

Prescription pattern of antihypertensive drugs in Family Practice Clinics at Jordan University Hospital

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Abstract

This study aims at assessing the prescription pattern of antihypertensive drugs in hypertensive patients attending the Family Practice Clinics at Jordan University Hospital in Amman, Jordan and evaluating their blood pressure control according to the international guidelines. The study sample involved 416 hypertensive Jordanian patients, 259 (62.3%) of them were females and 157 (37.7%) were males, with ages ranged from 18 to 94 years (mean $\pm$ SD 59.2 $\pm$ 10.2 years). Data was obtained from hypertensive patients by using patient's medical records and a designed questionnaire. Our results demonstrate that 192, 157, 52 and 13 patients were receiving one, two, three and more than three antihypertensive drugs, respectively. Only 2 patients were not receiving any therapy. Among the single prescriptions, angiotensin converting enzyme inhibitors were the most commonly prescribed, whereas diuretics were the most prescribed antihypertensive drugs in combined therapy. A significant reduction ($p < 0.0001$) in systolic and diastolic blood pressures was observed. Means $\pm$ SD of systolic/diastolic blood pressure in the last and first visits were 133.4 $\pm$ 18.4/83.2 $\pm$ 10.1 and 157.4 $\pm$ 13.9/94.6 $\pm$ 8.2, respectively. Despite the use of different antihypertensive drugs, most of the patients did not achieve recommended blood pressure control according to the international guidelines.

Keywords: drug prescription, antihypertensive drugs, hypertension, family practice clinics

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Introduction

Hypertension is one of the most prevalent health problems in Jordan and around the world [1]. A recent review showed that, in 2000, the prevalence of hypertension in the adult population worldwide was about 25% (972 million subjects), and that in 2025, this proportion is expected to increase to 29.2% (1.56 billion subjects) [2]. It was estimated that during 2004, approximately 15% of Jordanian adults had hypertension and that hypertension is considered one of the main leading causes of cardiovascular and cerebrovascular diseases and remains a major leading cause of death in Jordan [3].

World wide prevalence estimates for hypertension may be as much as 1 billion individuals, and approximately 7.1 million deaths per year may be attributable to hypertension and its complications [4]. Therefore, management of hypertension is an important step to decrease the morbidity and mortality of cardiovascular disease and to prevent uncontrolled complications. It is well documented that, in addition to lifestyle modifications, convenient antihypertensive drug therapy substantially reduces the risk of hypertension-related morbidity and mortality [5].

In recent years, many new effective antihypertensive drugs became available for physicians, which give hypertensive patients more opportunities to have their blood pressure controlled with fewer side effects. In addition, there are several published guidelines on classification of hypertension set to help physicians in reaching to proper control of hypertension. For example, the European Society of Hypertension (ESH) and European Society of Cardiology (ESC) considered systolic blood pressure (SBP)(mmHg) /diastolic blood pressure (DBP) (mmHg) of <120/<80, <130/ <85, 130-139/85-89, 140-159/90-99, 160-179/100-109, $\geq 180/\geq 110$, and $\geq 140/<90$ as optimal blood pressure, normal blood pressure, high-normal blood pressure, grade 1 ("mild") hypertension, grade 2 ("moderate") hypertension, grade 3 ("severe") hypertension and isolated systolic hypertension, respectively [6].

Many investigators have reported that blood pressure is not properly controlled among hypertensive patients in Jordan. For example, Jaddou et al. found that blood pressure in Jordan is poorly controlled, with around 70% of the sample not achieving their blood pressure goal [7]. Another study by the same authors, they showed that approximately one-half (47.5%) of hypertensive patients were unaware of their diagnosis and more than one-half

(57.1%) of those who were aware of their diagnosis, a good control of their hypertension was not achieved [8].

In the present study we studied the prescription pattern of antihypertensive drugs in hypertensive Jordanian patients who attended the Family Practice Clinics at Jordan University Hospital in Amman during the period April 2008 to August 2009. In addition, we evaluated whether the pattern of prescription of antihypertensive drugs used is appropriate and in accordance with international guidelines for management of hypertension.

Materials and Methods

This study was conducted on hypertensive patients attending the Family Practice Clinics at Jordan University Hospital in Amman, Jordan, during the period from April 2008 till August 2009. The study sample involved 416 hypertensive Jordanian patients, 259 (62.3%) of them were females, and 157 (37.7%) were males, with ages ranging from 18 to 94 years (mean $\pm$ SD 59.2 $\pm$ 10.2 years). The age distribution was such that 86.3 % of patients were above 50 years and 0.2% less than 30 years. The demographic data of the study patients regarding their mean $\pm$ SD ages, weights, body mass indices and duration of hypertension are presented in Table 1. The mean $\pm$ SD duration of hypertension was 8.73 $\pm$ 6.97 years.

There are four clinics; three of them are covered by resident physicians and one clinic by a consultant. The nurses divided the patients between the four clinics and treatment was prescribed by residents and occasionally after the consultant's opinion. Patients who were diagnosed of having hypertension $\geq$ 18 years old and on antihypertensive medications and/or lifestyle modification were included in this study. Two methods were used to ascertain the pattern of antihypertensive drug prescription and use, one by reviewing the patient's medical record and the second constituted a questionnaire that was filled by the researcher through an interview with patients. Patients gave a verbal consent for participation in the study. The data obtained from medical records of patients and from patient's interview (questionnaires) included the file number of patients, patient's gender, age, weight, body mass index, blood pressure before treatment (first visit), blood pressure after treatment (last visit), duration of hypertension, any concomitant medical problem(s), laboratory investigations (e.g. CBC, blood chemistry, liver and renal function tests, lipid profile...etc), source of medical care (e.g. Family Practice Clinics, Private Clinics, Ministry of Health Clinics, Military Medical Services, UNRWA...etc), lifestyle nature (e.g. physical activity, smoking habit, alcohol

consumption, dietary habits, changes in body weight...etc), any concomitant medical problem(s), drugs prescribed and any development of potential adverse effects from the antihypertensive therapy.

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS), version 17, computer software. The results were reported as a mean $\pm$ SD and a p-value of < 0.05 was regarded as statistically significant.

Results

Demographic Data

The demographic data of the study patients are presented in Table 1.

Type of Treatment

Regarding drug prescription pattern, it was found that two patients (0.5 %) were not receiving any drug treatment at the time of evaluation and kept on lifestyle modifications (weight reduction, salt restriction, appropriate degree of exercise...etc), mono antihypertensive therapy was prescribed to 192 patients (46.2%), 157 patients (37.7%) received two drugs, 52 patients (12.5%) received three antihypertensive drugs and 13 patients (3.1%) were given four or more antihypertensive drugs.

Types of Antihypertensive Drugs

Table 2 demonstrates the groups of antihypertensive drugs that were prescribed to patients receiving only one drug to control their high blood pressure. As shown, Angiotensin Converting Enzyme (ACE) inhibitors, beta blockers, Ca^{++} Channel Blockers (CCB's), Angiotensin Receptor Blockers (ARB's) and diuretics were given to 85 (44.3%), 42 (21.9%), 38 (19.8%), 20 (10.4%) and 7 (3.6%) patients receiving monotherapy, respectively.

Table 1. Gender, age groups and mean $\pm$ SD of the ages, weight, body mass index and duration of hypertension of the study hypertensive patients (N=416)

		Mean $\pm$ SD	Number (Percent)
Gender	Males		157 (37.7%)
	Females		259 (62.3%)
	Total		416 (100%)
Age (years)	Males	59.78 $\pm$ 10.78	
	Females	58.91 $\pm$ 9.86	
Age groups (years)	< 30		1 (0.2%)
	30-49		56 (13.5%)
	50-64		237 (57%)
	$\geq$ 65		122 (29.3%)
Weight (Kg)	Males	85.4 $\pm$ 14.8	
	Females	80.7 $\pm$ 13.2	
	Total	82.52 $\pm$ 14.06	
Body mass index (BMI) (kg/m ²)	Males	29.15 $\pm$ 4.71	
	Females	31.47 $\pm$ 5.06	
	Total	30.6 $\pm$ 5.06	
Duration of Hypertension (years)	Males	8.43 $\pm$ 7	
	Females	8.92 $\pm$ 6.97	
	Total	8.73 $\pm$ 6.97	

Table 2. Antihypertensive drug classes prescribed to patients receiving monotherapy (N=192)

Drug	Frequency (N)	Percent from Monotherapy (N=192)	Percent from total patients (N=416)
Angiotensin Converting Enzyme (ACE) inhibitors	85	44.3%	20.5%
Beta Blockers	42	21.9%	10.1%
Ca ⁺⁺ channel blockers (CCB'S)	38	19.8%	9.1%
Angiotensin receptor blockers (ARB's)	20	10.4%	4.8%
Diuretics	7	3.6%	1.7%
	192	100%	46.2.7%

Concerning patients who were on two antihypertensive drugs the data of different groups of antihypertensive drugs used are presented in Table 3. One hundred fifty seven (37.7%) of patients were on two antihypertensive drugs. The most frequently used combinations were a diuretic with a beta blocker (21% of patients) followed by an ACE inhibitor with a beta blocker (14% of patients).

Table 3. Frequency of two antihypertensive drug combination therapy (N=157). ACE: Angiotensin Converting Enzyme, ARB: Angiotensin Receptor Blocker, CCB: Calcium Channel Blocker

Drug combination	Frequency (N)	Percent (%)
Diuretic + β -blocker	33	21
ACE inhibitor + β -blocker	22	14
ACE inhibitor + CCB	21	13.4
ACE inhibitor + Diuretic	21	13.4
Diuretic + ARB	19	12.1
CCB + Diuretic	19	12.1
CCB + β -blocker	12	7.6
ARB + β -blocker	5	3.2
CCB + ARB	3	1.9
ACE inhibitor + α -blocker	1	0.6
CCB + α -blocker	1	0.6
Total	157	100%

Regarding patients who were on three antihypertensive therapy, 52 patients (12.5%) were on three drugs, 21.2% (11 patients) of whom were on a diuretic with a beta blocker and an ARB and the rest of the triple therapy combinations are shown in Table 4. Beta blockers were found to be the most frequently used class (39 patients or 75% of patients).

Table 4. Three antihypertensive drug combination therapy (N=52). ACE: Angiotensin Converting Enzyme, ARB: Angiotensin Receptor Blocker, CCB: Calcium Channel Blocker

Drug combination	Frequency (N)	Percent (%)
Diuretic + β -blocker + ARB	11	21.2
Diuretic + ACE inhibitor +CCB	9	17.3
Diuretic + β -blocker + ACE inhibitor	8	15.4
CCB + β -blocker + ACE inhibitor	7	13.5
CCB + β -blocker + Diuretic	7	13.5
ARB + β -blocker + CCB	4	7.7
Diuretic + CCB + ARB	3	5.8
ACE inhibitor + β -blocker + ARB	2	3.8
Diuretic + ACE inhibitor +ARB	1	1.9
Total number of patients who received three antihypertensive drug	52	100

With respect to patients receiving more than 3 antihypertensive drugs (13 patients) the most frequently used combinations included a diuretic, an ACE inhibitor, a β -blocker and a CCB (53.8% of patients) (data are not shown).

Table 5 demonstrates antihypertensive drugs prescribed in combination therapy. Diuretics were found to be the most prescribed drugs in combination therapy (64.9% of patients) followed by β -blockers (55.9% of patients).

Table 5. Antihypertensive drugs prescribed as combination therapy (N=222)

Drug	Frequency (N)	Percent from combined therapy (N=222) (%)	Percent from total patients (N=416) (%)
Diuretics	144	64.9	34.6
β-blockers	124	55.9	29.8
Angiotensin converting enzyme inhibitors	101	45.5	24.3
Ca ⁺⁺ channel blockers	98	44.1	23.6
Angiotensin receptors blockers	54	24.3	13
Alpha-adrenergic blockers	2	0.9	0.5
Total	*523	**	**

*The total exceeds the total number of patients (222) because some patients received two or more drugs. **Total exceeds 100% because data are overlapping due to multiple uses of medications.

The most commonly prescribed anti-hypertensive drugs, whether in mono or combination regimens, were β-blockers (atenolol, bisoprolol, carvedilol), ACE inhibitors (ramipril, enalapril, lisinopril), ARB's (candesartan, valsartan), CCB's (amlodipine, nifedipine) and diuretics (indapamide, hydrochlorothiazide, furosemide).

Effectiveness of Treatment

Table 6 demonstrates the mean± SD of systolic and diastolic blood pressure levels of the study patients in the first and last visits to the Family Practice Clinics at the University of Jordan Hospital. In the first visit, the mean systolic blood pressure (SBP)± SD was 156±13.72 in males and 158±14.04 mmHg in females (in both males and females 157.4±13.9 mmHg), whereas mean diastolic blood pressure (DBP)±SD was 94±8.03 mmHg in males and

95±8.27 mmHg in females (in both 94.6 ±8.2 mmHg). In the last visit, SBP± SD in males was 133.6±18.15 mmHg and 133.22±18.62 mmHg in females (in both 133.4±18.4 mmHg), while DBP was 83.89±9.88 mmHg in males and 82.82±10.26 mmHg in females (in both 83.2 ±10.1 mmHg). A significant reduction ($p < 0.0001$) in both systolic and diastolic blood pressures was observed in our patients in the last visit as compared to the first visit.

Table 6. Mean± SD of systolic and diastolic blood pressures in the first and last visits to the Family Practice Clinics at the University of Jordan Hospital (N=416)

	First Visit	Last Visit	95% *CI of the difference	P-value
Systolic Blood Pressure (Mean± SD)	157.4±13.9	133.4±18.4	22.1-26.0	**0.0001
Diastolic Blood Pressure (Mean± SD)	94.6±8.2	83.2±10.1	10.3-12.6	**0.0001

*CI = Confidence Interval. ** P-value significance (p-value of <0.05 was considered statistically significant)

Table 7 compares blood pressure levels in first and last visits of our patients to the Family Practice Clinics according to the European Society of Hypertension and European Society of Cardiology "ESH/ESC Definitions and Classification of Blood Pressure Levels". These results should express the effectiveness of control and management of hypertension of patients attending our clinics. In the first visit, around 96% of the study population had abnormal blood pressure readings (mild, moderate, severe or isolated systolic hypertension) 15 % of them had severe blood pressure (Grade 3) and 2.9 % of patients had high-normal blood pressure. In the last visit, around 50% of patients had abnormal blood pressure ranging from mild to severe or isolated systolic hypertension and about 47% of patients had optimal, normal or high blood pressure as compared to 4% of patients in the first visit. Thus, a better control of hypertension with antihypertensive therapy and lifestyle modifications was observed.

Table 7. Comparison between blood pressure in first versus last visit (N=416)

Hypertension classification	First visit Frequency (percent)	Last visit Frequency (percent)
Optimal	2 (0.5%)	55(13.2%)
Normal	1 (0.2%)	43(10.3%)
High normal	12 (2.9%)	97(23.3%)
Grade 1 (mild)	137 (32.9%)	138(33.2%)
Grade 2 (moderate)	185 (44.5%)	37(8.9%)
Grade 3 (severe)	63 (15.2%)	13(3.1%)
Isolated systolic hypertension	16 (3.8%)	21(5.1%)
*Hypotension		12 (2.9%)

*Observed drop in blood pressure in last visit (after receiving antihypertensive drugs)

Most of our study patients were found to be suffering from other concomitant diseases particularly hyperlipidemias and diabetes mellitus and they received, in addition to antihypertensive drugs, other drugs such as antiplatelets, antihyperlipidemics and antidiabetic agents.

The most frequent side effects related to the use of antihypertensive drugs reported by our patients include postural hypotension followed by lower limb edema followed by palpitations.

Effectiveness of Lifestyle Modification

Adherence of our patients to lifestyle modifications is presented in Table 8. Among the 416 patients involved in the study, 218 patients (52.4 %) were found to be obese and 166 patients (39.9%) were over-weight. A reduction in weight was observed only in 71 patients (17.1%), 151 patients (36.3%) had an increase in their body weight and 194 patients (46.6%) had no

change in their body weight. Eleven percent of the study population (46 patients) were found to be smokers (cigarettes or Hubble-bubble, commonly known in the Middle East as nargile) and 38.5% of patients were passive smokers. Alcohol drinking was reported by 1.4% of patients and no physical activity was reported by 146 patients (35.1%).

Concerning salt consumption, 269 patients (64.7%) restricted their salt intake, 144 patients (34.6%) used moderate salt in their food, and 3 patients (0.7%) added extra salt to their food. It appears that health education and lifestyle modifications were not followed strictly by our patients as advised by the attending physicians and according to the international hypertension management guidelines.

Table 8. Adherence to lifestyle modification among the study population (N=416)

		Frequency (N)	Percent (%)
Body weight	Obese	218	52.4
	Over weight	166	39.9
	Lean	32	7.7
	Total	416	100
Weight changes	No changes	194	46.6
	Weight increase	151	36.3
	Weight decrease	71	17.1
	Total	416	100
Alcohol consumption	Yes	6	1.4
	No	410	98.6
	Total	416	100
Smoking	Passive smoker	161	38.7
	Smoker	42	10.1
	Ex smoker	25	6
	*Nargile smoker	4	1
	Not smoker	184	44.2
	Total	416	100
Physical activity	No physical activity	146	35.1
	**Physically active	270	64.9
	Total	416	100
Salt intake	Low salt intake	269	64.7
	Moderate salt intake	144	34.6
	Added extra salt	3	0.7
	Total	416	100
Fat consumption	Low fat diet	231	55.5
	High fat diet	172	41.4
	Moderate fat diet	13	3.1
	Total	416	100
Vegetable intake	High intake	203	48.8
	Moderate	208	50
	Low	5	1.2
	Total	416	100

*Hubble-bubble. ** Walks 30 min a day for at least 4 times weekly

Discussion

Uncontrolled hypertension is associated with high incidence of morbidity and mortality [9, 10]. Many clinical studies reported a direct correlation between elevated blood pressure and an increased risk of cardiovascular diseases, heart failure, stroke and kidney disease [9]. Such higher incidence rates would be substantially reduced in proportion to blood pressure reduction [11]. There are many approaches to manage hypertension which include lifestyle modifications and pharmacotherapy.

Concerning lifestyle modifications approach, it is a key factor in achieving good control of elevated blood pressure provided strict adherence of patients to such modifications. Quitting smoking, food restriction, alcohol reduction or avoidance, reduction of weight and exercise proved to control hypertension, high blood sugar and lipid blood levels and even improve resistance to insulin in diabetics [9, 12]. Lifestyle modifications are strongly recommended before initiation of drug therapy and always should be adopted in hypertensive patients requiring single or combined antihypertensive therapy [13]. Regarding drug therapy of hypertension, several classes of antihypertensive drugs which act by different mechanisms and associated with few side effects are available and include diuretics, beta blockers, selective alpha 1 blockers, alpha 2 agonists, aldosterone antagonists, Calcium Channel Blockers (CCB's), Angiotensin Converting Enzyme (ACE) inhibitors, Angiotensin Receptor Blockers (ARB's), directly acting vasodilators, renin release inhibitors and specific renin antagonists [14]. Treatment should be targeted to reach a blood pressure of <140/<90 mmHg for most patients, and lower than that in certain conditions such as in diabetics or patients with kidney disease. Some medical professionals recommend keeping systolic/diastolic blood pressure levels down below 120/80 mmHg [13]. The type of antihypertensive therapy to use initially for hypertension has been the subject of huge number of studies and recommendations of the national guidelines like those set by the European Society of Hypertension (ESH) and European Society of Cardiology (ESC)⁶ and the seventh report of the Joint National Committee on Prevention, Evaluation and Treatment of High Blood Pressure (JNC7) [13]. A study concerning awareness of physicians in Jordan about such guidelines for the treatment of hypertension showed that only 60% of the interviewed physicians have heard about the JNC7 [15]. In general, the choice of the antihypertensive agent is highly individualized. Patient's age, tolerance to the side effects of the antihypertensive agent and associated clinical conditions play a major part in determining the

dose and type of antihypertensive drug [16]. Most antihypertensive medications can be used alone or in combination and along with lifestyle modifications usually result in acceptable control of hypertension.

Hypertension is one of the most prevalent conditions in Jordan, with about 20.6% of people are suffering from this chronic disease [1]. This high percentage indicates the importance of the proper management and rational selection of antihypertensive drug therapy in order to improve the overall health of the Jordanian population.

The study of the prescription pattern of antihypertensive drugs and its correlation with blood pressure control, to the best of our knowledge, was not previously well investigated in countries of the Middle East including Jordan. Such studies should give us an opportunity to evaluate the effectiveness of the management of hypertension and the commitment of the physicians to the recommendations of approved international guidelines. It will also provide important information about the prescription behavior of physicians, factors that affect the use of antihypertensive drugs, the rational selection of antihypertensive drug therapy, identification of major points for future intervention and improvements and eventually avoidance of possible hypertension-related health complications.

In this study, we interviewed and checked medical records data of 416 patients with hypertension who attended Family Practice Clinics at Jordan University Hospital in an attempt to address the nature of the prescription pattern and efficacy of antihypertensive therapy in such patients.

Our study showed that hypertension was more prevalent in females (62.3%) than in males (37.7%). Similar observations were reported by Jaddou et al. in Jordan, Al-Mehza et al. in Kuwait and Al Khaja et al. in Bahrain who found that hypertension is more common among females [17-19]. In contrast, a study conducted by Sweileh in Palestine reported a lower incidence (46.2%) of hypertension among females [20]. Most of our study population (86.3%) were above or equal to 50 years of age and 57% of them were in the age group of 50-64 years.

In the current study, we reported that about half of patients (46.2%) were treated with a single drug and their blood pressure at the end of study was reasonably acceptable, although not fulfilling the international guidelines. Similar findings were reported by many investigators in

Bahrain, Palestine, France, Italy and Egypt where most of their patients received a single antihypertensive therapy [19-23]. Monotherapy usually increases drug compliance, associated with a less incidence of side effects and is less costly.

According to the ESH/ESC guidelines for the management of arterial hypertension, monotherapy is likely to be successful more frequently for grade1 hypertensive patients and thiazide-type diuretics are superior in preventing one or more major forms of cardiac events, they are less expensive and they should be preferred for first-step antihypertensive therapy [6]. Diuretics also have been found to be the mainly prescribed class of antihypertensive drugs in the United Kingdom and the United States which is in agreement with the published international guidelines for antihypertensive treatment [24, 25]. A Jordanian study showed that only 47.6% of physicians recommended the use of thiazide diuretics as initial drugs for treatment of high blood pressure and even as first drug of choice for hypertensive patients with an appreciable cardiovascular disease risk [15].

Despite that diuretics being the most recommended drugs as a first line therapy for hypertension by many investigators, diuretics were prescribed as monotherapy to only 1.7 % of our patients which does not agree with the JNC7 recommendations.

Many other studies suggest that monotherapy was not sufficient, and aggressive therapy with two or more drug combinations is required or recommended. For example, PRATIK study investigators, Amar et al. reported that about half of patients with uncontrolled hypertension were on monotherapy [26]. Likewise, in the ABC-GP study, Stergiou et al. reported that 31% of their patients with uncontrolled hypertension were on monotherapy and 43% of them were on two drugs [27].

With respect to combined antihypertensive therapy, our study demonstrates that about 53.4% of patients were on combination therapy. Two and three antihypertensive drugs were prescribed to about 37.7% and 12.5% of our patients, respectively. Diuretics with beta blockers were the most prescribed combinations in the current study either as two or more drug combinations, followed by an ACE inhibitor with a β -blocker or an ACE inhibitor with a diuretic. Overall, it appears that diuretics were the most prescribed drugs in combination therapy.

Most of the recent international guidelines recommend combination antihypertensive therapy as the first-line treatment in patients with severe hypertension and proposed that the rationale for combination pharmacotherapy in patients with severe hypertension is to maximize antihypertensive efficacy and minimize side effects [6, 13]. Such guidelines have indicated that all available antihypertensive drug classes for the initiation and maintenance of hypertension may be used, but also indicated that the choice of drugs is influenced by many factors such as socio-economic factors, cardiovascular risk factors, co-existing diseases, patient's age and compliance and possible drug-drug interactions. According to our data, it is likely that such different considerations were applied in a limited manner.

Regardless of all discussed studies and international guidelines, most, if not all, of our patients have other medical problems mainly diabetes, hyperlipidemias, osteoporosis and ischemic heart disease and therefore need more aggressive treatment and/or drug modifications to reach an acceptable blood pressure level. Studying concomitant health problems with hypertension is very important for proper strategy in selecting convenient antihypertensive therapy.

Although a significant ($p < 0.0001$) reduction of both mean systolic and diastolic blood pressures was observed in all groups of our patients in the last visit as compared to the first visit, yet such reduction does not fulfill the recommendations of the JNC7 which stated clearly that the major goal of control of blood pressure is to achieve a level of systolic/diastolic blood pressure of $<140/<90$ mmHg in the large majority of all hypertensive patients receiving drug treatment [13]. In our study, means $\pm$ SD of systolic blood pressure/diastolic blood pressures in the first and last visits were $157.4 \pm 13.9/94.6 \pm 8.2$ and $133.4 \pm 18.4/83.2 \pm 10.12$ mmHg, respectively. In another Jordanian study, and many others, it was reported that hypertension was not controlled to the recommended levels [21, 28]. Despite the frequent use of combination pharmacotherapy in all such clinical trials, optimal hypertension control was not achieved in a large proportion of their participants.

We believe that it is very important to identify the major causes of failure to control a pathophysiologically multifactorial disease, such as essential hypertension and explain the poor blood pressure control in patients under medical care. A logical approach expected to achieve the maximal antihypertensive effect would be to combine drugs with different mechanisms of action. However, the key issue in good management of hypertension appears

to be in the selection of a specific antihypertensive agent that is going to be effective, convenient to patients and associated with fewer, if any, side effects. Many patients in this study complained of frequent side effects related to antihypertensive drugs such as postural hypotension, palpitations and lower limb edema. In addition, many patients did not follow the lifestyle modifications recommended by physicians. Thus, we believe that these factors contributed to some of the failures in achieving a proper control of hypertension to levels recommended by international guidelines.

Conclusions

We conclude from this study that, in general, there was relatively equal use of single and combined antihypertensive drugs by hypertensive patients attending the Family Practice Clinics at Jordan University Hospital, but target blood pressure was not achieved by the majority of patients. Reasons may be attributed to inadequate adherence to lifestyle modifications, compliance of patients and development of side effects to antihypertensive therapy. We highly recommend that physicians should be more serious and aggressive on management of hypertension and pay more attention to combination therapy. A continuing education program for physicians regarding current international guidelines is also recommended and adherence to lifestyle modification needs more attention by physicians and patients.

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