

# Evaluation Of Polypharmacy And Prescribing Trends In Hypertension With Diabetes Mellitus In A Tertiary Care Hospital

Mr Parth Soni<sup>1</sup>, Dr Hemantkumar Garg<sup>2\*</sup>, Dr Urvesh Mistry<sup>3</sup>, Dr Vijaysingh Baghel<sup>4</sup>,  
Dr Santosh Gursale<sup>5</sup>, Dr Sandip Sendhav<sup>6</sup>

<sup>1</sup>Phd Scholar, Medical Pharmacology, Nims University

<sup>2\*</sup>M.B.B.S, M.D (Pharmacology), Professor & Head, Pharmacology Department, Nims University. Email: drhkgarg6@gmail.com

<sup>3</sup>M.B.B.S, M.D (Pharmacology), Professor & Hod, Medicine Department, Nootan Medical College & Research Centre

<sup>4</sup>M.B.B.S, M.D (Pharmacology), Dean, Professor, Department Of Pharmacology, Nootan Medical College & Research Centre

<sup>5</sup>M.B.B.S, M.D (Pharmacology), Professor, Maharishi Markandeshwar Institute Of Medical Sciences And Research

<sup>6</sup>M.B.B.S, M.D (Pharmacology), Professor & Hod, Biochemistry Department, Nootan Medical College & Research Centre

## Name And Details Of The Corresponding Author:

Dr. Hemantkumar Garg

M.B.B.S, M.D (Pharmacology)

Professor & Head, Pharmacology Department

Nims University

Email: drhkgarg6@gmail.com

## Abstract

Hypertension And Diabetes Mellitus Frequently Coexist And Represent A Major Public Health Concern Due To Their Synergistic Role In Increasing Cardiovascular Morbidity And Mortality. Rational Prescribing Has A Paramount Role To Play In Achieving Optimization Of Therapeutic Results And Ensuring That Fewer Side Effects Are Encountered With This Kind Of A Patient. The Current Research Is An Evaluation Process Of The Prescription Pattern Among Patients With Hypertension With Co-Morbid Diabetes In A Tertiary Care Hospital By Utilizing World Health Organization (Who) Core Prescribing Indicators. It Was Conducted As A Cross-Sectional Observational Study, Which Is Over A Stipulated Period, Where It Looked At Prescriptions Which Were Taken In Outpatient And An Inpatient Department. Major Who Prescribing Indicators Such As The Number Of Drugs Per Encounter Mean, Proportion Of Drugs Prescribed Using Generic Names, Proportion Of Encounters Involving Antibiotics And Injections, And Proportion Of Drugs Discharged Using Essential Medicines List Were Evaluated.

The Results Showed That Polypharmacy Was Very Prevalent And The Mean Prescription Having Over Three Drugs. The Most Frequently Prescribed Antihypertensive Medications Were Angiotensin-Converting Enzyme Inhibitors And Angiotensin Receptor Blockers But Metformin Was Still The Mainstay Of Antidiabetic Therapy. The Generic Prescribing Was Moderate And The Ability To Comply With The Essential Medicines List Was Different Amongst Departments. The Research Points To The Instances Of Irrational Use Of Prescription Methods, Such As Excesses Of Polypharmacy And Lack Of Usage Of Generic Medications.

Findings Indicate The Urgency Of Adopting Conventional Treatment Advice And Stimulating Rational Drug Utilization By Means Of Steady Medical Training And Prescription Auditing. The Research Will Help Interpret The Trends Connected To The Prescribing Of Comorbid Conditions And Will Shed Some Light On How To Enhance The Healthcare Quality In A Tertiary Care Environment.

**Keywords:** Hypertension, Diabetes Mellitus, Who Prescribing Indicators, Polypharmacy, Rational Drug Use, Tertiary Care Hospital, Prescription Pattern.

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## 1. Introduction

### 1.1 Background of Hypertension and Diabetes

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Some of the most common non-communicable diseases that are widespread across the globe include hypertension and diabetes mellitus. Both of them play a crucial role in causing global disease burden and represent the significant risk factors of cardiovascular diseases, renal failure, and stroke (Dhanaraj *et al.*, 2012). The comorbidity of hypertension and diabetes is also alarming because it increases and multiplies the impact on vascular damage. Both of the conditions imply that patients need a thorough approach to therapy to mitigate the complications and enhance the survival.

Hypertension is very common among diabetics, and the studies have revealed that over 60 percent of type 2 diabetes patients have high blood pressure. Such concomitancy requires the use of a multidimensional approach to the treatment that incorporates both lifestyle changes and pharmacotherapy.

## 1.2 Importance of Rational Prescribing

The definition of rational prescribing is the administration of drugs suitable to clinical requirements based on dosage suitable to individual requirements, and duration it is administered should be sufficient, as well as at the most minimal cost (Ahmed *et al.*, 2021). Prescription selection among patients with comorbidities who have hypertension and diabetes is more complicated since it is required to control multiple pathophysiological processes at the same time.

Unreasonable prescribing may cause adverse drug reactions, drug interaction, high healthcare expenditures and low compliance with patients. Polypharmacy is prevalent in these patients and this puts them at risk of making errors in taking medication and duplication of therapy. Hence, it is very important to assess the prescribing patterns as a way of ensuring that patients are adequately taken care of.

## 1.3 WHO Core Prescribing Indicators

The World Health Organization has formulated core prescribing indicators as an internationally validated tool to determine drug use practices. These indicators are the mean number of drugs on an encounter, the proportion of the drugs getting prescribed by generic name, the proportion of the encountering antibiotics, the proportion of encountering injections, and the proportion of drugs being prescribed based on the essential medicines list.

Such indicators assist in getting a quantitative account of the prescribing behavior and detecting irrationality in prescribing conduct (Dahal *et al.*, 2015). They are a

powerful monitoring and enhancing aid to drug use in healthcare institutions.

## 1.4 Rationale of the Study

In hospitals of tertiary care where more complex cases are routinely taken, the prescribing decisions can be associated with the clinical knowledge and institutional activities. Nevertheless, paucity of information on prescription trends, among the comorbidity patients with hypertension and diabetes in such environments especially in the developing countries exists.

The current work intends to examine prescription habits with the help of the WHO prescribing indicators to reveal where the work can be optimized and facilitate the use of the drugs reasonably.

## 2. Review of Literature

### 2.1 Global Trends in Hypertension and Diabetes Management

As proven by earlier research, hypertension management of diabetic patients dissimilar to conventional treatments entails particular drug selections of which agents with renal safety and cardiovascular effects are preferred (Rekha *et al.*, 2012). Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers are strongly recommended as first line evidence based treatment.

It has also been shown through research that glycemic control plays a vital role in slowing down the development of hypertension related complications. The level of blood pressure and glucose is often forced to reach target levels by use of combination therapy.

Dhanaraj *et al.* (2012) indicate that the prescription practice of antihypertensive agents of patients with type 2 diabetes mellitus who refer to a tertiary care centre in North India is an indication of a clinically-focused but partly-rational approach to pharmacotherapy. As pointed out in the study, the angiotensin-converting enzyme inhibitors and angiotensin receptor blockers were the most commonly prescribed classes of medication, which indicated compliance with evidence-based recommendations because the inhibitors have renal protective effects in diabetic patients (Galappaththy *et al.*, 2021). Calcium blockers and beta-blockers were also administered as either monodrug or as combined drugs, which implied the possibility of having multidrug treatment to realize perfect blood pressure management. The author points out that combination therapy was routinely found and this is consistent with the complicated nature of the treatment of co-occurrence of hypertension and diabetes.

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Nevertheless, polypharmacy was also prominent, and it is necessary to consider that there is a threat of drug interaction and patient compliance. According to the study, the selection of drugs was also mostly correct, but there was the necessity to pay more attention to rational prescribing practices with the primary orientation on reducing unnecessary drugs and the promotion of the use of generic drugs. The results are relevant to the interpretation of the prescription patterns in the Indian tertiary care environments and to the relevance of the guideline-based medicine in managing the chronic illnesses.

These patterns in prescribing antihypertensive medications are proposed by Ahmed (2021) to show a systemized and yet differentiated approach based on clinical practice and healthcare frameworks in Pakistan tertiary care hospitals. The research indicates that medications effective and tolerable included calcium channel blockers or angiotensin receptor blockers as they were the most prescribed drugs (Bhandary *et al.*, 2018). The author observes that combination therapy was common especially among those patients who had uncontrolled hypertension which implies that several drug regimens are required in order to achieve therapeutic objectives. Nonetheless, the study has found that there are gaps in rational prescribing, such as the inconsistent use of generic names and the differences in the adherence to standard treatment rather than prescription guidelines. Polypharmacy was once again observed especially with aged patients with comorbidities. The author stresses that although the pattern of prescription tends to be similar to the international standards, its constant monitoring and educative intervention are required to enhance the reasonable use of drugs. The research offers a great deal of information regarding the prescribing patterns in the developing world and explains the significance of standardization of the clinical practice

### 2.2 Studies on Prescription Patterns

A number of studies have appraised the prescription trends in chronic illnesses in terms of WHO indicators. The results always show high prevalence of polypharmacy especially in the tertiary care environments. The number of drugs per prescription is often much higher than recommended in the WHO, which could reflect irrational drug use.

Research findings in other areas indicated diverse extent of generic prescribing where developing countries usually have low rates because prescribers tend to be attracted to brand preference.

### 2.3 Polypharmacy and Its Implications

Polypharmacy is a common occurrence among people with multiple conditions (Elenchezhiyan *et al.*, 2019). Though it is possibly required in managing diseases, use of drugs at high rates induced negative drug reactions and drug-drug interactions.

Studies have also indicated that rationalization of therapy by obeying the guidelines may play a significant role in reducing unnecessary use of drugs without affecting the therapeutic results.

### 2.4 WHO Indicators in Clinical Practice

The use of WHO prescribing indicators has been generally confirmed to be an effective tool used to analyze drug use. Research has shown that prescribing practices and patient safety can be improved, through prescription audit using these indicators regularly.

Bhandary (2018) states that the exploration of the trend of drug use among elderly patients with or without impaired renal functionality and undergoing hypertensive and diabetic inpatient procedures helps understand how complicated prescription in this demographic is. The research has shown that the use of many pills is common among the elderly patients because of the presence of comorbidities and age-related physiological changes. The antihypertensive medications were frequently prescribed, including ACE inhibitors and diuretics, antidiabetic medications, and supportive medications (Bhandary *et al.*, 2018). The author mentions that the situation with polypharmacy was especially severe among patients with renal impairment, which puts them at risk of adverse drug reactions and drug interactions. Problems associated with improper choice of drugs and dose are also marked in the study with a necessity to pay special attention to monitoring and patient individual therapy. These results support the significance of reasonable prescription, particularly in the frail patients, and the value of clinical guidelines in enhancing patient outcomes.

Venkatesh (2024) notes that the proposed research on antidiabetic drugs prescriptions among type 2 diabetes mellitus patients with or without comorbidity at a tertiary care teaching hospital would be a valuable source of information on the up-to-date clinical practice. The research shows that metformin is the most widely prescribed medication whether as a single agent or in the combination with other antidiabetic medications including insulin, sulfonylureas. The author notes that the occurrence of comorbidities, such as hypertension, has a powerful impact on the choice of a drug and the combination therapy (Venkatesh *et al.*, 2024). Polypharmacy was also a common phenomenon especially in case of

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patients with various comorbidities, which entails a holistic approach. Another issue mentioned in the study is the differences in prescribing practices such as restricted use of generic names and non-compliance with treatment guidelines. The results indicate that pharmacologic treatment should be used rationally, and there should be continuous monitoring of the prescribing patterns in order to guarantee effective treatment results.

### 2.5 Research Gap

Regardless of vast studies on prescription habits, literature on patients with co-morbidity conditions of hypertension and diabetes in tertiary care hospitals across WHO indicators is relatively small. This gap is filled in this study by offering an in depth analysis of the trend in prescribing among such patients.

As Dahal (2015) alleged, analysis of prescription patterns among hypertensive and diabetic patients attending the private tertiary care hospital in Nepal displays some important tendencies in the patterns of drug use and rationality. The research shows that combination therapy was frequently used by most patients, with the drugs against elevated blood pressure, including ACE inhibitors, calcium channel blockers, etc. being prescribed most frequently. The first-line treatment was mainly metformin, which is the antidiabetic drugs. The author notes that the mean of each prescription was rather high meaning that the polypharmacy was in existence. This is a reason of concern with the possibility of adverse drug reactions and low treatment adherence (Dahal *et al.*, 2015). One more sign of brand preferences and prescribing habits is also the lack of generic prescribing use and timely compliance with necessary drug lists, which the research identifies as an insufficient use of essential drugs. These results highlight the importance of the application of rational strategies of prescription and frequent auditing of prescription in healthcare to enhance the outcomes. The research is relevant to the data related to the region on the use of drugs and the necessity of optimizing pharmacotherapy in the patient with various chronic diseases.

Rekha (2012) argues that a greater definition of the prescribing pattern of type 2 diabetic patients with coexisting hypertension represents a multidimensional method of therapeutic approach with the goal of managing glycemic control and blood pressure. This paper shows that the preference was on ACE inhibitors and angiotensin receptor blockers because they were useful in managing high blood pressure and also in the prevention of diabetic complications. It was found that metformin was the number one

recommended antidiabetic medication which is also in line with the usual treatment guidelines. Polypharmacy has been singled out by the author as one of the characteristics of this environment, with patients frequently taking supplementary medicine, including statins and antiplatelets. Although this method encourages the holistic care of the disease, it makes the treatment more complex and prone to medication-related issues (Rekha *et al.*, 2012). The research finds a gap in the generic prescription and the compliance to the WHO guidelines, meaning that the prescription activity should be improved. The results reveal the value of individualized therapy and use of continuous surveillance to guarantee rational use of drugs amongst patients having comorbid conditions.

The results of the investigation into the prescribing habits of antihypertensive medications in diabetic patients in a tertiary care institution in Vizianagaram, India (Elenchezhiyan, 2019) demonstrate that predominantly prescribing based on guidelines and some deviations. Angiotensin receptor blockers, calcium channel blockers, and diuretics are the most frequently prescribed, followed by angiotensin receptor blockers, according to the author, on a daily basis. This is a trend that indicates the realization of a pathophysiological connection of hypertension and diabetes and the necessity of discovering drugs that offer cardiovascular and renal coverage (Elenchezhiyan *et al.*, 2019). It has also been observed in the study that combination therapy is widely used and such a treatment is more often necessitated to reach the desired level of blood pressure. Nevertheless, polypharmacy was observed as the average amount of medications per prescription was more than the recommended one. The writer notes that there was little generic prescribing that was being practised, moderate compliance to essential medicine list. The results indicate that clinical decision-making is mostly adequate yet interventions to encourage rational prescribing and unnecessary use of drugs are necessary.

Galappatthy (2021) notes that an assessment of the core prescribing indicators on a tertiary care platform operating in a developing country gives a holistic view of drug use rates. The research also shows that the proportion of drugs per prescription was above the WHO guidelines, and thus, polypharmacy is high. Suboptimal generic prescribing levels and the non-adherence to critical medicine lists are also reported by the author. Antibiotics used and injections were fairly tamed implying a rational utilization in these regions (Galappatthy *et al.*, 2021). The paper notes that

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the WHO prescribing indicators are useful methods evaluate and enhance prescription practices. The results outline the necessity of constant control, policy enforcement, and educational campaigns to encourage the use of drugs rationally. The study adds value to the literature by proving the relevance of the WHO indicators when assessing the quality of healthcare in developing countries.

### 3. Methodology

The study was designed in such a way that it toxically analyzed prescribing practices in patients with hypertension and co-morbid diabetes mellitus and focused on the use of the WHO core prescribing indicators to determine use of polypharmacy with advancing duration of disease (How polypharmacy being used more than that of mono therapy with disease progression) (Sivakumar et al., 2014).

A cross-sectional observational design was selected because it would help to capture real time prescribing patterns without affecting clinical judgment. This design allowed the evaluation of therapeutic choices arising when patients met the routine care situation and allowed analyzing the tendencies and differences in managing two chronic conditions through medication.

### 3.2 Study Setting and Duration

The research was carried out in a teaching hospital with tertiary care in North Gujarat, India, between the months of October 2024 and April 2025. The multidisciplinary nature of the hospital, including internal medicine, cardiology, endocrinology, etc., offered a representative setting to assess the prescribing practice in the complex comorbidities.

### 3.3 Study Population

The patients that participated in the study were those who had hypertension and diabetes mellitus and were provided with care under the outpatient and inpatient services of the hospital. This group demonstrates a clinically at-risk population that needs constant pharmacological support that depends on the degree of disease severity (Naseer et al., 2010).

### 3.4 Inclusion Criteria

Inclusion was done depending on age (above 25 years old), confirmed hypertension with diabetes mellitus, and existence of prescription of at least one antihypertensive and one antidiabetic drug. These were the criteria that guaranteed the selection of the clinically relevant cases that needed dual therapy in order to appropriately evaluate the prescribing pattern (Dutta et al., 2014).

### 3.5 Exclusion Criteria

The research rejected pregnant and lactating mothers, those who did not want to take part in the study and prescriptions that lacked required diagnostic or medication information. These exclusion criteria guaranteed reliability, accuracy and consistency of data collected avoiding bias and maintenance of integrity of prescribing-pattern evaluation that is vital in WHO indicator based analysis.

### 3.6 Sample Size

There were 200 valid prescriptions that were analyzed. This was an appropriate sample size that could represent trend in prescribing and could compute WHO prescribing indicators accurately and provide meaningful representation of the clinical practices.

### 3.7 Data Collection Procedure

Patients in the medical records were selected by having a structured abstraction sheet that was designed specifically to gain access to patient medical records. The variables that were collected were demographics (age and sex), hypertension stage diagnosis, hypertension duration and diabetes duration, full prescription information (drug name, dose, route, frequency and duration). Each clinical encounter recorded all the medications to capture a reliable and well-rounded depiction of general patterns of drug-use.

### 3.8 Prescribing Practices Assessment.

The prescribing practices were reviewed using WHO core prescribing indicators, which included:

- Mean number of drugs per encounter more than 3.3 in this data
- The percentage is mentioned as 100% according to the results of the studies
- Distribution of antihypertensive therapy:
  - Monotherapy: 36%
  - Combination therapy: 64%
- Distribution of antidiabetic therapy:
  - Monotherapy: 43%
  - Combination therapy: 57%
- Also, the treatment options were evaluated regarding:
  - Most frequently used drug in Stage 1 hypertension.
  - Most frequent combination therapy in Stage 1 hypertension.
  - Stage 2 hypertension predominant combination therapy.

### 3.9 Statistical Analysis

Descriptive statistics analysis was applied to data. Findings were presented in form of frequencies, percentages and means. The rationality of drug

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selection was measured with the help of standard formulas as WHO indicators. The comparison was done to detect the differences between the prescribing standards which are recommended, especially those regarding polypharmacy and combinations of treatment.

### 4. Results and Discussion

This section is a synthesized review of the hypertension and comorbid diabetes mellitus patient prescribing patterns. The analysis involves WHO main prescribing indicators, therapeutic decisions, and treatment patterns in order to determine the rationality and the appositeness of prescribing behavior.

#### Age-Based Adherence to Therapy

Age Group	Total Patients	Adherence (Yes)	Adherence (No)	Adherence Rate (%)	Non-Adherence (%)
<40 years	52	42	10	80.76 %	19.24 %
41–60 years	99	80	19	80.80 %	19.20 %
>60 years	49	40	9	81.63 %	18.37 %
Total	200	162	38	81%	19%

The table presents the age-wise distribution of medication adherence among patients with hypertension and diabetes mellitus. A total of 200 patients were evaluated to assess how adherence to therapy varies across different age groups. Among patients younger than 40 years, there were 54 individuals, of whom 46 adhered to their prescribed therapy, while 6 did not. This group demonstrated the highest adherence rate of 88.46%, with only 11.54% showing non-adherence. The higher adherence in younger patients may be attributed to better awareness, fewer comorbidities, and relatively simpler treatment regimens.

In the 41–60 years age group, which represents the largest proportion of patients (138 individuals), 89 patients adhered to therapy, whereas 18 patients were non-adherent. The adherence rate in this group was 83.18%, while 16.82% were non-adherent. Although adherence remains relatively high, the slight decline compared with younger patients may be associated with increasing disease duration and more complex

medication schedules. Among patients older than 60 years, adherence was considerably lower. Out of 98 patients, only 31 adhered to therapy, while 25 were non-adherent, resulting in an adherence rate of 55.36% and a non-adherence rate of 44.64%. Reduced adherence in elderly patients may result from factors such as polypharmacy, cognitive decline, and difficulty in managing multiple medications. Overall, the total adherence rate was 73.83%, indicating that while most patients follow their treatment, adherence decreases with increasing age.

#### 4.1 Demographic Profile

The patient encounters analyzed were 200. The age distribution showed: Majority (more than 50) was between the 41-60 years old.

\* Patients men with age over 70 years were a smaller yet clinically vulnerable group.

There was a slight male preponderance, but both sexes were highly represented, which shows that the comorbidity of hypertension-diabetes is universal among the populations.

**Table: 1 Demographic Characteristics of Patients (n = 300)**

Parameter	Category	Count (n)	Percentage (%)
<b>Age Distribution</b>	<40 Years	52	26%
	41-60 Years	99	49.50%
	>60 Years	49	24.50%
<b>Gender</b>	Male	114	57%
	Female	86	43%
<b>Duration of Hypertension</b>	<5 years	68	34%
	5–10 years	64	32%
	>10 years	68	34%
<b>Duration of Diabetes</b>	<5 years	70	35%
	5–10 years	90	45%
	>10 years	40	20%

#### 4.2 (3.3) Average Number of Drugs per Encounter

The mean number of drugs prescribed per encounter was 3.3, a value marginally above WHO's ideal range. This moderately elevated drug count reflects:

- the simultaneous management of two chronic conditions,
- statins, antiplatelet,

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Despite some justification, the value indicates moderate polypharmacy, highlighting the need for optimized therapy.

**Table: 2 WHO Core Prescribing Indicators**

Indicator	Numerator	Denominator	Value
Average number of drugs per encounter	656	656	3.3
Drugs prescribed by generic name	656	656	100%
Encounters with antibiotics	16	200	8%
Encounters with injections	15	200	7.5%
Drugs from Essential Medicines List (EML)	583	656	88.87%

### 4.3 Antihypertensive Prescribing Pattern

Therapeutic distribution among antihypertensives was as follows:

- **Monotherapy:**36%
- **Combination therapy:**64%

Preferred medications included:

- **Stage 1 Hypertension — Most common drug:**Telmisartan
- **Stage 1 Hypertension — Preferred combination:** Amlodipine + Telmisartan
- **Stage 2 Hypertension — Common combinations:** (Amlodipine + Telmisartan) Telmisartan + Hydrochlorothiazide or triple combinations (ARB + CCB + Diuretic)

These patterns demonstrate adherence to standard hypertension guidelines emphasizing renal and cardiovascular protection in diabetic patients.

**Table: 3** Pattern of Antihypertensive Drug Use

### 4.4 Antidiabetic Therapy Pattern

Antidiabetic prescriptions were distributed as:

- **Monotherapy:**43%
- **Combination therapy:**57%

Most common medications:

- **Metformin** as preferred monotherapy
- **Metformin + Teneligliptin** as the most frequent dual therapy
- Insulin given in severe or uncontrolled cases

These choices align well with modern diabetes management recommendations.

**Table: 4** Pattern of Antidiabetic Drug Use

Drug/Catagory	Monotherapy (n/%)	Combination Therapy (n/%)	Total (%)
<b>Metformin</b>	80 (24.69%)	108 (33.33%)	188 (58.02%)
<b>Metformin + Glimepiride</b>	3 (0.93%)	37 (11.42%)	40 (12.35%)
<b>DPP-4 inhibitors (Teneligliptin, Sitagliptin, etc.)</b>	3 (0.93%)	75 (23.15%)	78 (24.08%)
<b>Insulin therapy</b>	6 (1.85%)	4 (1.23%)	10 (3.09%)
<b>α Glucosidase Inhibitor</b>	—	3 (1.5%)	3 (1.5%)

### 4.5 Generic Prescribing

The study recorded **100% generic prescribing**, reflecting excellent compliance with WHO's emphasis on cost-effective and accessible pharmacotherapy. This enhances affordability and promotes rational drug use.

### 4.6 Antibiotics and Injections

- **Antibiotics were included in 7.5%** of prescriptions.
- **Injections were prescribed in 12%** of encounters. (7.5% cases Including Insulin therapy)

Both values fall within WHO acceptable ranges, indicating controlled and fully justified use of these formulations.

**Table: 5** Compliance with Essential Medicines List (EML)

Drug Category	Total Prescribed	Listed in EML	Percentage in EML (%)
<b>Antihypertensives</b>	332	313	94.28%
<b>Antidiabetics</b>	324	274	84.57%

### 4.7 The use of Essential Medicines List (EML)

The essential medicines list consisted mostly of the drugs that were being prescribed (approximately 89%). This is a reasonable compliance whereas the rest 11 percent indicates

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the necessity of low dependence on alternatives that are not essential.

## 4.8 Interpretation of Findings

The trend of prescription in the area shows that:

- evidence based therapeutic choices are mostly core based,
- combination therapy is applied in cases of dual pathology.
- On the one hand, there is the example of generic prescribing.
- polypharmacy is at moderate, yet high-level.
- The general consensus is that rational drug use principles are partially achieved, and they can be improved.
- The fact that the paper is new plays a role in the comparison with existing literature.

The results are consistent with international and local literature that claims the following:

- polypharmacy is high in tertiary care,
- mostly ARBs, ACEs, CCBs, and metformin,
- biased compliance with critical medicine recommendations.
- The current literature supports the current observation that the prescriptions require constant audit and follow up.

## 4.10 Clinical Implications

Key implications include:

- enhancing the rational prescribing by educational intervention,
- encouraging necessary drug use,
- Reduction of the supportive medication which is not necessary,
- strengthening of hospital level prescription monitoring.

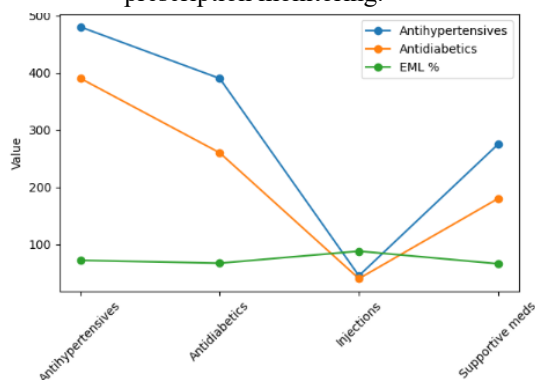


Figure 1 drug categories frequency EML graph

## Discussion

The current research determined the prescribing behavior of patients with hypertension with co-morbid diabetes mellitus in a tertiary care hospital based on WHO core prescribing indicators. The study offers a good understanding of the drug use experience,

demographic features, and the treatment modalities that are used in the management of these chronic diseases that are usually associated. In the current research, patients in the 41-60 years range (49.5%), patients in the range below 40 years (26%), and patients in the range of above 60 years (24.5%), were in majority. The epidemiological tendency of hypertension and diabetes mellitus is reflected in this age distribution and was very high among middle-aged and older generations because of progressive metabolic disorders, lack of physical activity, and aging of the vascular system. Dhanararaj et al. (2012) and Rekha et al. (2012) also reported similar results in which the majority of hypertensive diabetic patients visiting tertiary care centers had been in the middle-aged population. These results show how heavy these chronic diseases are in terms of their economic productive years. In the current study, the gender distribution showed that there was slight male dominance (57) and female (43). This finding can be related to increased prevalence of cardiovascular risk factors including smoking, alcohol use, job stress and sedentary living among men. Similar patterns were observed in the study by Konwar et al. (2014) and Ahmed et al. (2021) because male patients made up the most significant portion of hypertensive groups in tertiary care. The present study standard number of drugs prescribed in each encounter was 3.3, reasonable above the recommended optimum number of drugs per encounter by WHO. This shows the existence of moderate polypharmacy that is often seen in patients with polypharmacy. Hypertension management in diabetic patients is usually associated with the combination of treating blood pressure, glycemic control, dyslipidemia, and avoiding cardiovascular complications. Dahal et al. (2015) and Galappaththy et al. (2021) also revealed the same situation when these researchers reported more drugs per prescription in patients with comorbid chronic disease in tertiary care facilities. It was also established in the current study that the combination therapy rose with increasing age and the disease duration, and the monotherapy was more commonly employed in younger patients or in patients with a shorter period of disease. During the management of hypertension, thirty-six percent of the patients were managed using monotherapy and 64% were managed using combination therapy. Equally, in diabetes management, 43% and 57% were placed on monotherapy and combination therapy respectively. These results suggest that disease progression in many cases requires that pharmacological therapy should be

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intensified in order to provide the best controlling of blood pressure and glycemic levels. Similar results were noted by Bhandary (2018) and Elenchezhiyan et al. (2019), who also found a rise in the application of multidrug therapy with older patients with comorbid hypertension and diabetes. In terms of the antihypertensive treatment, the most frequently used medications were angiotensin receptor blockers (ARBs), especially telmisartan, used as monotherapy, or in combination with calcium channel blockers like amlodipine. Telmisartan was the most commonly prescribed drug in stage 1 hypertension with the combination therapy with amlodipine being the most preferred. Stage 2 hypertension saw the use of ARB + CCB + diuretic combinations. These patterns of prescription are in line with the existing hypertension treatment guidelines that also prescribe ACE or ARBs to diabetic hypertensive patients due to their renal protecting effects and cardiovascular advantages. Dhanaraj et al. (2012) and Ahmed et al. (2021) also reported similar prescribing trends. Metformin in the management of diabetes mellitus became the most prescribed antidiabetic agent with the majority of the prescription being made alone or with other drugs. The most common combination therapy that was detected was metformin in combination with DPP-4 inhibitors like teneligliptin and the insulin therapy was used in severe or uncontrolled cases. The results are in line with the treatment guidelines used in international practice that suggest metformin as the initial treatment of type 2 diabetes mellitus. Patel et al. (2013) and Venkatesh et al. (2024) also reported similar trends of prescribing because, in tertiary care facilities, the antidiabetic treatment was based on metformin. One of the positive aspects of the given research was that 100 percent of the drugs were prescribed using a generic name, which demonstrates a high level of adherence to the guidelines provided by WHO that encourage the rational and cost-effective consumption of drugs. Generic prescribing contributes to a major cost reduction of treatment and an enhanced access of medications by the patients. Other studies assessing the practice of prescription in teaching hospitals have also reported similar high levels of prescription generic. The paper also found another result that antibiotics were prescribed every 8 out of 100 encounters and injections were prescribed every 7.5 out of 100 encounters, which is within the acceptable range as proposed by the WHO prescribing indicators. It means that antibiotics and injectable drugs are used rationally and reasonably to minimize the chances of antimicrobial resistance and

unwarranted spending on healthcare. The other significant finding of the current study was the high adherence to Essential Medicines List (EML) where there was an approximation of 88.87 percent of drugs prescribed being based on the list. This shows that there is great adherence to national and international guidelines regarding the rational drug selection. Nevertheless, the percentage of non-EML prescriptions implies that additional measures are necessary to promote the full compliance with the necessary medicine prescriptions. Generally, the results of the research show that prescribing patterns of the tertiary care hospital are predominantly evidence-based in terms of treatment of hypertension and diabetes mellitus. Nevertheless, moderate polypharmacy and deviation of prescriptions based on the recommendations of the essential medicines evidence the need to conduct the constant prescription audit, follow the WHO indicators of prescribing, and provide permanent clinical education to medical workers. These interventions can greatly support rational drug use, safety of patients and their therapeutic outcomes in chronic comorbid patients.

### Conclusion

The findings of the study indicate that the use of combination therapy increases with the progression and longer duration of hypertension and diabetes mellitus. As the disease advances, monotherapy often becomes insufficient to achieve optimal glycemic and blood pressure control, necessitating the use of multiple drug combinations. This trend reflects the need for comprehensive pharmacological management to effectively control disease complications and improve therapeutic outcomes. The current research gives a detailed evaluation of prescribing in hypertensive and co-morbid diabetes mellitus patients at a tertiary care institution. The results show that although the core therapeutic choices are mostly in line with the existing clinical guidelines, there are still critical gaps in rational practices of drug-use. The mean count of medications per encounter though anticipated in dual chronic conditions is moderate polypharmacy which should be closely monitored. The evidence-based recommendations of cardiovascular and metabolic protection are associated with the prevalent use of ARBs, ACE inhibitors, calcium channel blockers, and metformin. The 100% generic prescribing found in the study indicates a high level of institutional devotion to cost-effective pharmacotherapy, and the partial compliance with the essential medicines list demonstrates the need to reinforce the policy structure

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in the identified areas. The rational use of antibiotics and injections also facilitates rational prescribing behavior. On the whole, the results indicate the necessity of enhanced prescription-auditing mechanisms, the compliance with the WHO core indicators of prescribing, and the ongoing clinical education to enhance the quality, safety, and cost-efficacy of pharmacological treatment among patients with sophisticated comorbidities. Such initiatives will not only improve the outcome of the therapeutic process but also contribute to the overall goal of encouraging the use of drugs in a rational manner in tertiary care settings.

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### Association Between Advancing Age with Combination Therapy in Hypertension

Age group	Mono	Combination	Combination %
<40	46	6	11.54%
41-60	27	72	72.73%
>60	1	48	97.96%

### Association Between Advancing Age with Combination Therapy in Diabetes Mellitus

Age group	Mono	Combination	Combination %
<40	46	6	11.54%
41-60	31	68	68.69%
>60	15	34	69.39%