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PRESCRIBING PATTERN OF ANTIHYPERTENSIVE MEDICATIONS AMONG PHYSICIANS AT KING ABDULAZIZ MEDICAL CITY

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Abstract:

Objective: *To investigate the antihypertensive prescribing patterns among physicians at KAMC-R.*

Methods: *After each scheduled clinic, a data collector will check all patients who have a diagnosis of hypertension, and then we will screen the patients for eligibility by checking the patient's chart. All patients who were above 18 years, have been diagnosed with hypertension and are taking at least one antihypertensive agent were included.*

Results: *the study included 632 patients where the frequency of the six antihypertensive drug classes were as follow: CCBs (25.14%), Diuretics (21.36%), ARBs (19.57%), ACE inhibitors (16.29%), b-Blockers (14.71%) and other antihypertensive agents (2.93%). Amlodipine was the most common prescribed drug (23.36%) followed by furosemide (12.64%), lisinopril (12.50%), valsartan (10.14%) and metoprolol (9.71%).*

Conclusion: *The most prescribed antihypertensive class was CCBs, and the most prescribed drug is amlodipine. It was also evident that diabetes is the most common co-morbidity in our patients, but CKD is more common in males, in some instances, physicians didn't adhere to guidelines.*

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INTRODUCTION:

Hypertension (HTN) is one of the common chronic diseases and considered a modifiable risk factor for renal failure, cardiovascular events, and stroke. [1] HTN is defined as persistent elevation of SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg in adults not on antihypertensive medications. Based on the most recent guidelines, BP levels are classified as to Normal (SBP ≤120 mm Hg and DBP < 80 mm HG), Pre-HTN (SBP 120-139 mm Hg and/or DBP 80-90 mm Hg), Stage-1 HTN (SBP 140-159 mm Hg and/or DBP 90-99 mm Hg), and stage -2 HTN (SBP ≥ 160 mm Hg and/or DBP ≥ 100 mm Hg). [2]

Hypertension is considered a high prevalence cardiovascular disease. In an analysis of worldwide data pertaining to global burden of hypertension in adult population, approximately 26.5 % (95% CI 26·0–26·8%) of the adults (>20-year old) had hypertension in 2000. The percentage of hypertension is predicted to reach 29.5% by 2025. This analysis also shows that the distribution of the disease is almost similar among males and females.[3] In a World Health Organization (WHO) global report on hypertension, approximately 17 million deaths yearly were reported to be due to cardiovascular disease. More than half of these mortality events were considered due to complications of hypertension. [4]

In Saudi Arabia, a national epidemiological heath survey of 17,230 adults (30-70 year-old) showed that the age-adjusted prevalence of hypertension is 24%. Unlike the global prevalence, males are more significantly ($p<0.001$) affected by hypertension than females. [5]

Lifestyle modification is usually the first step in the management of hypertension. Many treatment options for hypertension are available in the market and are currently in use, which includes diuretics (loop, Potassium-sparing, and thiazide), Angiotensin-converting enzyme inhibitors (ACEI's), renin inhibitors, angiotensin II-receptor antagonists (ARB's), calcium channel blockers (CCB's), beta blockers (BB) and central alpha-2 agonists. The type of antihypertensive agents used for any patient has been the point of focus in multiple national guidelines and wide studies. [6]

Saudi Hypertension Management Society (SHMS) published their third edition of the hypertension guidelines in 2011 that have been commonly cited as potential means to close the gap between scientific evidence and clinical practice.[7] However, several surveys have shown limited compliance with this guideline. The Saudi guidelines are mainly based on different international guidelines such as Canadian Recommendations for the Management of Hypertension, World Health Organization (WHO), and the VII Report of (US) Joint National Committee (JCI VII). [7]

A systemic review of multiple guidelines released in 2013 concluded that there was a "guidelines overload", this can cause controversy among physicians regarding adherence to any specific guideline. [8]

The prescribing pattern of antihypertensive agents varies from country to country, city to city, hospital to hospital; in fact, it differs between physicians who are practicing within the same hospital. The prescription of antihypertensives depends mostly on the patient's condition, sex, ethnicity, age, marital status.[9] A comparative study has been conducted between six European countries (Denmark, Finland, Germany, Norway, Sweden, and the Netherlands). The study included six classes of antihypertensive agents based on Anatomical Therapeutic Chemical (ATC). The study showed that there is a difference in both the relative and absolute utilization of antihypertensive classes between the selected countries. [10]

In one study, among 341 (aged 65–94 years) hypertensive African American patients, 29% were taking one anti-hypertensive agent, 35% were on two agents, 22% were on three, and 9% were in all four classes of medications. The most used agent on patients taking one agent was ACEI/ARB (43%), while in patients taking three agents it was ACEI/ARB + BB + diuretics in 39% of patients. [11]

A retrospective cohort study conducted in the United States from October 1, 1998 to March 1, 2001 that included medical records of 9975 patients with diabetes and hypertension showed that ACEI and ARB were the most prescribed antihypertensive drugs (62.2%), and the majority of the population was on two or more antihypertensive agents (57.2%). The study also resulted that treatment regimens were mostly consistent with the evidence-based guidelines at the time of the study. The study's main limitation was that 97% of the population was males due to the nature of the study location, preventing the results to be generalized on females. [12]

In a data search containing 149 participants who were prescribed 353 anti-hypertensive drugs, the patients' adherence to the drug was analyzed and studied. The mean age was 64 years and the mean systolic pressure

was 158 mmHg. Fifteen percent of the participants were diagnosed with coronary artery disease (CAD), 9% with heart failure, and 58% with diabetes. The most common prescribed drugs were BB. In this study, 88% of the participants were prescribed more than one drug. The mean number of hypertensive medications prescribed per person was 2.5. [13]

A cross sectional study was done to assess the patterns of prescribing, and dispensing of antihypertensive drugs. Four hundred patients who are above 18 years were included. Of those, 69% of them had stage-1 hypertension and 31% had stage-2 hypertension. Patients with diabetes mellitus were 64.3%, congestive heart failure 15.1%, and ischemic heart disease 2,3%. The most common antihypertensive drugs used were diuretics. The most frequent prescribed one was hydrochlorothiazide 55% then enalapril 22.3%, methyldopa 11.2%, atenolol 6.9%, and nifedipine 4.6%. [14]

A cross-sectional study was conducted in Saudi Arabia on 149 patients who had hypertension and diabetes. The sample included 81 (54.4%) females and 68 (45.6%). Overall, calcium channel blockers were utilized the most (48%), and then followed by ACE inhibitors antihypertensive class (36.2%). Differences between the two genders' prescription patterns were found. With males being prescribed ACE inhibitors the most (54.4%) whereas females were prescribed with calcium channel blockers more (48.1%). [15]

A new data pertinent to the trend in prescribing of antihypertensive medications at KAMC-R will be collected and analyzed. The extent of physicians' compliance with the current guidelines and factors affecting the both prescribing habits and degree of compliance with the guidelines will also be addressed in this study.

To provide updated information on the consumption and patterns of prescribing antihypertensive medications to the KAMC-R and Saudi Food and Drugs Authority (SFDA) In addition, this study result will be compared with local and global data regarding the same concerns. Variables affecting physician's compliance or non-compliance with the current guidelines will be also addressed and solution and recommendations will be suggested to improve non-compliance.

Objectives of the Study:

Aim of the Study:

To investigate the antihypertensive prescribing patterns among physicians at KAMC-R.

Specific Objectives:

1. To describe the prescribing habits of antihypertensive medication among physicians at KAMC-R.
2. To assess the compliance of the current practice of KAMC-R physician with the current Saudi hypertension management guidelines.

Secondary Objectives:

1. To identify factors affecting the compliance with the Saudi hypertension management guidelines.
2. To evaluate the extent to which current antihypertensive prescribing practices achieve blood pressure control (<140/90 mmHg).
3. To compare the blood pressure control among patients on single versus combination of antihypertensive therapy.

MATERIALS AND METHODS:

After each scheduled clinic, a data collector will check all patients who have a diagnosis of hypertension, and then we will screen the patients for eligibility by checking the patient's chart.

Study Area/Setting:

The study will be conducted in internal medicine clinics of the King Abdulaziz Medical City-Riyadh (KAMC-R). KAMC-R is National Guard tertiary care; academic hospital belongs to the government sector. It has more than 690 beds with an additional 25 reserved for expected surgical operations and 132 beds for emergency admissions. It serves mainly the National Guard employees and their families, however it also offers services to other eligible patients referred from outside the National Guard. Department of internal medicine involves approximately 25 consultants who run approximately 25 outpatient clinics. Patients with diabetes, hypertension, different types of infections, COPD, bronchial asthma, stroke, DVT and pulmonary embolism, multiple medical problems, ischemic heart diseases & congestion heart failures, and other conditions without an obvious diagnosis are normally seen and served in by internal medicine department clinics. All clinics are located in the main hospital of the KAMC-R.

Study Subjects:

Inclusion criteria:

- Patients are eligible if they:
- Are more than 18 years old.
- Have been diagnosed with hypertension.
- Are on at least one antihypertensive medications.

Exclusion criteria:

- Pregnant woman.
- Using any hypertension medication for another indication, other than hypertension, such as peripheral vascular disease, atrial fibrillation, anxiety…etc

Study Design:
Cross-sectional Study that will be conducted by using chart review.
Sample Size:
We assumed the prevalence of patients who are compliant with the antihypertension management guidelines are 50% and the margin of error is 5% and the level of significance is 95%. As a result, the required sample size is 377.
Sampling Technique:
Convenience sampling. Patient with known hypertension who meets the inclusion criteria will be included and the needed data will be obtained from MNGHA's electronic medical records management system which is used in KAMC-R (Best Care).

DATA COLLECTION METHODS, INSTRUMENT USED, MEASUREMENTS:

A data collection sheet will be developed to help collecting the data on site. All data will be collected from the internal medicine clinics at KAMC-R. After each scheduled clinic, a data collector will check all patients who have a diagnosis of hypertension, and then we will screen the patients for eligibility by checking the patient's chart. The data collector will use the electronic chart, health information system (BESTCARE) to gather information on the patient demographics, diagnosis, comorbidities, and laboratory data and prescribed medications. The data collection could be either in the morning or in the evening time depending on the clinic schedule. All data will be transferred to a unified excel sheet and kept confidentially.

Data Management and Analysis Plan:
Data analysis will be carried out using SPSS version 20. The mean (standard deviation) will be used for continuous variables such as weight, age, height, systolic and diastolic pressure and the frequency and percentage for categorical variables like gender. The Chi-squared test will be used to assess the compliance of the current practice of KAMC-R physician with the current Saudi hypertension management guidelines, patient's demographics, diagnosis, comorbidities, laboratory data and prescribed medications. The test will be considered significant if the P value is less than 0.05.

Ethical Considerations:
Participants' data will remain anonymous to preserve the confidentiality of the patient. Privacy and confidentially will be completely protected, no identifiers or personal information will be collected or stored including patient`s named, IDs and others. This project will not involve intervention or patient survey. Rather, patients' chart review will be executed after a list of patients who have been diagnosed with hypertension is obtained from the internal medicine department.

RESULT:

A total of 632 patients records were analyzed. The average ages of the study population were 67.3±13 with 60.6% females and 39.4% are males. The average systolic blood pressure in the last reading was 137±21 mmHg and the average diastolic blood pressure was 71±13 mmHg. Most of the patients (82.2%) ranged between 40 and 80 years. The total drugs prescribed were 1400 drugs. The frequency of the six antihypertensive drug classes were as follow: CCBs (25.14%), Diuretics (21.36%), ARBs (19.57%), ACE inhibitors (16.29%), b-Blockers (14.71%) and other antihypertensive agents (2.93%). Amlodipine was the most common prescribed drug (23.36%) followed by furosemide (12.64%), lisinopril (12.50%), valsartan (10.14%) and metoprolol (9.71%). Table 1 shows the frequency of the prescription for each drug prescribed within the six classes of antihypertensive drugs.

Table 1

		Per drug		Per drug group	
Drug group	Name of drug	Frequency	Percent	Frequency	Percent
CCBs	Amlodipine	327	23.36%	352	25.14%
	Nifedipine	23	1.64%		
	Diltiazem HCI	1	0.07%		
	Verapamil	1	0.07%		
Diuretics	Furosemide	177	12.64%	299	21.36%
	Indapamide	67	4.79%		
	Hydrochlorothiazide	35	2.50%		
	Spironolactone	18	1.29%		
	Bumetanide	2	0.14%		
ARBs	Valsartan	142	10.14%	274	19.57%
	Losartan	98	7.00%		
	Candesartan	34	2.43%		
ACE Inhibitors	Lisinopril	175	12.50%	228	16.29%
	Perindopril	49	3.50%		
	Captopril	3	0.21%		
	Fosinopril	1	0.07%		
B-blockers	Metoprolol	136	9.71%	206	14.71%
	Atenolol	59	4.21%		
	Carvedilol	6	0.43%		
	labetalol	5	0.36%		
Others	Hydralazine	36	2.57%	41	2.93%
	Clonidine	4	0.29%		
	Terazosin	1	0.07%		

CCBs, calcium channel blockers; ACE inhibitors, angiotensinconverting enzyme inhibitors; ARBs, angiotensin receptor blockers.

Out of 632 patients, 157 patients received monotherapy, 190 had double therapy, 152 triple therapy and 133 had four drugs prescribed or more. Table 2 shows frequency and percentage of therapy regimen in the study population.

Table 2

Therapy regimen	Frequency	Percent
Monotherapy	157	24.84%
Double therapy	190	30.06%
Triple therapy	152	24.05%
Quadruple therapy and more	133	21.04%

with diabetes (80.7%), 282 female patients were diagnosed with dyslipidemia (73.6%), 39 female patients were diagnosed with CKD (10.2%), and 52 female patients were diagnosed with Heart failure (13.6%). When comparing between genders we found that 55 male patients were diagnosed with CKD (22.1%) compared to only 39 in females (10.2%), and 46 male patients were previously diagnosed with stroke (18.5%), while on the other hand only 30 female patients were diagnosed with stroke were only (7.8%).

In our study we found that 508 patients with co-morbidities were also diagnosed with diabetes, and 451 patients were diagnosed with dyslipidemia, and 94 patients were diagnosed with CKD, and 85 patients were diagnosed with heart failure. When comparing between genders we found that 199 male patients (79.9%) were diagnosed with diabetes, 169 male patients diagnosed with dyslipidemia (67.9%), 55 male patients diagnosed with CKD (22.1%), and 33 male patients were diagnosed with Heart failure (13.3%). Whereas 309 female patients were diagnosed

Table 3 shows frequency of co-morbidities in males and table 4 in females

Table 3

	Male	
Co-morbidity	Frequency	Percent
Diabetes	199	79.90%
Dyslipidemia	169	67.90%
CKD	55	22.10%
Stroke	46	18.50%
HF	33	13.30%
Angina	24	9.60%
MI	10	4.00%
Asthma	9	3.60%
Anemia	8	3.20%
Hypothyroidism	8	3.20%
Atrial fibrillation	5	2.00%
Liver cirrhosis	1	0.40%
Hyperthyroidism	0	0.00%

Table 4

	Female	
Co-morbidity	Frequency	Percent
Diabetes	309	80.70%
Dyslipidemia	282	73.60%
HF	52	13.60%
CKD	39	10.20%
Hypothyroidism	38	9.90%
Stroke	30	7.80%
Angina	26	6.80%
Asthma	21	5.50%
Anemia	12	3.10%
MI	11	2.90%
Atrial fibrillation	10	2.60%
Liver cirrhosis	2	0.50%
Hyperthyroidism	1	0.30%

The pattern of prescription of antihypertensive drugs wasn't exactly following the guidelines. 32 hypertensive patients with no comorbidity, 38% of them are on CCBs, followed by 22% on ARBs, 16% on ACEI, and 9% on diuretic, and 85 hypertensive patients with heart failure, 32% of them on BBs and ACEI or ARBs. There are 76 hypertensive patients with previous stroke, 23% of them are on ACEI and diuretic. There are 80 diabetic patients without microalbuminuria or CKD are taking ACEs along with CCB, also, we found that 101 diabetic patients without microalbuminuria or CKD are taking ARBs along with CCB. There are 17 diabetic patients with microalbuminuria or CKD are taking ARBs along with CCB, adding to that, there are 11 diabetic patients with microalbuminuria or CKD are taking ACEs along with CCB. Patients with asthma have shown to be following the guideline when most patients are on Beta Blockers. On the other hand, 21 patients are Non-diabetic with chronic kidney disease, 24% of them are on CCBs, 9.5% of them are on ACEs, and 5% of them are on ARBs. Patients with MI is also added to the list not accurately following the guidelines when 23% are on Beta blocker and ACEI only.

DISCUSSION:

In recent studies: Some studies showed that ACEIs are the most commonly prescribed classes.[11,12,13,14] Other studies conclude that CCBs are the most common class.[15,16] In contrast, there are also studies that put diuretics and beta blockers as the most common.[17,18,19,20] While In our study, Most of patients received Double Therapy which also goes with the international guidelines. Most common prescribed medication class was CCBs, but Most commonly combination prescribed therapy was CCB and ARBs.

We studied patterns of antihypertensive drug prescribing in patients with hypertension, to evaluate whether they were consistent with evidence-based practice guidelines.

In a recent study about prescribing patterns of antihypertensive drugs: [19,20]

1. Dual therapy was the most commonly prescribed regimen with 174 patients (48.3%).
2. Monotherapy with 109 patients (30.2%).
3. Triple Therapy with 47 patients (13%).
4. Four drugs prescribed and more with 30 patients (8.3%)

In our study, we found a similar result. out of 632 patients:

1. Dual Therapy was the most commonly prescribed regimen with 190 patients (30.6%).
2. Monotherapy with 157 patients (24.84%).
3. Triple Therapy with 152 patients (24.05%).
4. Four drugs prescribed and more with 133 patients (21.04%).

Our study is also concerned about the compliance of physicians to Saudi guidelines in term of antihypertensive drug prescriptions. Specifically, the Saudi Hypertension Management Society (SHMS) guidelines.[6] Only 38% of patients with no comorbidity are on CCBs, CCBs are the recommended class for patients without comorbidities, and the remaining patients were not on the recommended drugs. 23% of patients with previous MI were on beta blockers and ACEIs, which is not recommended in SHMS guidelines. 17 diabetic patients with microalbuminuria or CKD are taking ARBs & CCBs and 11 diabetic patients with microalbuminuria or CKD are taking ACEs & CCBs.

And these two results are matching with SHMS guideline.

Limitation:

There are some limitations in this study:

3. It was only in one center in one city.
4. This study is conducted in a tertiary-care hospital, patients who receive health care in primary or secondary centers may have a different pattern of antihypertensive therapy.
5. Documentations of the last 3 readings of BP was missed at least once by the patients or the medical staff in many cases, preventing us from calculating the average read of the last 3 visits of the study population and the improvement of their BP.
6. Smoking as a risk factor was not documented clearly in a lot of records.

CONCLUSION & RECOMMENDATION:

This study showed that the most prescribed antihypertensive class was CCBs, and the most prescribed drug is amlodipine, both results are in contrast with many studies. It also showed that the outpatients with hypertension in our hospital received double thereby which is constant with local guidelines. Diabetes is the most common co-morbidity in our patients, but CKD is more common in males, in some instances, physicians didn't adhere to guidelines. Further investigations for the use of antihypertensive medication are needed, and more studies on the adherence for guidelines should be done to assess what drive physicians for these clinical judgments. Continued efforts are needed to improve antihypertensive medication use and guidelines adherence.

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