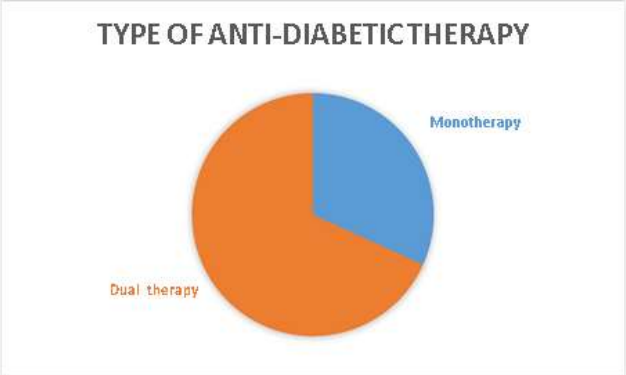

Figure 1: Percentage distribution of study patients as per the no. of Anti-diabetic drugs prescribed.

Anti-diabetic drugs in the present study of 50 patients, two drug therapy (68%) was utilized the most to treat the study participants followed by mono-therapy (32%) (Figure 28). All the drugs used under two drug therapies were in form of fixed drug combinations only).

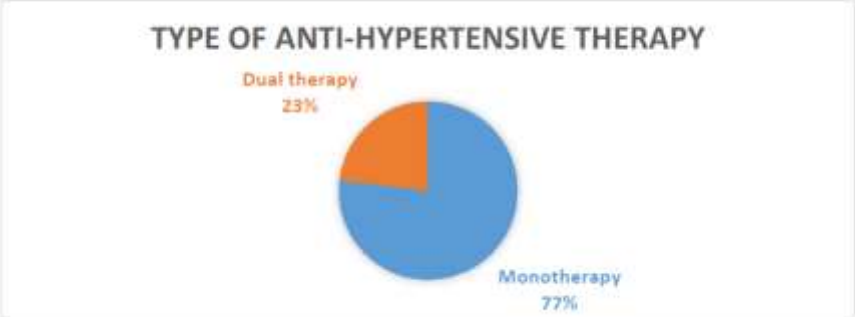

Figure 2: Percentage distribution of study patients as per the no. of Anti-hypertensive drugs prescribed.

Whereas for comorbidity Anti-hypertensive drugs in the present study as two drug therapy (23%) was utilized the most to treat the study participants followed by mono-therapy (77%) (Figure 29). All the drugs used under two drug therapies were in form of fixed drug combinations only).

Table 12: Distribution of Anti-diabetic drugs prescribed to the study patients.

SI No.	DRUGS CLASS	n=136	%
1	Sulfonylureas	21	15
2	Biguanides	58	43
3	DPP-4 inhibitors	19	14
4	SGLT-2 inhibitors	8	6
5	insulin	30	22

In the current study, total of 136 Anti-diabetic drugs were prescribed to the study population among which Biguanides (Metformin) 43% were the most frequently prescribed drug class followed by insulin (22%), Sulfonylureas (15%), DPP-4 inhibitors (14%) and while SGLT-2 inhibitors (6%) were least prescribed (Table-12).

Table 13: Distribution of Anti-hypertensive drugs prescribed to the study patients.

SI No	DRUG CLASS (ANTI-HYPERTENSIVE DRUGS)	n=85	%
1	ARB	12	14
2	CCB	34	40
3	β blockers	13	15
4	ACEi	12	14
5	THZD	2	2
6	α blockers	5	6

In the current study, total of 85 Anti-hypertensive drugs were prescribed to the study population among which CCB (40%) were the most frequently prescribed drug class followed by β blockers (15%), ARB (14%), ACEi (14%), α blockers (6%) and while THZD (2%) were least prescribed (Table-13).

Table 14: Distribution of individual anti-diabetic drugs prescribed to the study patients.

SI No	DRUGS	n=85	%
1	GLIMEPIRIDE	12	14
2	GLIPIZIDE	3	3.52
3	GLICLAZIDE	6	7
4	METFORMIN	58	68
5	CANAGLIFLOZIN	4	5
6	DAPAGLIFLOZIN	4	5
7	VILDAGLIPTIN	14	16
8	SITAGLIPTIN	5	6
9	REGULAR INSULIN	20	23.52
10	HUMAN MIXTARD	8	9
11	INSULIN GLARGINE	2	2

While analysing the individual anti-diabetic drugs in the current study, it was found that

Metformin (68%) were most frequently prescribed anti-diabetic drugs to the study participants followed by Regular insulin (23.52%) and others (Table-14).

Table 15: Distribution of individual antihypertensive drugs prescribed to the study patients.

SI No	DRUGS	n=85	%
1	Enalapril	6	7
2	Amlodipine	20	23.52
3	Clinidipine	14	16
4	Telmisartan	16	19
5	Hydrochlorothiazide	10	12
6	Metoprolol	10	12
7	Atenolol	2	2
8	Indapamide	5	6
9	Losartan	2	2

While analysing the individual antihypertensive drugs in the current study, it was found that Amlodipine (23.52%) was the most frequently prescribed antihypertensive drug to the study participants followed by Telmisartan (19%) and others (Table-15).

Table 16: Distribution of fixed drug combinations prescribed to the study patients.

SI No	FIXED DRUG COMBINATION (ANTIDIABETIC DRUGS)	n=43	%
1	Metformin + Glimepiride	12	28
2	Metformin + Gliclazide	6	14
3	Metformin + Sitagliptin	2	5
4	Metformin + Glipizide	3	7
5	Metformin + Canagliflozin	4	9
6	Metformin + Vildagliptin	16	37

In the given study it was found that total of 43 fixed drug drugs combinations were used among which Metformin + Vildagliptin (37%) was utilized the most followed by Metformin + Glimepiride (28%) and others (Table-16).

Table 17: Distribution of fixed drug combinations prescribed to the study patients.

SI No	FIXED DRUG COMBINATION (ANTIHYPERTENSIVE DRUGS)	n=16	%
1	ARB + β blockers	2	12.5
2	ARB + CCB	6	37.5
3	ARB + Diuretics	2	12.5
4	ACEi + α blockers	5	31.25
5	ACEI + CCB	1	6.25

In the given study it was found that total of 16 fixed drug drugs combinations were used among which ACE inhibitors + CCB (37.5%) was utilized the most followed by ACE inhibitors + α-blockers (31.25%) and others (Table-17).

ACEI (Angiotensin converting enzyme inhibitors), ARB (Angiotensin receptor blocker), CCB (Calcium channel blocker), THZD (Thiazide diuretics).

DRUG RELATED PROBLEMS (DRPs)

The problem concerned with **DRP Others (53.52%)** were most common mentioned in the table, DRPs encountered are "Insufficient awareness of health and diseases (possibly leading to future problems) & Unclear complaints, further clarification necessary". **Drug choice problem (34.50%)** was the second most frequent cause. Overall, as many as 142 DRPs were identified, averaging 23.7 (SD=31.43) problems per patient. The details of the type of DRPs found in patients can be seen in Table 18.

Table 18: TYPE OF DRPS FOUND ON PATIENTS.

SI No.	DETAILED CLASSIFICATION	FREQUENCY (%)
A1	**Adverse reactions**	**1 (0.7%)**
A1.1	Side effect suffered (non-allergic)	1 (0.7%)
A1.2	Side effect suffered (allergic)	0 (0%)
A1.3	Toxic effects suffered	0 (0%)
A2	**Drug choice problem**	**49 (34.50%)**
A2.1	Inappropriate drug (not most appropriate for indication)	3 (2.11%)
A2.2	Inappropriate drug form (not most appropriate for indication)	0 (0%)
A2.3	Inappropriate duplication of therapeutic group or active ingredient	3 (2.11%)
A2.4	Contra-indication for drug (incl. Pregnancy/breast feeding)	2 (1.4%)
A2.5	No clear indication for drug use	41 (28.87%)
A2.6	No drug prescribed but clear indication	0 (0%)
A3	**Dosing problem**	**10 (7%)**
A3.1	Drug dose too low or dosage regime not frequent enough	0 (0%)
A3.2	Drug dose too high or dosage regime too frequent	3 (2.11%)
A3.3	Duration of treatment too short	0 (0%)
A3.4	Duration of treatment too long	7 (5%)
A4	**Drug use problem**	**2 (1.4%)**
A4.1	Drug not taken/administered at all	0 (0%)
A4.2	Wrong drug taken/administered	2 (1.4%)
A5	**Interactions**	4 (2.81%)
A5.1	Potential interaction	2 (1.4%)
A5.2	Manifest interaction	2 (1.4%)
A6	**Others**	**76 (53.52%)**
A6.1	Patient dissatisfied with therapy despite taking drug(s) correctly	2 (1.4%)
A6.2	Insufficient awareness of health and diseases (possibly leading to future problems)	37 (26.05%)
A6.3	Unclear complaints. Further clarification necessary	37 (26.05%)
A6.4	Therapy failure (reason unknown)	0 (0%)
	Sum Total	**142 (100%)**

Most of the DRPs were caused by Patient/Psychological (48.72%) with "Patient unwilling to adapt life-style" being the most common cause (10.76%) followed by "Treatment not in line with health beliefs" (10.19%) (Table 19). "Information" (41.64%) was the second most frequent cause.

Table 19: CLASSIFICATION OF DRPS CAUSES FOUND ON PATIENTS.

CODE	DETAILED CLASSIFICATION	FREQUENCY (%)
B1	**Drug/Dose selection**	**6(1.7%)**
B1.1	Inappropriate drug selection	4(1.13%)
B1.2	Inappropriate dosage selection	1(0.3%)
B1.3	More cost-effective drug available	0(0%)
B1.4	Pharmacokinetic problems, incl. ageing/ deterioration in organ function and interactions	0(0%)
B1.5	Synergistic/preventive drug required and not given	0(0%)
B1.6	Deterioration/improvement of disease state	0(0%)
B1.7	New symptom or indication revealed/presented	1(0.3%)
B1.8	Manifest side effect, no other cause	0(0%)
B2	**Drug use process**	**7 (2%)**
B2.1	Inappropriate timing of administration and/or dosing intervals	0(0%)
B2.2	Drug underused/under-administered	0(0%)
B2.3	Drug overused/over-administered	0(0%)
B2.4	Drug dose too high or dosage regimen too frequent	0(0%)
B2.5	Duration of treatment too short	0(0%)
B2.6	Duration of treatment too long	7(2%)
B3	**Information**	**147 (41.64%)**
B3.1	Instructions for use/taking not known	29(8.21%)
B3.2	Patient unaware of reason for drug treatment	36(10.19%)
B3.3	Patient has difficulties reading/understanding, Patient Information Form/Leaflet	36(10.19%)
B3.4	Patient unable to understand local language	10(2.83%)
B3.5	Lack of communication between healthcare professionals	36(10.19%)
B4	**Patient/Psychological**	**172 (48.72%)**
B4.1	Patient forgets to use/take drug	29(8.21%)
B4.2	Patient has concerns with drugs	6(1.7%)
B4.3	Patent suspects side-effect	2(0.6%)
B4.4	Patient unwilling to carry financial costs	28(7.93%)
B4.5	Patient unwilling to bother physician	0(0%)
B4.6	Patient unwilling to change drugs	18(5%)
B4.7	Patient unwilling to adapt life-style	38(10.76%)
B4.8	Burden of therapy	0(0%)
B4.9	Treatment not in line with health beliefs	36(10.19%)
B4.10	Patient takes food that interacts with drugs	15(4.24%)
B5	**Logistics**	**21(5.94%)**
B5.1	Prescribed drug not available (anymore)	9(2.54%)
B5.2	Prescribing error (only in case of slip of the pen)	4(1.13%)
B5.3	Dispensing error (wrong drug or dose dispensed)	8(2.26%)
B6	**Others**	**0**
B6.1	Other cause	0(0%)
B6.2	No obvious cause	0(0%)
	Sum total	**353 (100%)**

Table 20: Classification of Intervention on DRP Found on Patient.

CODE	DETAILED CLASSIFICATION	FREQUENCY (%)
	No intervention	
C1	**At prescriber level**	**144 (36.18%)**
C1.1	Prescriber informed only	40(10%)
C1.2	Prescriber asked for information	25(6.28%)
C1.3	Intervention proposed, approved by Prescriber	26(6.53%)
C1.4	Intervention proposed, not approved by Prescriber	13(3.26%)
C1.5	Intervention proposed, outcome unknown	40(10%)
C2	**At patient/carer level**	**132 (33.16%)**
C2.1	Patient (medication) counselling	42(10.55%)
C2.2	Written information provided only	31(7.78%)
C2.3	Patient referred to prescriber	30(7.53%)
C2.4	Spoken to family member/caregiver	29(7.28%)
C3	**At drug level**	**122 (30.65%)**
C3.1	Drug changed	26(6.53%)
C3.2	Dosage changed	19(4.77%)
C3.3	Formulation changed	0(0%)
C3.4	Instructions for use changed	27(6.78%)
C3.5	Drug stopped	22(5.52%)
C3.6	New drug started	28(7%)
C4	**Other intervention or activity**	**0**
C4.1	Other interventioN	0(0%)
C4.2	Side effect reported to authorities	0(0%)
	Sum total	**398 (100%)**

Table 20 shows that most of the pharmacist's intervention to resolve DRPs were conducted **"At Prescriber level" (36.18%)** by Prescribed informed only (10%), Intervention proposed, outcome unknown (10%). **At patient/carer level** came in second with 33.16% by providing medication counselling and written information provided only (10.55% & 7.78% respectively).

DISCUSSION

Medication Adherence

The study revealed a high prevalence of medication non-adherence among type II diabetic individuals, with 94% exhibiting low adherence. Common reasons included forgetting to take medications during travel, discontinuing medication after glycemic control, and difficulty adhering to the medication plan. Studies by Sharma et al, Khotkar et al, and others corroborated these findings, emphasizing forgetfulness, lack of awareness about consequences, and side effects as contributing factors to non-adherence. While some studies reported better adherence rates, overall, adherence plays a crucial role in glycemic control in diabetes management. Physicians can improve adherence by fostering communication,

simplifying treatment plans, and providing patient education and counseling.

Drug Utilization Pattern

The study found a male predominance (62%) among patients, possibly due to lower socioeconomic status of females leading to fewer medical visits. Patients aged 40-50 years constituted the largest group (32%), consistent with increased risk of cardiovascular disease and diabetes with age. Two-drug combinations (68%), particularly Metformin + Vildagliptin (37%), were most commonly prescribed, reflecting the need for multiple drugs in diabetic patients with hypertension. Metformin (68%) was the most frequently prescribed anti-diabetic drug, while CCBs (40%) were the most prescribed class of anti-hypertensive drugs, followed by β-blockers (15%). Fixed drug combinations like ARB + CCB (37.5%) were commonly used, aligning with treatment guidelines. Amlodipine (23.52%) was the most frequently prescribed antihypertensive drug, consistent with its efficacy and few contraindications.

Drug Related Problems

The study utilized the PCNE Classification for Drug-related problems to categorize DRPs, finding an average of 2.88 DRPs per patient. Polypharmacy was associated with increased risk of DRPs, although discerning its exact contribution to adverse outcomes remains complex. A significant correlation was observed between the number of medications and the occurrence of DRPs, emphasizing the need for early detection and intervention. Pharmacists played a crucial role in addressing DRPs, primarily through patient/carer-level interventions such as counseling and education. The study suggests the potential for pharmacists to enhance medication management and improve therapeutic outcomes in patients with type 2 diabetes and hypertension. The findings also highlight a shift in focus from negative polypharmacy to potential undertreatment, particularly among patients with fewer prescribed drugs on admission.

CONCLUSION

Medication adherence

The study examined medication adherence among 50 individuals with type 2 diabetes and hypertension. The results indicate significant challenges in adherence to antidiabetic and antihypertensive medications. A majority of participants reported instances of forgetfulness and inconvenience in adhering to their medication plans. Remarkably, only a small proportion demonstrated high adherence, emphasizing the need for interventions to improve

adherence rates. Additionally, the study highlighted a concerning disparity, with the majority of participants experiencing uncontrolled blood glucose levels despite being on prescribed drug therapy. Enhancing medication adherence and glycemic control strategies is imperative to optimize the management of type 2 diabetes in this population.

Drug utilization pattern

This study revealed that the most commonly prescribed antidiabetic medications were oral, however, the use of insulin preparations in the treatment of Type 2 DM is steadily increasing. Metformin was the most commonly prescribed drug followed by glimepiride. In combination therapy the most frequent drugs administered was metformin + Vildagliptin. Out of insulin therapy, Regular insulin was given more frequently.

Total of 85 drugs were used to treat the study patients among which two drug combinations was the most dominant. CCB followed by ARB was most commonly used class in the study subjects. Among all the antihypertensive drugs, amlodipine was utilized for majority of the patients, either in monotherapy or in polytherapy. Fixed drug combination of ARB + CCB was utilized the most followed by ACEI + α blockers. On evaluation of all the prescribed drugs it was found that the entire drug prescribed were rational and were in accordance with JNC-8 treatment guidelines except the use of beta blockers which was prescribed in few patients. However, study on much larger population is required so that result can be translated for the further and more precise benefit of the medical community.

Drug related problems

The study identified significant challenges in medication management among type 2 diabetic patients with hypertension. The majority of patients were male and above 40 years old, indicating a trend of diabetes onset shifting to a younger age population. Medications prescribed were predominantly combination anti-diabetic therapy, with metformin being the most prescribed drug. A high comorbidity rate of hypertension was observed, necessitating appropriate drug management. Drug-related problems (DRPs) were prevalent, with drug choice issues being the most frequent, followed by dosing problems and drug use problems. Psychological factors and patient unwillingness to adapt to lifestyle changes were prominent contributors to DRPs. Interventions primarily targeted prescriber education and patient counseling. The study underscores the critical role of pharmacists in addressing DRPs and optimizing medication management for diabetic patients. However, the findings also highlight the need for further research to understand the complexities of polypharmacy,

optimize drug therapy, and improve therapeutic outcomes in this patient population. Strategies aimed at enhancing communication, patient education, and medication adherence should be explored to mitigate the challenges posed by DRPs in the management of type 2 diabetes and hypertension.

BIBILOGRAPHY

1. Mandal S, Maiti T, Das AKR, Das A, Mandal A, Sharma Sarkar B, Mandal S. Drug utilization study in patients with type 2 diabetes mellitus attending diabetes clinic of a tertiary care hospital in rural Bengal. Int J Basic Clin Pharmacol. 2016 Aug; 5(4): 1647-1654. DOI: http://dx.doi.org/10.18203/2319-2003.ijbcp20162487
2. Verma V, Kumar M, Gupta A, Dhar K, Sharma J. A study on drug utilization pattern of antihypertensive drugs in hypertensive diabetic patients. Int J Basic Clin Pharmacol., 2019 Oct; 8(10): 2242-2246. DOI: http://dx.doi.org/10.18203/2319-2003.ijbcp20194264
3. Khotkar K, Chaudhari S, Jadhav PR, Deshmukh YA. Assessment of Medication Adherence in Type II Diabetic Patients: A Cross-sectional Study. MGM Journal of Medical Sciences, 2017 Apr-Jun; 4(2): 65-69. DOI: https://ortholibrary.in/doi/MGMJMS/pdf/10.5005/jp- journals-10036-1142
4. Zazuli Z, Rohaya A, Adnyana IK. Drug-Related Problems in Type 2 Diabetic Patients with Hypertension: A Prospective Study. J Basic Clin Pharm., 2017 Sep-Nov; 8(4): 65-69. DOI: http://www.jbclinpharm.org/
5. Lam WY, Fresco P. Medication Adherence Measures: An Overview. BioMed Res Int., 2015; 2015: 217047. DOI: http://dx.doi.org/10.1155/2015/217047
6. Prathyusha Rani T, Prashanthi B, Ayesha Amreen Fathima, Ayesha Firdose, Sara Naser, Najma Begum, Kauser Begum. Medication Adherence in Patients with Type 2 Diabetes Mellitus - A Cross-sectional Study. Asian J Pharm Clin Res., 2019; 12(10): 177-180. http://dx.doi.org/10.22159/ajpcr.2019.v12i10.34787
7. Pradeepa R, Mohan V. Epidemiology of type 2 diabetes in India. Indian J Ophthalmol., 2021 Nov; 69(11): 2932-2938. DOI: https://doi.org/10.4103%2Fijo.IJO_1627_21
8. Natarajan N, Putnam W, Van Aarsen K, Beverley Lawson K, Burge F. Adherence to antihypertensive medications among family practice patients with diabetes mellitus and hypertension. Can Fam Physician., 2013 Feb; 59(2): e93-e100. DOI: https://pubmed.ncbi.nlm.nih.gov/23418264/
9. Williams B, MacDonald TM, Caulfield M, Cruickshank JK, McInnes G, Sever P, Webb DJ, Salsbury J, Morant S, Ford I, Brown MJ. Prevention And Treatment of Hypertension

With Algorithm-based therapy (PATHWAY) number 2: protocol for a randomised crossover trial to determine optimal treatment for drug-resistant hypertension. BMJ Open, 2015 Aug 7; 5(8): e008951. DOI: https://doi.org/10.1136%2Fbmjopen-2015-008951

10. Nguyen Q, Dominguez J, Nguyen L, Gullapalli N. Hypertension management: an update. Am Health Drug Benefits, 2010 Jan; 3(1): 47-56. DOI: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4106550/
11. Zaman Huri H, Chai Ling L. Drug-related problems in type 2 diabetes mellitus patients with dyslipidemia. BMC Public Health, 2013 Dec 17; 13: 1192. DOI: https://doi.org/10.1186/1471-2458-13-1192
12. Ayele Y, Melaku K, Dechasa M, Ayalew MB, Horsa BA. Assessment of drug related problems among type 2 diabetes mellitus patients with hypertension in Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia. BMC Res Notes, 2018; 11: 728. DOI: https://doi.org/10.1186/s13104-018-3838-z
13. PCNE Classification for Drug-Related Problems V9.1 - Page 1. The PCNE Classification V 9.1. DOI: https://www.pcne.org/upload/files/417_PCNE_classification_V9-1_final.pdf
14. Belayneh YM, Mamo T, Ahmed S, Kifle ZD. A retrospective study of drug related problems and contributing factors among type 2 diabetes mellitus patients on follow up at public health institutions of kemisse town, north east Ethiopia. Metabol Open, 2021 Jun 7; 11: 100098. DOI: https://doi.org/10.1016/j.metop.2021.100098
15. Sahoo J, Mohanty S, Kundu A, Epari V. Medication Adherence Among Patients of Type II Diabetes Mellitus and Its Associated Risk Factors: A Cross-Sectional Study in a Tertiary Care Hospital of Eastern India. Cureus, 2022 Dec 29; 14(12): e33074. DOI: https://doi.org/10.7759%2Fcureus.33074
16. Priyanka T, Lekhanth A, Revanth A, Gopinath C, Chandra Babu S. Effect of Polypharmacy on Medication Adherence in Patients with Type 2 Diabetes Mellitus. Indian J Pharm Pract., 2015; 8(3): 126-132. DOI: http://dx.doi.org/10.5530/ijopp.8.3.7
17. Osterberg L, Blaschke T. Adherence to medication. N Engl J Med., 2005 Aug 4; 353(5): 487-97. DOI: https://doi.org/10.1056/nejmra050100
18. Sharma T, Kalr J, Dhasmana D, Basera H. Poor adherence to treatment: A major challenge in diabetes. J Indian Acad Clin Med., 2014; 15(1): 48-52. DOI:https://www.researchgate.net/publication/287392995_Poor_adherence_to_treatment_A_major_challenge_in_diabetes
19. Parthasarathi G, Nyfort-Hansen K, Nahata MC. A Textbook of Clinical Pharmacy

Practice: Essential Concepts and Skills. 2nd ed. Hyderabad: Universities Press, 2008; 146-156, 160- 164.

20. Shanmugapriya S, Saravanan T, Rajee SS, Venkatrajan R, Thomas PM. Drug prescription pattern of outpatients in a tertiary care teaching hospital in Tamil Nadu. Perspect Clin Res., 2018 Jul-Sep; 9(3): 133-138. DOI: https://doi.org/10.4103%2Fpicr.PICR_86_17
21. Khrime D, Kumar A, Pandey AN, Bansal N, Sharma U, Varma A. Antihypertensive drug utilization pattern and awareness in diabetic hypertensive patients at tertiary care centre. Int J Res Med Sci., 2015 Feb; 3(2): 461-465. DOI: https://www.msjonline.org/index.php/ijrms/article/view/1300
22. Shah J, Khakhkhar T, Bhirud S, Shah RB, Date S. Study of utilization pattern of anti-hypertensive drugs in hypertensive diabetic patients with or without reduced renal function at tertiary care teaching hospital. Int J Med Sci Public Health, 2013; 2(2): 175-180. DOI: https://dx.doi.org/10.5455/ijmsph.2013.2.167-172
23. Shaimol T, Biju CR, Anilasree BP, Jayakrishnan SS, Babu G. Medication adherence to oral hypoglycemic agents in type 2 diabetic patients. J Pharm Res Clin Pract., 2014; 4(2): 8-12. DOI: https://www.rroij.com/open-access/medication-adherence-to-oral-hypoglycemic- agents-in-type-2-diabetic-patients.pdf
24. Yuvaraj K, Gokul S, Sivaranjini K, Manikandanesan S, Murali S, Surendran G, Majella MG, Kumar SG. Prevalence of medication adherence and its associated factors among patients with noncommunicable disease in rural Puducherry, South India - A facility-based cross-sectional study. J Family Med Prim Care, 2019 Feb; 8(2): 701-705. DOI: https://doi.org/10.4103/jfmpc.jfmpc_350_18
25. DiPiro JT, et al. A textbook of PHARMACOTHERAPY; A Pathophysiologic Approach. 6th ed. 185, 194, 195, 198, 199, 212, 222, 1334.
26. Walker R, Whittlesea C. A textbook of Clinical Pharmacy and Therapeutics. 5th ed. 296, 686, 688.
27. KD Tripathi. Essentials of Medical Pharmacology. 6th ed. New Delhi: Jaypee Brothers Medical Publishers, 2019; 263, 270.
28. Olokoba AB, Obateru OA, Olokoba LB. Type 2 diabetes mellitus: a review of current trends. Oman Med J., 2012 Jul; 27(4): 269-73. DOI: https://doi.org/10.5001/omj.2012.68
29. Metri KG, Raghuram N, Ram CVS, Singh A, Patil SS, Mohanty S, Palukuru S, Nagendra HR. The Deadly Duo of Hypertension and Diabetes in India: Further Affirmation from a New Epidemiological Study. J Assoc Physicians India, 2022 Jul; 70(7): 14–17. Available from: https://www.japi.org/x2c4c4b4/the-deadly-duo-of-hypertension-and-

diabetes-in-india-further-affirmation-from-a-new-epidemiological study #:~:text = The % 20weighted%20prevalence%20of%20hypertension,36.5%25)%20(Ta ble%202)