Research Article

A Prospective Observational Study on Drug Utilization Pattern of Anti-hypertensive Therapy in Diabetic Hypertensive Patients with and without Reduced Renal Function

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ABSTRACT

The aim of our study was to study the drug utilization pattern of anti-hypertensives to achieve target BP (≤140/90mmHg) among diabetic hypertensive patients with and without reduced renal function. The prospective observational study was conducted in a hospital for 6 months period in patients who were diagnosed with diabetes and hypertension with and without reduced renal function. Demographic details as well as the pharmacotherapy of the patients were analysed. Elevated or non-target BP is defined as greater than or equal to 140/90 mmHg according to JNC 8th report. Reduced renal function is defined as eGFR ≤60ml/min/1.73m^2. eGFR was calculated by using MDRD equation. We have categorized the patterns of use of anti-hypertensive drugs among patients as monotherapy, dual, triple or quadruple therapy. We compared the proportions of drug class used among patients with eGFR above and below 60ml/min/1.73m^2. 100 diabetic-hypertensive patients were enrolled in our study, among them 55 patients were without reduced renal function and 45 were with reduced renal function. Most of the patients were male, belonged to the age group 61-80 years and were overweight. Patients with eGFR >60ml/min/1.73m^2 were mostly on dual therapy and ARB was the most prescribed drug class. Patients with eGFR ≤60ml/min/1.73m^2 were mostly on dual therapy and diuretics were the most prescribed drug class. Most of the patients required multiple drug therapy than monotherapy to achieve adequate BP control. The average number of anti-hypertensive medications prescribed for patients with and without reduced renal function was not statistically significant.

Keywords: Drug utilisation, Anti-hypertensive, Renal function, Glomerular Filtration Rate (GFR).

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INTRODUCTION

Hypertension affects about 20-60% of patients with type-2 diabetes[1]. Patients with T2DM has two fold higher chances of suffering from hypertension in comparison to age match subjects without diabetes[2]. The benefits of tight blood pressure (BP) control in patients with diabetes exceed the benefits of tight glycemic control and extend to the prevention of both macro-vascular and micro-vascular complications[3]. However, studies consistently demonstrate that most diabetic patients do not achieve recommended levels of BP control, and the majority have a BP of >140/90mmHg[4–6]. The major adverse outcomes of DM are vascular complications, both, at the microvascular (retinopathy, nephropathy or neuropathy) and macrovascular levels (coronary artery disease, cerebrovascular and peripheral vascular disease)[7]. These vascular complications are augmented by the co-existence of HTN[8]. To minimize and delay the vascular complications among diabetic-hypertensive patients, a tight control of Blood Pressure (BP) and glucose levels is required[7,9].

There are a growing number of pharmacological treatment options for patients with hypertension. However, the choice of anti-hypertensive drug class is influenced by many factors such as age, stage of hypertension and the presence of co-morbid conditions. The eighth report of the Joint National Committee on the Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC) stated that angiotensin converting enzyme inhibitors (ACE-I) is an important component of most regimens to control BP in diabetic patients[10]. In these patients, ACE-I may be used alone, but are much more effective when combined with thiazide type diuretic or other anti-hypertensive drugs. The JNC eighth report recommended that the BP in diabetics should be controlled to levels of 140/90 mmHg or lower. Rigorous control of BP is paramount for reducing the progression of diabetic nephropathy to end-stage renal disease (ESRD). In hypertensive patients with chronic kidney disease (CKD), defined as a glomerular filtration rate (GFR) <60 ml/min, the JNC eighth report recommended a goal BP of ≤ 140/90 mmHg and a need for using more than one anti-hypertensive drug to achieve this goal[10]. The guidelines indicate that most patients with CKD should receive an ACE-I or an angiotensin receptor blocker (ARB) in combination with a diuretic and that many will require a loop diuretic or a thiazide[11].

MATERIALS AND METHODS

Study design

The study is a Prospective Observational Study.

Study Site

The study was conducted in a 750 bedded multispecialty hospital located at Vadapalani, Chennai.

Study Period And Ethical Clearance

The study was approved by Institutional Ethics Committee of Vijaya Group of Hospitals, Vadapalani, Chennai (Ref No: 7398/KKCP/2019 dated 04/Mar/19). The study was carried out for the period of six months from March 2019 to August 2019.

Study Population

Patients (inpatients) of all departments diagnosed with hypertension and diabetes with and without reduced renal function.

Study Population Size

100 diabetic hypertensive patients with and without reduced renal function were included in the study based on the inclusion and exclusion criteria after getting the patient consent (Annexure II) and the required data was collected in specially designed data entry form (Annexure III).

Patient Selection

Inclusion criteria

- Age: Above ≥18 years

- Gender: Both male and female

- Diabetic-hypertensive patients

- All the inpatients diagnosed with and without chronic kidney disease

Exclusion Criteria

- Out patients

- Congestive heart failure

- Patients undergoing hemodialysis or transplantation

- Patients having emergency/ life threatening medical/ surgical conditions

- Pediatric patients

- Pregnant and lactating women

Data Collection

The data was collected from the patients who met the inclusion criteria. To study the drug utilization patterns, relevant details of every diabetic-hypertensive in-patient with and without reduced renal function was collected. The relevant data on drug prescription of each patient will be collected from the in-patient record. The demographic data- age, sex, past and present history of disease, blood pressure, serum creatinine and random blood sugar (RBS), drug therapy - drugs, dosage form, dose, route of administration, frequency was noted.

Statistical Analysis

The data collected was entered into Microsoft Excel Sheet. Continuous variables were represented as 'Mean (±SD), and categorical variables was represented as 'Frequency (percentage)'. Chi-square was done to assess the difference between categorical variables. The p value of < 0.05 was considered as significant.

RESULTS AND DISCUSSION

This study analysed the drug utilization pattern of antihypertensive therapy in diabetic hypertensive patients with and without reduced renal function. The patients with eGFR <60 ml/min/1.73m^2 was considered to be with reduced renal function. The prescription was analysed for the overall distribution pattern of antihypertensive medications as one drug, two drugs, three drugs and four drugs combination in a regimen.

We have included 100 diabetic-hypertensive patients in our study out of which 55 patients were without reduced renal function (eGFR >60ml/min/1.73m^2) and 45 patients were presented with reduced renal function (eGFR ≤60 ml/min/1.73m^2). The male population was Predominant over female population. Out of 100 diabetic-hypertensive patients 52 patients were male.

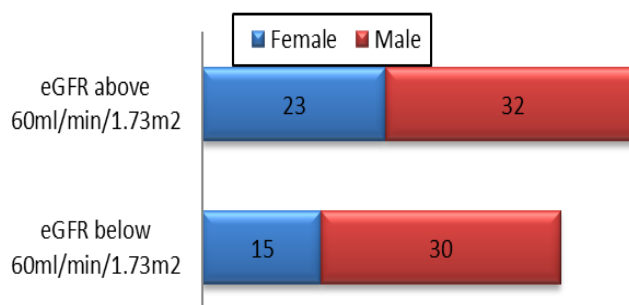**Figure 1:** Distribution of patients based on gender

The mean age of the population with eGFR >60ml/min/1.73m^2 was 61.58± 13.79 years and the mean age of the population with eGFR ≤60 ml/min/1.73m^2 was 65.49± 14.87 years. Majority of the patients belonged to the age group of 61-80 years. Most of the diabetic-hypertensive patients were having overweight BMI, 28(50.91%) patients without reduced renal function were overweight and 26(57.78%) patients with reduced renal function belonged to overweight BMI category. There were more smokers 18(40%) and alcoholics 13(28.89%) in patients with reduced renal function when compared to patients without reduced renal function. This shows that smoking and alcohol will increase the progression of nephropathy in diabetic-hypertensive patients.

Table 1: Social Habits of Diabetic-hypertensive patients

Estimated Glomerular Filtration Rate	Social habits	No. of Patients (n=55)	Percentage (%)
eGFR> 60 ml/min/1.73m²	Smokers	6	10.91
	Alcoholics	6	10.91
eGFR ≤60 ml/min/1.73m²	Smokers	18	40.00
	Alcoholics	13	28.89

Our study revealed that the patients without reduced renal function were found to have random blood glucose level below 200mg/dl and the mean blood glucose level was found to be 185±48.26 while the patients with reduced renal function were found to be with random blood glucose level above 200mg/dl with mean random blood glucose of 232±71.62.

Table 2: Random blood glucose level in diabetic hypertensive patients

Estimated Glomerular Filtration Rate	Random Blood Glucose		Mean±SD
eGFR> 60 ml/min/1.73m²	<200 mg/dl	37	185±48.26
	≥200 mg/dl	18	
eGFR ≤60 ml/min/1.73m²	<200 mg/dl	19	232±71.62
	≥200 mg/dl	26	

The mean eGFR of diabetic-hypertensive patients without reduced renal function was found to be 102.98± 27.80 and in patients with reduced renal function was found to be 33.50±13.07. The most common co-morbidity was found to be Coronary Artery Disease in both patients without reduced renal function 16(29.09%) and in patients with reduced renal function 21(46.67%).

Most of the diabetic hypertensive patients were prescribed with multiple drug regimen than single drug therapy to achieve goal the blood pressure of ≤ 140/90 mmHg as recommended by JNC eighth report. Use of multidrug therapy is based on patients BP, age, co-morbidities, whether BP is under control with the current drugs or not and the progression of CKD etc.
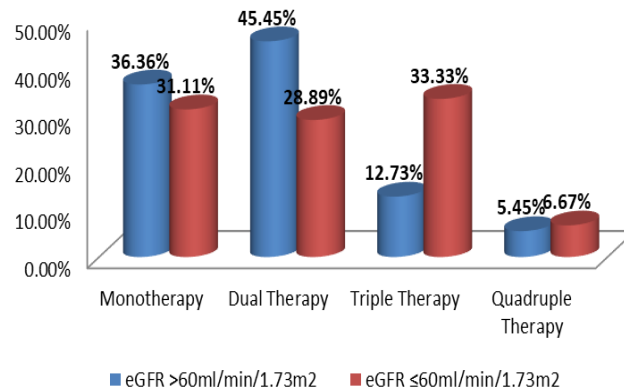

Figure 2: Multiple drug therapy in diabetic hypertensive adults with and without reduced renal function

In our study most of the patients were prescribed with dual drug therapy. Patients with reduced renal function were most commonly on triple drug therapy. In diabetic hypertensive patients with normal renal function Angiotensin II receptor blocker were the most commonly prescribed class of antihypertensive for patients 35(63.64%) followed by diuretics 23(41.82%) which was concurrent to the study conducted by Dorchhom Khrime et al[12]. In patients with reduced renal function about 31(68.89%) patients were prescribed with diuretics followed be calcium channel blockers 18(40%) and beta blockers 18(40%) which was similar to the study conducted by Jyothirmayee et al[13], in 2018.

Table 3: Comparison of numbers of antihypertensive medications prescribed in both groups

Drug Class		ARB	ACEI	Diuretics	CCB	β Blocker	α-Blocker
Patients without reduced renal function	Monotherapy n(%)	12 (6.03)	1 (0.50)	4 (2.01)	2 (1.01)	2 (1.01)	0
	Dual therapy n(%)	14 (7.04)	0	17 (8.54)	9 (4.52)	12 (6.03)	0
	Triple therapy n(%)	7 (3.52)	0	7 (3.52)	2 (1.01)	5 (2.51)	0
	Quadruple therapy n(%)	2 (1.01)	0	3 (1.51)	2 (1.01)	3 (1.51)	1 (0.50)
	Total n(%)	35 (17.59)	1 (0.50)	31 (15.58)	15 (7.54)	20 (10.05)	1 (0.50)
Patients with reduced renal function	Monotherapy n(%)	1 (0.50)	0	7 (3.52)	4 (2.01)	2(1.01)	0
	Dual therapy n(%)	6 (3.02)	0	7 (3.52)	4 (2.01)	6 (3.02)	3 (1.51)
	Triple therapy n(%)	8 (4.02)	0	18 (9.05)	8 (4.02)	7 (3.52)	3 (1.51)
	Quadruple therapy n(%)	2 (1.01)	0	5 (2.51)	2 (1.01)	3 (1.51)	0
	Total n(%)	17 (8.54)	0	37 (18.59)	18 (9.05)	18 (9.05)	6 (3.02)
p* value		0.98	-	0.28	0.51	0.51	-

The average number of anti-hypertensive medications prescribed for patients with and without reduced renal function was not statistically significant. This correlates with the study conducted by Waleed M. Sweileh et al.[14], in 2019.

CONCLUSION

This study has provided an insight into actual use of antihypertensive medicines in patients with diabetes with respect to their renal function. Our study concludes that combination therapy was mostly used in diabetic-hypertensive patients in general. More intensive therapy was given to diabetic-hypertensive patients with reduced renal function. Most of the patients required multiple drug therapy than monotherapy to achieve adequate BP control. The average number of anti-hypertensive medications prescribed for patients with and without reduced renal function was not statistically significant.

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