ORIGINAL ARTICLE

CONTENTS

# Assessment of prescribing practice of anti-hypertensive medications in a sample of Iraqi patients with diabetes

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## ABSTRACT

**Aim:** This research aims to comprehensively assess the prescribing practices of anti-hypertensive medications in a sample of Iraqi patients with diabetes. Specifically, exploring medication types and classes, adherence to clinical guidelines for managing hypertension in the context of diabetes, and factors influencing prescribing decisions.

**Materials and Methods:** This descriptive cross-sectional retrospective study investigates medication usage in an outpatient clinic in Najaf, Iraq, utilizing systematic sampling. A total of 157 prescriptions from hypertensive outpatients aged 18 and above with comorbid diabetes were randomly selected.

**Results:** In our study, diabetic hypertensive patients were found to be administered antihypertensive medicines. The usage patterns revealed that a substantial proportion relied on CCBs (48.4%), followed by ARBs (34.4%), ACEIs (32.5%) and Diuretics (32.5%). Notably, single-drug therapy with CCB was more common than multiple-drug therapy among diabetic hypertensive patients in this investigation.

**Conclusions:** This study reveals that CCBs are the most commonly prescribed antihypertensive class among diabetic patients in Iraq, followed by ARBs, diuretics, and ACEIs. While this pattern shows partial alignment with guidelines recommending ACEIs and ARBs as first-line treatments, the preference for CCBs suggests a need for further studies exploring the reasons behind these prescribing patterns.

**KEY WORDS:** anti-hypertensive, diabetic patients, medications, drug combinations, pattern of prescription, calcium channel blocker

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## INTRODUCTION

The clinical and pharmacological management of diabetes and hypertension is of utmost importance, as they are prevalent, life-threatening disorders [1, 2]. Non-communicable diseases (NCDs) are the leading cause of death and morbidity in Iraq, with 55% of Iraqi deaths attributed to NCDs in 2019 [3]. Diabetes and hypertension affect each other. It has been demonstrated that people with uncontrolled blood pressure, despite hypotensive medication, have a higher chance of developing diabetes [4]. Diabetes and hypertension are components of metabolic syndrome, they coexist and influence one another's courses [5]. People with diabetes are twice as likely to develop hypertension as non-diabetics of equivalent age [6].

In recent decades, diabetes mellitus and hypertension have increased globally. Several risk factors for these chronic diseases, such as population ageing and rapid shifts in lifestyles toward westernization, have grown more prevalent [7]. Behavioral alterations for hypertension management in diabetic patients are shown in table 1. Over the past decade, blood pressure standards globally have revised their recommended blood pressure objectives due to a better understanding of hypertension management in diabetics [8]. Hypertension treatment in diabetes mellitus avoids problems. People with diabetes who manage to control their blood pressure effectively can significantly benefit, as this helps prevent both microvascular and macrovascular complications associated with diabetes and hypertension [9]. Hypertension is a significant NCDs and the third-leading global disability-adjusted life year cause. In 2000, there were 972 million hypertensive individuals worldwide; this number is projected to increase by 60 percent to 1.56 billion by 2025 [10]. Diabetes is often accompanied by hypertension, which can be prevented by controlling BP. People with diabetes should aim for BP under 130/80 mmHg [8, 11] and angiotensin receptor II blockers (ARB) and angiotensin converting enzyme inhibitors (ACEI) are recognized treatments for reducing cardiovascular events and slowing the progression of diabetic kidney disease (DKD). They slow the progression of renal failure and mortality from cardiovascular disease [11-13]. Controlling blood pressure in diabetics may be facili-

tated by calcium channel blockers (CCB), especially in combination therapy [14]. Beta-blockers and CCB have favorable benefits in the managing hypertension in diabetic individuals. Beta-blockers prevent cardiovascular events and are useful in a multidrug regimen [11]. Numerous diabetic patients necessitate combination therapy with multiple antihypertensive medications [4]. The majority of diabetes individuals have a BP that is greater than 140/90 mmHg, as evidenced by numerous studies [15-16]. ACEIs or ARBs are good first-line treatments for high-risk CV events. According to the Lipid-Lowering and Antihypertensive medication for Prevention of Heart Attack trials (ALLHAT) diabetic subgroup results, for diabetics with normal urine albumin excretion (<30 mg/day), calcium channel blockers (CCB) are currently the first-line drugs [17-18]. If target BP levels are not achieved with monotherapy at the standard dose, further antihypertensive medication should be administered. A di-hydro pyridine CCB is superior to a thiazide/thiazide-like diuretic for patients being evaluated for combination therapy with an ACE inhibitor. Based on the Avoiding Cardiovascular Events via Combination Treatment in Patients Living with high systolic blood pressure (ACCOMPLISH) trial, ACE/CCB combination medication is recommended for type 2 diabetes patients [17, 19]. Combining medications from different classes with diverse mechanisms of action helps achieve successful blood pressure control with minimal adverse effects [20].

### SELECTION OF THERAPY FOR HYPERTENSION

All guidelines recommend lifestyle adjustments before or alongside BP-lowering medications for hypertension management. Important lifestyle changes include dietary modifications, weight loss, and regular exercise [20]. If blood pressure is significantly raised, more than 160/100 mmHg, a pharmaceutical prescription with at least two medicines should be initiated. Any therapy, including ACEI, ARBs, diuretics, and CCB, may be employed [21, 22]. ACEIs or ARBs should be used first in individuals with significant albuminuria to prevent renal disease development, reduced estimated glomerular filtration rate, edema, or other strong cardiovascular signals, such as heart failure with arrhythmias and reduced ejection fraction [23, 24]. Combination Therapy Prevents Cardiovascular Events in Individuals Living with Systolic Hypertension (ACCOMPLISH) study gives the strongest data that an ACEI-CCB is better than an ACEI-thiazide diuretic for reducing adverse CV events in diabetic and non-diabetic patients DM [19].

## AIM

The present research aims to comprehensively assess the prescribing practices of anti-hypertensive medications in a sample of Iraqi patients with diabetes. Specifically, exploring medication types and classes, adherence to clinical guidelines for managing hypertension in the context of diabetes, and factors influencing prescribing decisions.

## MATERIALS AND METHODS

A descriptive, cross-sectional, retrospective study of medication use in an outpatient clinic in Najaf, Iraq, where we randomly selected 157 prescriptions from outpatients with hypertension and diabetes over 18 years of age using systematic sampling. Diabetic hypertensive medication histories were obtained, and anti-hypertensive drug classes and combinations were administered to hypertensive diabetes patients by general practitioners and pharmacological treatments variety. Patients with incomplete medical records were excluded from the study.

### DATA ANALYSIS

Microsoft Excel was used to do the data analysis. Variables are continuous; the data was depicted as the mean (standard deviation) and the frequency for categorical variables.

## RESULTS

For the study, 157 prescriptions were taken from 65 (41.4%) men with a mean age of 55.2±5 years and 92 (58.6%) women with a mean age of 61.1±6.2 years. Table 2 summarizes the data on the use of antihypertensive agents in patients with diabetes. Among those with both diabetes and hypertension, CCBs are the most frequently prescribed, with a utilization rate of 48.4%, mostly amlodipine. Following CCBs, ARBs are the second most commonly used antihypertensive class at 34.4%, while 32.5% of diabetic patients are treated with ACEIs. Diuretics are also used by 32.5% of patients with diabetes and hypertension, although indapamide is the least prescribed one. β-blockers are rarely prescribed for this patient group. The prescription patterns for each class of antihypertensive medication in males and females are illustrated in Fig. 1 and Fig. 2, respectively.

Table 3 compares males and female's antihypertensive drugs usage and whether there are gender differences between the two groups of diabetic patients. Women use CCB, ARB, and diuretics more than men, who use ACE inhibitors, CCB, and diuretics. Fig. 3 reveals the different

**Table 1.** Behavioral alterations for hypertension medication in diabetic patients

| Alteration | Suggestion |
|---|---|
| Diet | Follow the dietary approaches to stop hypertension DASH diet |
| Physical activity | Small modifications in exercise can improve cardiovascular health |
| Smoking cessation | To improve cardiovascular health, quit smoking. |
| Sodium restriction | Limit sodium consumption to 2.0 g/day |
| Weight loss | If required, lose weight to maintain a healthy weight. |

**Table 2.** Use of medications for hypertension in patients with diabetes

| Class | Drug | Prescriptions Quantity | Percentage |
|---|---|---|---|
| **ACEIs** | Perindopril | 45 | 28.7% |
| | Captopril | 6 | 3.8% |
| | **Total** | 51 | 32.5% |
| **CCBs** | Nifedipine | 11 | 7.0% |
| | Amlodipine | 65 | 41.4% |
| | **Total** | 76 | 48.4% |
| **β-blockers** | Bisoprolol | 7 | 4.45% |
| | Carvedilol | 4 | 2.57% |
| | Atenolol | 11 | 7.0% |
| | **Total** | 22 | 14.0% |
| **Diuretics** | Indapamide | 9 | 5.73% |
| | Hydrochlorothiazide | 17 | 10.83% |
| | Furosemide | 25 | 15.9% |
| | **Total** | 51 | 32.5% |
| **ARBs** | Telmisartan | 3 | 1.9% |
| | Losartan | 1 | 0.64% |
| | Candesartan | 22 | 14% |
| | Valsartan | 28 | 17.83% |
| | **Total** | 54 | 34.4% |

**Table 3.** Comparison of antihypertensive drug use in men and women

| Class | Males, n (%) | Females, n (%) |
|---|---|---|
| ACEI | 36 (55.38) | 15 (16.3) |
| CCB | 27 (33.8) | 49 (53.3) |
| β-Blockers | 4 (6.15) | 18 (19.57) |
| Diuretics | 22 (33.85) | 29 (31.5) |
| ARB | 17 (26.2) | 37 (40.2) |

antihypertensive medications along with the number of patients who received them as monotherapy. Among the 71 patients who received monotherapy for hypertension, 26 (36.6%) received CCBs, followed by 18 (25.4%) who received ACEIs, 15 (21.1%) who received ARBs, 6 (8.5%) who received diuretics, and 6(8.5%) who received β-blockers. As it shown in table 4, among the 73 patients prescribed two antihypertensive medications, 19 received a combination of a CCB and ARB, while 15 were given a combination of diuretics and an ACEI. Additionally, 12 (16.4%) patients were treated with a combination of diuretics and an ARB, and another 12 (16.4%) patients received an ACEI and CCB. Further, 5 (6.85%) patients were prescribed a combination of a CCB and β-blockers, 4 (5.48%) patients were given CCBs and diuretics, 3 (4.1%) patients received an ARB and β-blockers, and another 3 patients (4.1%) were prescribed diuretics and β-blockers. In the same table 4, out of 13 patients prescribed three anti-hypertensives, 3 (23.08%) received a combination of diuretics, CCB and ACEI, and another 3 (23.08%) were given a combination of diuretics, ARB, and CCB. In addition, 2 (16.7%) of patients were treated with ACEI, CCB and β-blockers, while 2 (16.7%) patients were prescribed ARB, β-blockers, and diuretics. Another 2 (16.7%) patients received diuretics, CCB, and β-blockers, and one patient was given a combination of diuretics, β-blockers, and ACEI.

## DISCUSSION

To assess compliance with evidence-based guidelines, we examined diabetes and hypertension patients' an-

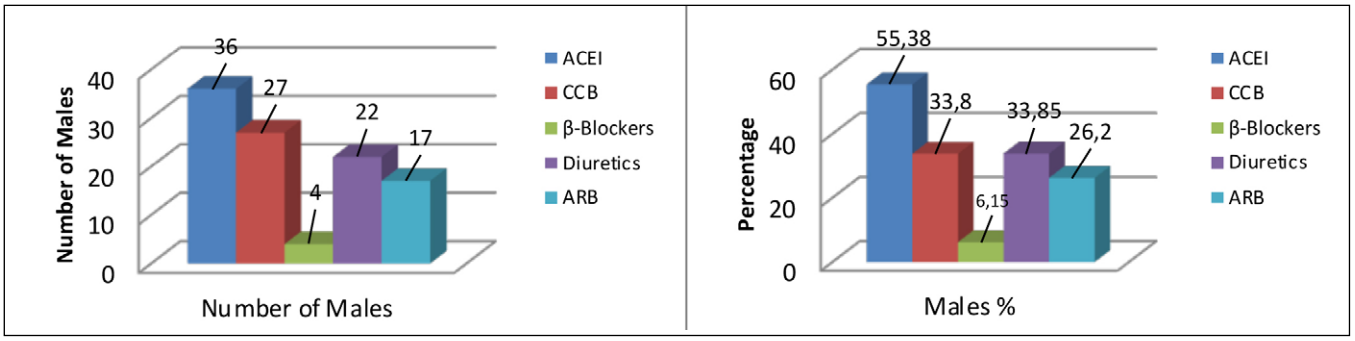


**Fig. 1.** Anti-hypertensive Class vs (a) No. of Males, (b) Males %.

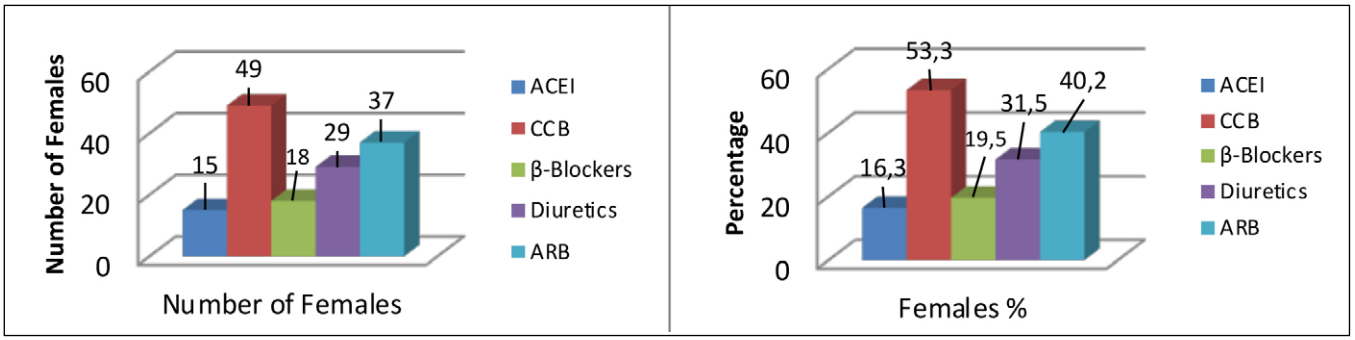


**Fig. 2.** Anti-hypertensive Class vs (a) No. of Females, (b) Females %.

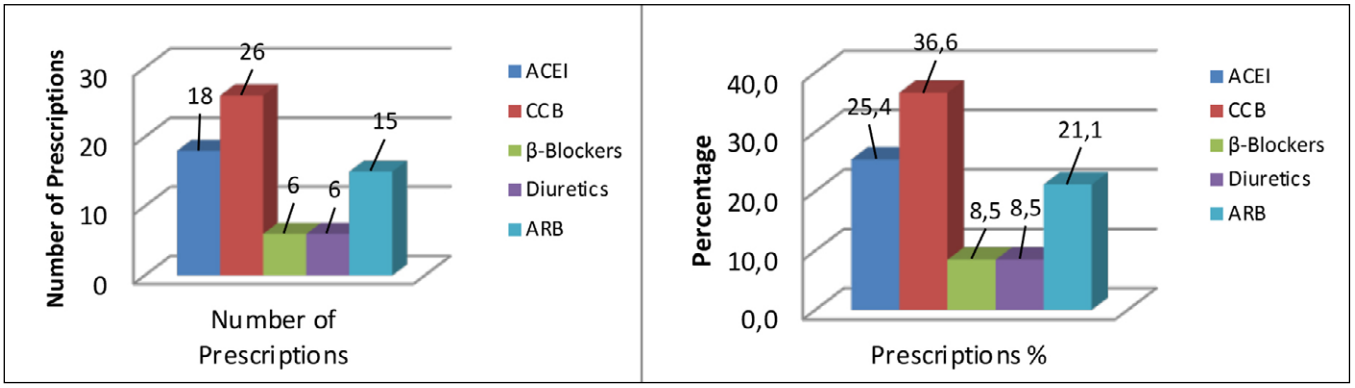


**Fig. 3.** Antihypertensive Monotherapy Prescribing Patterns (n=71): Analysis by (a) No. of Prescriptions, (b) Prescription Percentage. w

tihypertensive use. The analyzed prescriptions showed that the most commonly prescribed classes, in order, were CCBs, ARBs, diuretics, and ACEIs, followed by β-blockers, regardless of whether mono or polytherapy was used. Consistent with the findings of a Saudi study, CCBs were the most frequently used group of medicines among diabetic hypertensive patients [25]. This result partially aligns with that found by an Indian study, where CCBs were the second most prescribed antihypertensive medications [26]. One probable justification for this prescription pattern could be the effectiveness of CCBs in minimizing cardiovascular events in diabetic hypertensive patients. According to the current investigation results, a CCB was usually prescribed as a single-drug therapy in 48.4% of the cases, rather than as part of a combination treatment. These findings lend credence to previous studies, which demonstrated that a monotherapy might effectively manage hypertension [27, 28]. Also, this study compared patients on multiple therapy to those on a single BP-lowering medicine. The present findings match Marinier et al. who reported that the usage of several antihypertensive medications significantly improved BP control in the treated hypertension population [29]. The combination of CCBs and ARBs was the most prescribed two drug regimen with a prescription rate of 26.03%. This finding is in accordance with Elenchezhiyan V. et al., who revealed that the combination of CCBs and ARBs was given to 44 % of patients [26]. The prescription of CCBs and ARBs may indicate that practitioners are better aware of the long-term cardiovascular and renovascular benefits. Approximately

**Table 4.** The use of combined antihypertensive drugs

| Drug combinations (DC) | Prescriptions quantity | Percentage |
|---|---|---|
| **2 DC** | | |
| ARB + diuretics | 12 | 16.4 |
| ARB + CCB | 19 | 26.03 |
| ARB + β-Blockers | 3 | 4.1 |
| Diuretics + CCB | 4 | 5.48 |
| β-blockers + Diuretics | 3 | 4.1 |
| CCBs + β-blockers | 5 | 6.85 |
| ACEI + diuretics | 15 | 20.55 |
| ACEI + CCB | 12 | 16.4 |
| Total | n = 73 | 46.5 |
| **3 DC** | | |
| β-blockers + ACEI + CCB | 2 | 16.7 |
| β-blockers +ACEI + diuretics | 1 | 7.69 |
| Diuretics +ACEI + CCB | 3 | 23.08 |
| ARB + Diuretics + β-blockers | 2 | 15.38 |
| Diuretics + ARB + CCB | 3 | 23.08 |
| β-blockers + CCB +diuretics | 2 | 15.38 |
| Total | n =13 | 8.3 |

46.5% of medicines in this study were for combinations of two medications, with third-drug varieties coming in at 8.3% (Table 4). These findings are comparable to two earlier studies which illustrated that nearly half of patients were given multiple medications [25, 30]. However, this outcome does not go well with Dahal et al., where combination antihypertensive medications were prescribed to only 6.6% [31]. This research is not without limitations. One significant limitation is the cross-sectional setting, which hinders the ability to establish whether the observed patient characteristics and prescription patterns are causally linked. Additionally, relying on patient reports and medical records may introduce biases due to recall errors and potential mis-categorization. Moreover, the data was gathered from a limited number of outpatient clinics, which may limit the generalizability of the findings to all hypertensive diabetic patients in Iraq.

## CONCLUSIONS

This study provides a detailed assessment of antihypertensive prescribing patterns among diabetic patients in Iraq. The results show that CCBs were the most commonly prescribed antihypertensive class, followed by ARBs, diuretics, and ACEIs. While the high use of CCBs, particularly as monotherapy, suggests a preference for these medications, the findings reveal a partial alignment with evidence-based guidelines, which generally recommend ACEIs and ARBs as the first-line treatment for diabetic patients due to their renoprotective and cardiovascular benefits. The significant use of ARBs, often in combination with CCBs, does reflect some adherence to these guidelines, particularly in the context of combination therapy. However, the predominance of CCBs as monotherapy may indicate a deviation from the recommended first-line use of ACEIs and ARBs, potentially due to local prescribing practices or patient-specific factors. Overall, while the study's findings partially align with current guidelines, they also highlight the need for further education and alignment with best practices in antihypertensive management for diabetic patients. Future research with larger and more diverse populations is recommended to explore the reasons behind these prescribing patterns and assess their impact on long-term patient outcomes.

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## CONFLICT OF INTEREST

The Authors declare no conflict of interest

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