"A STUDY ON UTILIZATION OF ANTIHYPERTENSIVE DRUGS IN A FAMILY PRACTICE CLINIC AT JORDAN UNIVERSTY HOSPITAL"

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Dedication

To My Family

Father, Mother,

&

My Beloved wife

And to

Dr. Yacoub M. Irshaid

Essam A. Al Drabah

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List of Abbreviations

ACEIs	**Angiotensin converting enzyme inhibitors**
BBs	**Beta adrenergic blockers**
ISH-WHO	**International Society of Hypertension- World Health Organization**
CVD	**Cardiovascular disease**
CCBs	**Calcium channel blockers**
ARB	**Angiotensin receptors blockers**
HTN	**Hypertension**
CAD	**Coronary artery disease**
DM	**Diabetes Mellitus**
MI	**Myocardial infarction**
JNC 7	**Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure**
HDL	**High density lipoprotein**
LDL	**Low density lipoprotein**
N	**Number**
K/DOQI	**Kidney Disease Outcome Quality Initiative.**
NSAID	**Non-Steroidal Anti-Inflammatory Drugs**
PPIs	**Proton Pump inhibitors**
SD	**Standard Deviation**
SBP	**Systolic blood pressure**
DPB	**Diastolic blood pressure**
CHF	**Congestive heart failure**
ISH/ISC	**International Society of Hypertension/International Society of Cardiology**
LVH	**Left ventricular hypertrophy**
TG	**Triglycerides**

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ABSTRACT

Hypertension is considered one of the most prevalent health problems in the world. The prescription pattern of antihypertensive drugs in Jordanian population was not previously well investigated. Recommendations by international guidelines for hypertension management change over the time and utilization of antihypertensive drugs also changed. The study of the utilization of antihypertensive drugs and their prescription pattern, and commitment to international guidelines may be helpful to improve blood pressure control rate in Jordan.

Objectives

The primary aim of this study was to investigate the drug utilization and the prescription pattern of antihypertensive drugs in family practice clinic at Jordan University Hospital in Amman. Data from 416 patients, aged ≥18 years, were analyzed during the study period. Data were obtained from hypertensive patients by using designed questionnaire and patient's medical records.

Results

The major result of this study revealed that from 416 patients, 62.3% were females and the mean age of patients was 59 ±10 years. Six classes of antihypertensive drugs were used. These were Angiotensin converting enzyme inhibitors, β-blockers, calcium channel blockers, diuretics,

angiotensin receptor blockers (ARBs) and α-adrenergic antagonist. Of those 45.6% were on monotherapy. Among those on combination therapy, 37.7% were on two drugs, 12.5% on three drugs and 3.1% on four or more drugs. Among the mono-therapy prescriptions, ACE inhibitors were the most commonly prescribed (43.7%), whereas diuretics were least used (3.7%). As combination therapy, diuretics were the most prescribed antihypertensive drugs (36.5%), followed by

B-blockers (31.5%). Combinations consisting of diuretics and β-blockers were the most commonly seen. With respect to overall utilization, ACE inhibitors were the most prescribed (192) 46.2%. Despite that there was significant reduction in blood pressure between first and last visit, 73.4% of patients still had abnormal blood pressures after the treatment.

Conclusion:

The present study represents the current prescribing trend for antihypertensive drugs in family medicine clinics in Jordan University Hospital in Jordan. Despite the significant reduction in blood pressure in the last visit and after receiving antihypertensive drug treatment, most of the patients did not achieve recommended blood pressures according to international guidelines. Despite the inadequacy of monotherapy to control blood pressure, many of the patients continued to receive this treatment. Life style modification needs more attention by physicians and patients.

1. Introduction:

Hypertension (HTN) is one of the most prevalent health problems in Jordan and around the world (Al-Safi et al., 2006). 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) (Kearney et al., 2005). HTN is considered one of the main leading causes of cardiovascular and cerebrovascular diseases remain the one of leading causes of death in Jordan (Brown et al., 2009). Management of HTN is an important step to decrease the morbidity and mortality of cardiovascular disease and to prevent uncontrolled complications. Therefore, convenient antihypertensive drug therapy substantially reduces the risk of hypertension-related morbidity and mortality (Weinberger et al., 2003). It was estimated that during 2004, approximately 15% of Jordanian adults had hypertension (Brown et al., 2009). 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 HTN and its complications. (http://www.who.int/whr/2002).

Antihypertensive agents are among the most used therapeutic classes. 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.

Few studies examined HTN in Jordan especially its effect as a risk factor for cardiovascular disease (CVD) and cerberovascular diseases. The most common risk factor of stroke in Jordan was found to be HTN (76%) followed by diabetes mellitus (Bahou et al., 2004). HTN was found to be the main risk factor for congestive heart failure (CHF). It was reported that 38% of males and 63% of females with CHF have

a history of HTN (Hammoudeh et al., 2005). Some national studies reported that blood pressure is poorly controlled among hypertensive patient in Jordan. Jaddou *et al* (2000) found that blood pressure in Jordan is poorly controlled, with around 70% of the sample did not achieve their blood pressure goal. Another study showed that approximately one-half (47.5%) of hypertensive patients were unaware of their diagnosis and more than one-half (57.1%) of those aware of their diagnosis did not achieve control of their HTN (Jaddou *et al*., 2003).

2. Aims and Objectives

This research is concerned with studying the utilization of antihypertensive drugs at the "family practice" clinic of Jordan University Hospital specifically; the following items will be explored:

1. To study the patterns of anti hypertensive drug prescribing.
2. To identify whether the pattern of prescription of antihypertensive drugs is appropriate and in accordance with international guidelines for management of hypertension.
3. To look for response to treatment by identifying the degree of blood pressure control.
4. To look for specified adverse effects of anti hypertensive drugs.
5. To identify the degree by which life-style modifications was followed by both physician and patient.
6. To study the patterns of prescription for treatment of other major risk factors such as diabetes mellitus and hyperlipoproteinemias.
7. To evaluate the effectiveness of the prescribed treatment and patient's response to the therapy.

3. Literature Review

3.1. Hypertension

3.1.1. Definition

Hypertension is a chronic disease manifested by consistent elevation of systolic blood pressure (SBP) or diastolic arterial pressure (DBP), or both. Individuals are diagnosed as having hypertension when the average of three or more DBP measurements made on three consecutive clinical visits is 90 mmHg or higher, or when the SBP measurements made on three consecutive visits is greater than 140 mmHg. The individual may have combined systolic and diastolic hypertension or isolated systolic hypertension (Huether, 2004).

3.1.2. Classification

There are several published guidelines on classification of blood pressure level. Recently, the European Society of Hypertension (ESH) and European Society of Cardiology (ESC) published a classification of hypertension similar to 2003 and 1999 WHO guidelines (Table1). (http:/www.esholine.org/documents/2003_guidelines.pdf) Another new definition and classification was published in 2003 by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of high blood pressure (JNC7)(Table 2). The new term, prehypertension, (for those with blood pressure ranging from 120–139 mmHg systolic and/or 80–89 mmHg diastolic) was chosen to identify individuals at high risk of developing HTN, so that both patients and clinicians are alerted to this risk and encouraged to intervene and prevent or delay the disease from developing (Chobanian et al ., 2003).

Table 1. ESH/ESC Definitions and Classification of Blood Pressure Levels

CATEGORY	SYSTOLIC (mmHg)	DIASTOLIC (mmHg)
Optimal	<120	<80
Normal	<130	<85
High – Normal	130-139	85-89
Grade 1 Hypertension ("mild")	140-159	90-99
Grade 2 Hypertension ("moderate")	160-179	100-109
Grade 3 Hypertension ("severe")	≥180	≥110
Isolated Systolic Hypertension	≥ 140	<90

Note: When a patient's systolic and diastolic blood pressures fall into different categories, the higher category should apply.
Reference: 2003 European Society of Hypertension-European Society of Cardiology guidelines for the management of arterial hypertension.
(http:/www.esholine.org/documents/2003-guidelines.pdf)

Table 2: JNC7 Classification of blood pressure for adults.

BP classification	**SBP (mmHg)**	**DBP (mmHg)**
Normal	<120	<80
Prehypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	≥ 160 or	≥ 100

***SBP**, systolic blood pressure; **DBP**, diastolic blood pressure*
Reference: (Chobanian et al., 2003).

3.1.3. Signs and Symptoms

Hypertension is called the silent killer because it is largely asymptomatic disease specially mild-to-moderate hypertension (Pitts and Adams, 1998), (Chiang and Jamshahi, 1998), (Decker et al., 2006), (Rogers and Anderson, 2007). Accelerated hypertension may be associated with headache, somnolence, confusion, visual disturbances, nausea and vomiting (hypertensive encephalopathy). Retina is affected with narrowing of arterial diameter to less than 50% of venous diameter, copper or silver wire appearance, exudates, hemorrhages, or papilledema may also occur (Tierney et al., 2003).

3.1.4. Etiology

Hypertension is considered one of the most common complex diseases. The etiology of hypertension differs widely amongst individuals within a population (Dickson and Sigmund., 2006). The majority of patients (90-95%) have essential hypertension with no identifiable cause (Oparil et al., 2003). Secondary causes of hypertension include renal disease, renal artery stenosis and primary hyperaldosteronism. Many risk factors contribute to develop of HTN or exacerbate it, such as sedentary lifestyle (Kyrou et al, 2006). Obesity (more than 85% of cases of hypertension occur in those with over weight with a body mass index greater than 25) (Haslam and James, 2005). Salt (sodium) sensitivity (Rodriguez et al., 2007). Alcohol intake ,(Djoussé and Mukamal, 2009) and vitamin D deficiency (Tuohimaa., 2009), (Lee et al., 2008). It is also related to aging (Kosugi et al., 2009). Family history increases the risk of developing hypertension (Luma and Spiotta, 2006).

3.2. White coat high blood pressure

Elevation of blood pressure only in the clinical environment without target organ disease and when the BP reading in the clinic is significantly higher than those obtained by either a manual reading outside this environment, or only temporary elevation is called white coat HTN. It may be caused by patient's anxiety related to the stress of the examination and fear that something will be wrong with his or her health. The initial visit to the physician's office is often the cause of an artificially high blood pressure. This elevation disappears with repeated testing after rest and with follow-up visits and blood pressure checks. The term suggests that the physician's white coat induces the patient's anxiety and a brief increase in BP (Pickering, 1996).

Patients with white-coat hypertension are at risk for developing HTN and need close monitoring of BP outside the clinic environment. Studies suggest that patients with white-coat hypertension are at a higher risk for cardiovascular disease than normotensive patients. However, treating white-coat HTN is controversial (Glen et al., 1996). Sometimes, routine measurements done in medical offices for patients with known hypertension may incorrectly diagnose 20% of patients as uncontrolled hypertension because of this phenomenon (Kim et al., 2005).

3.6. Hypertension and target organ damage

3.6.1. Hypertension and Cardiovascular Disease

The relationship between BP and risk of CVD events is continuous, consistent, and independent of other risk factors. The higher the BP is, the greater the chance of developing heart attack, CHF, stroke, and kidney diseases. Meta-analysis of 61

prospective observational studies involving one million subjects, aged 40–69 years, clearly showed a direct relationship between BP and cardiovascular risk. Even a small rise in BP is associated with a proportional and substantial effect on risk of death from coronary heart disease or stroke (Lewington et al., 2002). Beginning at 115/75 mmHg, CVD risk doubles for each increment of 20/10 mmHg (Chobanian *et al.,* 2003). Sustained HTN can cause structural and functional cardiac abnormalities that lead to myocardial ischemia, CHF, and sudden cardiac death. Long-standing HTN also promotes the development of left ventricular hypertrophy (LVH), hypertensive cardiomyopathy and ventricular dysrhythmia (Grossman and Messerli., 1996). Left ventricular hypertrophy is considered a compensatory mechanism of the heart in response to the increased resistance caused by elevated BP, and is a strong and independent risk factor for CAD, HF, and arrhythmias (Eselin and Carter., 1994).

3.6.2. Hypertension and Cerebrovascular Disease

Chronic arterial HTN is the most significant modifiable risk factor for stroke (ischemic and hemorrhagic). Stroke risk is proportional to BP level throughout the range of BP studied, with 30% increase in risk for each 10 mm Hg increase in systolic blood pressure. Reducing the elevated BP is the main preventive measures for chronic hypertensive cerebral vasculopathy and it decreases the risk of both initial and recurrent stroke (Jones et al., 2003).

A sudden, prolonged increase in systemic BP also can cause hypertensive encephalopathy, which is classified as a hypertensive emergency. Hypertensive encephalopathy is now uncommon because effective antihypertensive therapy is available (Tortorice and Carter , 1993).

3.6.3. Hypertension and kidney diseases:

The indicator for measurement of kidney function is glomerular filtration rate (GFR). It declines with aging and the rate of decline is found to be greatly accelerated by HTN. HTN also is associated with nephrosclerosis, which is caused by increased intraglomerular pressure. Studies have demonstrated that achieving aggressive BP control is the most important strategy to slow the rate of kidney function decline and to slow chronic kidney disease progression (K/DOQI., 2002) (Wühl and Schaefer, 2008). It has been found that 10% of deaths caused by HTN result from renal failure (Fauci et al., 2006).

3.6.4. Hypertension and the Eye diseases:

HTN causes retinopathies that may progress to blindness. Retinopathy is evaluated according to the Keith, Wagener, and Barker funduscopic classification system. Grade 1 is characterized by narrowing of the arterial diameter, indicating vasoconstriction, Were Grade 2 is manifested by arteriovenous nicking and Grade 3 is manifested by cotton wool exudates and flame hemorrhages. Papilledema develops in sever cases and is classified as Grade 4 (Anne and kimble, 2008).

3.1.5, Treatment:

3.1.5.1. Goals of treatment:

The ultimate goal of treating HTN is to reduce the complications and associated morbidity and mortality (Chobanian *et al.,* 2003). The new BP goals recommended by the ISH-WHO are systolic/diastolic BP <140/90mmHg in subjects aged >65 years and <130/85 mmHg in those <65 years and in diabetic hypertensives irrespectively of their age (Stergiou et al., 2003).

Treating SBP and DBP to targets that are <140/90 mmHg is associated with a decrease in CVD complications. Studies in patients with HTN and DM or renal disease have shown additional cardiovascular and renal protection by more aggressive BP reduction to levels below the conventional 140/90 mm Hg threshold (Hansson *et al.,* 1998, Bakris et al., 2000). Therefore, a lower blood pressure goal at <130/80 mm Hg is recommended in these patients (ESH/ESC 2003) (Chobanian et al., 2003). In patients with hypertension and diabetes or renal disease, the BP goal is <130/80 mmHg. *(American Diabetic Association, 2003; National Kidney Foundation, 2002).* Moreover, patients with left ventricular dysfunction (heart failure) have a BP goal of less than 120/80 mm Hg (Owan et al., 2006, Dipiro et al., 2009). Table (3).

3.1.5.2. Benefits from controlling hypertension:

Antihypertensive therapy has been associated with reductions in stroke incidence by about 35–40 %, myocardial infarction (MI) by 20–25 %; and CHF by >50 percent. (Neal et al., 2000).

For isolated systolic HTN which affects over 15% of all subjects older than 60 years, and considered the major modifiable cardiovascular risk factor in elderly, active treatment reduced all-cause mortality by 17%, cardiovascular mortality by 25%, all cardiovascular endpoints by 32%, total stroke by 37%, and myocardial infarction including sudden death by 25% (Staessen et al., 1999).

Table 3. Recommended Blood Pressure goal according to American Heart Association (AHA) 2007.

Most patients for general prevention	<140/90 mm Hg
Patients with diabetes (referred to as coronary artery disease risk equivalent), significant chronic kidney disease, known coronary artery disease (myocardial infarction, stable angina, unstable angina), noncoronary atherosclerotic vascular disease (ischemic stroke, transient ischemic attack, peripheral arterial disease, abdominal aortic aneurism [referred to as coronary artery disease risk equivalents]), or a Framingham risk score of 10% or greater	<130/80 mm Hg
Patients with left ventricular dysfunction (heart failure)	<120/80 mm Hg

(Owan et al., 2006, Dipiro et al., 2009)

3.1.6. Prevention

The degree to which HTN can be prevented depends on a number of features including: current BP level, changes in end/target organs (retina, kidney, heart - among others), risk factors for cardiovascular diseases and the age at presentation. Unless the presenting patient has very severe HTN, there should be a relatively prolonged assessment period within which repeated measurements of BP should be taken. Following this, lifestyle advice and non-pharmacological options should be offered to the patient, before any initiation of drug therapy. The process of managing HTN according to the guidelines of the British Hypertension Society suggests that non-pharmacological options should be explored in all patients who are hypertensive or pre-hypertensive. These measures include;

a. Weight reduction and regular aerobic exercise (e.g., walking) are recommended as first steps in treating mild to moderate HTN. Regular exercise improves blood flow and helps to reduce resting heart rate and blood pressure (Elley and Arroll, 2002). Several studies indicate that low intensity exercise may be more effective in lowering BP than higher intensity exercise (*www.hypertensionlibrary.com*). These steps are highly effective in reducing blood pressure, although drug therapy is still necessary for many patients with moderate or severe HTN to bring their BP down to a safe level.

b. Reducing sodium (salt) in the diet may be effective: It decreases BP in about 33% of people. Many people use a salt substitute to reduce their salt intake (Klaus *et al.,* 2009).

c. Additional dietary changes beneficial to reducing BP include the DASH diet (**D**ietary **A**pproaches to **S**top **H**ypertension), which is rich in fruits and vegetables and

low-fat or fat-free dairy foods. This diet has been shown to be effective based on research sponsored by the National Heart, Lung, and Blood Institute (Appel et al., 1997). In addition, an increase in daily calcium intake has the benefit of increasing dietary potassium, which theoretically can offset the effect of sodium and act on the kidney to decrease blood pressure (Vollmer et al, 2001).

d. Discontinuing tobacco use and alcohol consumption has been shown to lower BP (Xin et al., 2001). The exact mechanisms are not fully understood, but BP (especially systolic) always transiently increases following alcohol or nicotine consumption. Besides, abstinence from cigarette smoking is important for people with HTN, because it reduces the risk of many dangerous outcomes of HTN, such as stroke and heart attack. Coffee drinking (caffeine ingestion) also increases BP transiently but does not produce chronic HTN.

e. Reducing stress, for example with relaxation therapy, can be an additional method of ameliorating HTN (Jacob et al., 1991).

3.1.7. Management of hypertension

3.1.7.1 Non pharmacological treatment

Lifestyle modification:

Lifestyle modification is strongly recommended before initiation of drug therapy if HTN is not severe. Independent of blood BP lowering, risk factors should be reduced. Adoption of healthy lifestyles by all persons is critical for the prevention of high BP and is an indispensable part of the management of those with HTN (Whelton et al., 2002). Adoption of the DASH diet is one example of lifestyle change repeatedly shown to effectively lower mildly-elevated BP Dietary sodium should be reduced to no more than 100 mmol per day (2.4 g of sodium) (Sacks *et al.,* 2001). Weight loss of

as little as 4.5 kg reduces BP and/or prevents HTN in a large proportion of overweight persons, although the ideal is to maintain normal body weight (He et al 2000). Alcohols consumption should be limited or avoided (Xin et al., 2001) (Table 4).

Table 4. Lifestyle modifications to prevent and manage hypertension*

Modification	Recommendation	Approximate SBP Reduction)**
Weight reduction	Maintain normal body weight (Body mass index 18.5–24.9 kg/m2).	5–20 mmHg/10kg
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and low fat dairy products with a reduced content of saturated and total fat.	8–14 mmHg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).	2–8 mmHg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week).	4–9 mmHg

Reference:(DASH, Dietary Approaches to Stop Hypertension, 2006)
; SBP, systolic blood pressure.

* For overall cardiovascular risk reduction, stop smoking.

** The effects of implementing these modifications are dose and time dependent, and could be greater for some individuals.

3.1.7.2. Pharmacological treatment:

There are many effective and well-tolerated antihypertensive drug classes available today for convenient therapy of HTN. The aim of treatment should be targeted to reach to a BP control to <140/90 mmHg for most patients, and even lower in certain conditions such as DM or kidney disease. (Some medical professionals recommend keeping BP levels below 120/80 mmHg) (Chobanian *et al.,* 2003).

The (JNC VII) recommends that patients with HTN with no co-morbid illness begin antihypertensive drug therapy with a low dosage of a diuretic or beta blocker. This recommendation is supported by the results of a meta-analysis demonstrating that diuretics and beta blockers are the only agents shown to decrease the incidence of stroke and congestive heart failure in patients with HTN (Psaty et al., 2003).

1. Diuretics: thiazide diuretics (hydrochlorothiazide, indapamide) are recommended as the first-line drug for HTN by many experts, and are much more affordable than other therapies. The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) study showed better cost-effectiveness and slightly better outcomes for the thiazide diuretic, chlorthalidone, compared with a calcium channel blocker and an ACE inhibitor in a 33,357-member ethnically mixed study group (ALLHAT., 2002). Thiazide-type diuretics have been the basis of antihypertensive therapy in the majority of placebo-controlled outcome trials, in which CVD events, including strokes, CHD, and CHF have been reduced by BP lowering (Psaty et al., 2003). By causing volume and sodium depletion, thiazide diuretics stimulate the production of renin and angiotensin. This leads to a relative increase in BP and sodium retention, which counteracts some of the other antihypertensive effects of the thiazide diuretics. As stated in the Merck Manual of Geriatrics notes, "Thiazide-type

diuretics are especially safe and effective in the elderly" (Materson et al., 1993). The higher diuretic dosages cause relative hypokalemia, as well as increased serum lipid levels, insulin resistance and uric acid levels. These adverse metabolic effects counteract the positive cardiovascular benefits of blood pressure reduction. Such effects do not occur when diuretics are administered in a low dosage, such as 6.25 or 12.5 mg per day of hydrochlorothiazide (Neutel et al., 1996).

Thiazide-induced hypokalemia could contribute to increased ventricular ectopy and possible sudden death, particularly with high doses in the absence of a potassium-sparing agent (Siscovick et al., 1994). The potassium-sparing/thiazide diuretic combinations are used to prevent thiazide-induced hypokalemia. Current combinations include spironolactone hydrochlorothiazide, triamterene-hydrochlorothiazide and amiloride-hydrochlorothiazide. Loop diuretics may be indicated in patient with HTN and congestive heart failure (Ernst et al., 2009).

2. Beta blockers: (atenolol, bisoprolol, labetalol, metoprolol, propranolol) for first line therapy: Systematic reviews suggest that there is strong evidence to support the use of thiazide diuretics and some evidence for the use of beta-blockers. Whilst once first line agents, now less directly used due to the risk of diabetes (Mayor et al., 2006). For the newer antihypertensive drugs, these reviews do not yet provide sufficient evidence to make conclusions about their effects on morbidity and mortality (Messerli et al., 1998). It is reasonable to use a beta blocker as first choice in patients where the drug can be used to treat more than the HTN, such as patients with frequent recurrent migraine, patients with sympathetic hyperactivity, resting tachycardia, and palpitations. Beta blockers should not be used in patients with bronchial asthma or other forms of obstructive airway disease.

3. Angiotensin-converting enzyme inhibitors (ACEIs), such as captopril, enalapril, fosinopril, lisinopril, quinapril, and ramipril, are among the best tolerated antihypertensive drugs. They have been used extensively as initial agents in the treatment of HTN in selected patients, including those with left ventricular systolic dysfunction and DM and microalbuminuria or proteinuria. Congestive heart failure is a "compelling indication" for the use of ACEIs, because they have been clearly shown to prolong survival in patients with CHF (Garg and Yusuf., 1995). The renin-angiotensin-aldosterone axis is important in the maintenance of systemic blood pressure. ACE inhibitors interfere with the conversion of angiotensin I to angiotensin II and thereby decrease angiotensin II levels and effect, Which leading to decreased blood pressure.

A fixed combination of the ACEIs, perindopril, and the calcium channel blocker amlodipine, recently have been proved to be very effective even in patients with additional impaired glucose tolerance and in patients with metabolic syndrome (Widimský., 2009). One study suggests that ACE inhibitors increase the risk of hypoglycemia in treated diabetic patients (Herings et al., 1995).

4. Angiotensin receptors blockers (ARBs): used as line therapy and may be used where ACEIs are not tolerated (when induce not tolerated cough). (telmisartan, irbesartan, losartan, valsartan, candesartan). These drugs and ACEIs are especially useful in reducing the progression of nephropathy in type 2 diabetes mellitus, which strongly confirms that antagonism of the renin-angiotensin system is an effective approach to cardiovascular and renal disease (Ruilope et al., 2002).

5. Calcium channel blockers (CCBs): They include dihydropyridine such as nifedipine, amlodipine, and nondihydropyridines such as diltiazem, verapamil .The CCBs decrease total peripheral resistance, which leads to reduction in BP, decrease coronary resistance and enhance post-stenotic coronary perfusion. They are recommended when the preferred first-line agent is contraindicated or inactive. The European Trial on Systolic Hypertension in the Elderly (Syst-EUR) showed significant reductions in stroke and all CVD with the dihydropyridine CCB, nitrendipine, as compared with placebo (Staessen et al., 1997). At the present time there are no outcome studies which identify a group of patients who would specifically benefit from a calcium antagonist. It is clear that post MI patients with left ventricular dysfunction do worse with diltiazem than with placebo (*The Multicentres Diltiazem Post infarction Trial Research Grou*p, 1988).

6. Alpha adrenergic blockers: (Prazosin, Terazosin, Doxazosin) has been shown to increase risk of heart failure, and to be less effective than a simple diuretic These agents are not usually used as first-line therapy. Phentolamine and phenoxybenzamine block the action of norepinephrine at α-adrenergic receptor sites. These two compounds block both presynaptic (α_2) and postsynaptic (α_1) α-receptors, and the former action accounts for the tolerance that develops. Prazosin, terazosin, and doxazosin are more effective because they selectively block only postsynaptic α receptors, i.e., α_1 receptors. Thus, presynaptic α activity remains, suppressing norepinephrine release and tolerance occurs only infrequently. Accordingly, these three agents can produce substantial hypotension following the first dose. Their use has decreased with a report of their association with an increase in cardiovascular events. The doxazosin arm of the Antihypertensive and Lipid Lowering Treatment to

Prevent Heart Attack Trial (ALLHAT) was terminated prematurely because of a significant increase in the risk of congestive heart failure (ALLHAT, 2002). However, these agents may be useful in hypertensive patient with prostatic hypertrophy and currently are the only drugs approved for both indications (Raymond and Smith, 1997).

7. Central alpha-2 agonists: Centraly acting drugs: clonidine, methyldopa, reserpine and guanfacine. Methyldopa remains the antihypertensive drug of choice for idiopathic HTN of pre-eclampsia because of its long and extensive use without reports of serious adverse effects on the fetus (Ramsay et al., 1999, Kyle and Redman, 1992). In addition is preferred to use in women diagnosed of HTN during pregnancy, Methyldopa may be also continued postnatally in ladies who were suffering from chronic hypertension (Sibai, 1996).

8. Direct vasodilators (hydralazine and minoxidil). These agents are usually not used for initial therapy. Hydralazine is the most versatile of the drugs that cause direct relaxation of vascular smooth muscle. It acts mainly on arterial resistance. Unfortunately, the effect of hydralazine on peripheral resistance is partly negated by a reflex increase in sympathetic discharge that raises heart rate and cardiac output, limiting the usefulness of hydralazine, especially in patients with severe coronary artery disease. Minoxidil is even more potent than hydralazine but unfortunately produces significant hypertrichosis and fluid retention and, therefore, its use is mainly limited to patients with severe HTN. Diazoxide is restricted in its application to acute situations. It begins to act immediately to lower blood pressure, and its effects may last for several hours. Nitroprusside given intravenously, also acts as a direct vasodilator, with onset and offset of actions that are almost immediate. Nitroglycerin

is a third direct-acting vasodilator useful as an intravenous agent. These latter three drugs are useful only for the treatment of hypertensive emergencies. Sodium nitroprusside (0.1 to 3.0 μg/kg per min) is considered as the ideal vasodilator for the treatment of acute HF. It has a rapid onset and brief duration of action. When administered by intravenous infusion, it results in reflex sympathetic activation leading to reflex tachycardia, headache and flushing.

3.1.7.3. Compelling indications for each drug group

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- ACEIs for diabetes with proteinuria. Blockade of the renin-angiotensin system in type 2 diabetic patients with diabetic nephropathy improves renal function (Amann et al., 2003).
- ACEI for systolic heart failure (Remme, 2001), (Chobanian et al., 2003).
- ACEIs and ARBs for renal protection; Renin-angiotensin-system (RAS) antagonists preserve kidney function not only by lowering blood pressure but also by their antiproteinuric, antifibrotic, and anti-inflammatory properties (Wühl and Schaefer, 2008).
- Diuretics (preferred) or long-acting dihydropyridine calcium blockers for isolated systolic hypertension in the elderly (Syst-Eur trial Lancet 2006).
- Beta blockers for IHD (Chobanian et al., 2003).
- Beta-blockers and ACEI (with systolic dysfunction) for post myocardial infarction (Gibbons et al., 2003, Chobanian et al., 2003).
- Beta-blockers and calcium channel blockers are compelling indication for hypertensive patients with CHD (WHO/ISH, 1999).

3.1.7.2.1.Side effects:

Adverse side effects of antihypertensive drug therapy may be responsible about substantially less than predicted efficacy of drug therapy in preventing the most frequent complication of hypertension (Schneider et al., 1995). Each antihypertensive class is responsible for specific possible side effects that are related to different mechanisms of action for each class (Table 5).

Table 5. Common side effects of various classes of antihypertensive drugs .

Side Effect	Thiazide	Beta-blockers	ACEIs	CCBs	ARBs
Effect on serum K+	↓ K		↑K		↑K
Impaired glucose tolerance	+				
Hyperuricaemia/gout	+				
Raynaud's		+			
Cough			+		
Ankle oedema /flushing				+	
Lethargy/dyspnoea		+			
constibation				+	

ACEIs: angiotensin converting enzyme inhibitors, ARBs: Angiotensin receptor blockers, CCBs: calcium channel blockers

3.1.7.4. Combination therapy

The National Health and Nutrition Examination Survey (NHANES) report showed that blood pressure is controlled to a level below 140/90 mm Hg in only 27% of patients diagnosed with HTN in United States (Burt et al., 1995) and 24% of the subjects in France (Chamontin et al., 1998). Because monotherapy is effective in achieving target BP goal in only about 50 percent of patients, treatment with two or more agents from different pharmacologic classes is often necessary to achieve adequate BP control (Materson et al., 1993). Hypertension guidelines, ESH–ESC and JNC-7 demonstrate that the rationale for combination pharmacotherapy in HTN can be clearly stated, first to maximize antihypertensive efficacy and second to minimize side effects. Guidelines for combination therapy had been put by ESH/ESC (Table 6) and JNC7 (Table 7).

Essential HTN is a very heterogeneous disease in terms of the different mechanisms that interact to increase BP in each individual. Thus, some patients might show a negligible or no response of BP to one antihypertensive agent (non-responders), whereas others might show a large decline (responders) (Stergiou et al., 2006). In order to manage a pathophysiologically multifactorial disease, such as essential HTN, a multi mechanistic therapeutic approachs are required. Thus, a logical approach expected to achieve the maximal antihypertensive effect would be to combine drugs with different mechanisms of action (Zanchetti et al., 1999). The importance of pharmacotherapy combination was clearly demonstrated in many HTN trials, where more than 50% of participants required combination therapy with two or more antihypertensive agents. In the ALLHAT study, combination therapy was administered to 63% of participants (ALLHAT, 2002). In the Losartan Intervention

For Endpoint (LIFE) reduction in hypertension study that followed 9,193 HTN patients with left ventricular hypertrophy for an average of 4.9 years, 89% of the participants received combination therapy (Dahlof et al., 2002). Likewise, in the International Verapamil–Trandolapril Study (INVEST) trial conducted on 22,576 patients with coronary heart disease, 83% of patients received combination therapy (Pepine et al., 2003). however it should be emphasized that a BP goal below 140/90 mm Hg was achieved in 66%, 48% and 71% of participants in the ALLHAT, the LIFE and the INVEST studies, respectively .The conclusion is that in the recent outcome trials, despite the frequent use of combination pharmacotherapy, optimal HTN control was not achieved in a large proportion of the participants.

Studies in primary care have shown that combination pharmacotherapy is consistently underused. In the PRATIK study (A large study in primary care in France), about half of patients with uncontrolled HTN, were on monotherapy (Amar et al., 2002). Likewise, In the Aggressive Blood Pressure Control in General Practice Study (ABC-GP) in Greece, 31%of uncontrolled patients were on monotherapy and 43% on two drugs suggesting that the potential of antihypertensive treatment has not been properly utilized (Stergiou et al., 2003).

Table 6. Antihypertensive drug combinations recommended by the European Society of Hypertension-European Society of Cardiology (ESH/ESC).

- Diuretic with beta-blocker
- Diuretic with ACE inhibitor
- Diuretic with Angiotensin receptor blocker
- Calcium antagonist (dihydropyridine) with beta-blocker
- Calcium antagonist with ACE inhibitor
- Calcium antagonist with angiotensin receptor blocker
- Calcium antagonist with diuretic
- Beta-blocker with alpha-blocker

ACE, Angiotensin converting enzyme

Table 7. Antihypertensive drug combinations recommended by Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7).

Combination Type	Fixed-Dose Combination, (mg)
ACEIs and CCBs	Amlodipine-benazepril hydrochloride (2.5/10, 5/10, 5/20,10/20) Enalapril-felodipine (5/5) Trandolapril-verapamil (2/180, 1/240, 2/240, 4/240)
ACEIs and diuretic	Benazepril-hydrochlorothiazide (5/6.25, 10/12.5, 20/12.5, 20/25) Captopril-hydrochlorothiazide (25/15, 25/25, 50/15, 50/25) Enalapril-hydrochlorothiazide (5/12.5, 10/25) Fosinopril-hydrochlorothiazide (10/12.5, 20/12.5) Lisinopril-hydrochlorothiazide (10/12.5, 20/12.5, 20/25) Moexipril-hydrochlorothiazide (7.5/12.5, 15/25) Quinapril-hydrochlorothiazide (10/12.5, 20/12.5, 20/25)
BBs and diuretic	Atenolol-chlorthalidone (50/25, 100/25) Bisoprolol-hydrochlorothiazide (2.5/6.25, 5/6.25, 10/6.25) Metoprolol-hydrochlorothiazide (50/25, 100/25) Nadolol-bendroflumethiazide (40/5, 80/5) Propranolol LA-hydrochlorothiazide (40/25, 80/25) Timolol-hydrochlorothiazide (10/25)
Centrally acting drug and diuretic	Methyldopa-hydrochlorothiazide (250/15, 250/25, 500/30, 500/50) Reserpine-chlorthalidone (0.125/25, 0.25/50) Reserpine-chlorothiazide (0.125/250, 0.25/500) Reserpine-hydrochlorothiazide (0.125/25, 0.125/50)
Thiazide and potassium sparing Diuretics	Amiloride-hydrochlorothiazide (5/50) Spironolactone-hydrochlorothiazide (25/25, 50/50) Triamterene-hydrochlorothiazide (37.5/25, 75/50)

ACEIs: angiotensin converting enzyme inhibitors, CCBs: calcium channel blockers, BBs: β blockers.

3.1.7.5. Special Situations in Hypertension Management:

Five groups of patients with hypertension require special consideration because of associated conditions: patients with DM, renal disease, coronary artery disease, women of reproductive age and the elderly.

3.1.7.5.1 Hypertension and Diabetes mellitus:

Coronary artery disease is much more common in patients with both DM and HTN than in patients with each one alone. These disorders frequently coexist in the same patient and lead to accelerated structural and functional cardiovascular impairment (Messerli et al., 2001). Experimental and clinical evidence indicate that an elevation in arterial pressure is of critical importance in the pathogenesis of diabetic cardiovascular disease. HTN has a high prevalence in diabetic patients and may occur in as many as 50% of patients with noninsulin dependent DM (Barnett, 1994).

For long-term therapy of diabetic hypertensive patients, it is reasonable to select antihypertensive drugs that decrease arterial pressure without having a negative effect on insulin resistance or other metabolic risk factors. Although diuretics and diuretic ß-blocker based therapy have been found to be effective in reducing cardiovascular related morbidity and mortality in patients with hypertension, accumulating evidence from several longterm trials show that the beta-blocker and diuretic combination might have a diabetogenic effect. ACE inhibitor-based or angiotensin receptor blocker-based treatment combinations might protect against the development of diabetes, therefore may be superior to diuretics and ß-blockers (Opie and Schall., 2004). American Diabetes Association (ADA) and JNC7 both recommended that BP in diabetics should be controlled to levels of 130/80 mmHg or lower. The ADA has also recommended the use both ACEIs and ARBs in Type2 diabetic patients with

chronic kidney diseases (CKD) because these agents delay the deterioration in GFR and the worsening of albuminuria (ADA, 2003 and Chobanian *et al.,* 2003).

3.1.7.5..2.Chronic Kidney Disease:

Chronic kidney disease is defined as either: (1) reduced excretory function with GFR <60 mL/min/1.73 m^2 or (2) the presence of albuminuria (>300 mg/day or 200 mg/g creatinine). Coronary vascular disease is the most common cause of death in individuals with CKD. A target BP of less than 130/80 mmHg is recommended. This recommendation is based on data from the Modification of Diet in Renal Disease Study, in which the rate of progression to end-stage renal disease (ESRD) among patients with proteinuria was slowest in patients with SBP below 130 mmHg. A meta-analysis of individuals with CKD and albuminuria found that positive predictors of outcome were lower SBP levels (110–129 mmHg), lower albumin excretion ratio (AER) (<1.0 g/day), and the presence of ACEI therapy. The American Society of Nephrology and the National Kidney Foundation recommend a goal BP for all CKD patients of <130/80 mmHg and the need for more than one antihypertensive drug to achieve this goal. The guidelines indicate that most patients with CKD should receive an ACEI or an ARB in combination with a diuretic, and many require a loop diuretic rather than a thiazide. (Chobanian *et al.,* 2003)

Angiotensin converting enzyme inhibitors protect the kidney from deterioration that occurs with chronic kidney disease, hypertension, and diabetes and also reduce significant worsening of proteinurea in patient with type1 diabetes and proteinurea (Bakris et al., 2000).

Patient with diabetes are at risk for nephropathy especially in Type 1 diabetes. There is evidence that ACEIs therapy reduces significant progression to severe chronic

kidney disease and kidney failure in patients with Type1 diabetes and proteinuria (Lewis et al., 1993).

3.1.7.5.3. Post Myocardial Infarction:

In hypertensive patients with ischemic heart disease (IHD), the JNC 7th report recommended the use of beta blockers (BB) unless contraindicated. Beta Blockers lower BP; reduce symptoms of angina; improve mortality; and reduce cardiac output, heart rate, and AV conduction. The reduced inotropy and heart rate decrease myocardial oxygen demand (Gibbons et al., 2003, Chrysant and Oparil. 2001).

If angina and BP are not controlled by BBs therapy alone, or if BBs are contraindicated, as in the presence of severe reactive airway disease, severe peripheral arterial disease, high-degree AV block, or the sick sinus syndrome, either long-acting dihydropyridine or nondihydropyridine type CCBs may be used. Calcium channel blockers decrease total peripheral resistance, which leads to reduction in BP and in wall tension, decrease coronary resistance and enhance post-stenotic coronary perfusion. Nondihydropyridine CCBs also can decrease heart rate and should not be used in combination with BBs because they may produce severe bradycardia or high degree heart block. Therefore, long acting dihydropyridine CCBs are preferred in combination with BBs. Short-acting dihydropyridine CCBs should not be used because of their potential to increase mortality, particularly in the setting of acute MI (Chobanian *et al.,* 2003).

Another trial found that ACE inhbitors therapy is recommended definitely in all patient who are post MI because of reduced cardiovascular risk that is independent of LV function and BP in post-MI patients (Smith et al., 2001).

ACE inhibitors have been evaluated in patients at risk of coronary disease, and similar to β-blocker, should be started early in patients with acute coronary syndrome (non–ST segment elevation MI and unstable angina) (Braunwald et al., 2002).

3.1.7.5.4. Cerebrovascular disease:

Treatment of HTN has the greatest potential for reducing the incidence of acute stroke. Indeed, it is estimated that up to 70% of strokes may be prevented by adequate treatment of hypertension (Gorelick, 1995). Stroke risk is proportional to BP throughout the range of BP studied, with 30% increase in risk for each 10 mm Hg increase in systolic blood pressure (Jones et al ., 2003).

Studies have suggested that stroke represents a "compelling indication" for certain classes of antihypertensive medications such as diuretics and/or ACE inhibitors.

In the LIFE study (Losartan Intervention for Endpoint Reduction in Hypertension), there were fewer strokes in the losartan-treated group than in the group treated with atenolol (Dahlof et al., 2002). In the ALLHAT study, the stroke incidence was 15 % greater with ACEI than with thiazide-type diuretic or dihydropyridine CCB, and the BP reduction in the lisinopril group was also less than with chlorthalidone or amlodipine. The addition of the diuretic, indapamide, to the ACEI, perindopril, caused a 43 % reduction in stroke occurrence in the PROGRESS trial (PROGRESS, 2001). The reduced incidence of stroke appeared related to the BP reduction obtained by the combination therapy even though many patients on entry into the study were not hypertensive. No significant reduction was observed in those on perindopril alone whose BP was only 5/3 mmHg lower than in the control group.

3.1.7.5.5. Congestive Heart Failure CHF:

Heart failure is a "compelling indication" for the use of ACEIs. Abundant evidence exists to justify their use with all stages of HF. In patients intolerant of ACEIs, ARBs may be used. ß blockers such as (carvedilol, metoprolol) are also recommended in HF because of clinical evidence demonstrating decreased morbidity and mortality, and improvement in HF symptoms. ACE inhibitors may be appropriate due to their beneficial effects on mortality in patients at high risk for CVD. ALLHAT study also has suggested that thiazide-diuretic therapy is useful in preventing disease progression (Chobanian *et al.,* 2003). ACE inhibitors reduce morbidity and mortality and are considered the first-line treatment for patient with CHF (Garg and Yusuf, 1995). Aldosterone antagonists may provide additional benefit in patients with severe left ventricular dysfunction. In the Randomized Aldactone Evaluation Study (RALES), low dose spironolactone (12.5–25 mg daily), when added to standard therapy, decreased mortality by 34 % (Pitt et al., 1999). Hyperkalemia is a risk with aldosterone antagonists even at low doses (especially since most patients also are taking ACEIs or ARBs), but its incidence can be reduced by monitoring serum potassium carefully.

3.1.7.5..6. The Elderly:

Hypertension is very common, occurring in over 50% of elderly people, and is a major risk factor for stroke and ischemic heart disease. Based on systematic reviews, there is evidence to show that drug treatment of hypertension in older people saves lives and prevents unnecessary morbidity. There is also strong evidence to support the use of diuretics as first line agents (McDonagh et al., 2000).

The evidence for the effectiveness of drug therapy is compelling. A recent high quality systematic review analyzed data from 15 studies including more than 21,000 patients over 60 years of age. The analysis showed that over a five year period when compared to a control, antihypertensive drug therapy was associated with significant reductions in mortality due to stroke (40% reduction), coronary heart disease (26% reduction), all cardiovascular causes (30% reduction) and overall mortality (16% reduction) (Mulrow et al., 1997).

For first line therapy, systematic reviews suggest that there is strong evidence to support the use of thiazide diuretics and some evidence for the use of beta-blockers. For the newer antihypertensive drugs these reviews do not yet provide sufficient evidence to make conclusions about their effects on morbidity and mortality (Messerli et al., 1998)

There is very little evidence on which to base treatment decisions for patients in their eighties and above. The Hypertension in the Very Elderly Trial (HYVET) helps to provide treatment decisions for this patient group this study showed that indapamide SR+perindopril treatment significantly reduced total mortality by 21% (P=0.019) and stroke mortality by 39% (P=0.046) (Bulpitt et al., 2001). The evidence is presented in a meta-analysis of seven studies that provided data on 1670 patients over the age of 80 (Gueyffier et al., 1999). The analysis showed that when antihypertensive drugs were compared to control treatments over an average treatment period of three and a half years, there were significant reductions in morbidity from stroke (34% reduction), heart failure (39% reduction) and cardiovascular events (22%reduction). Despite the reduction in morbidity there was no significant reduction in mortality rates.

Compelling indications and contraindication for the use of antihypertensive drug cases are shown in table (8).

Table 8. Indications for use of antihypertensive drug classes.

Class of Drug	*Compelling Indications*	*Possible Indications*	*Compelling Contraindications*	*Possible Contraindications*
Diuretics	Heart failure Elderly patients Systolic hypertension	Diabetes mellitus	Gout	Dyslipidemia Sexually active males
ß blocker	Angina After MI Tachyarrhythmia's	Heart failure Pregnancy Diabetes	Asthma and COPD Heart block	Dyslipedimia Athletes Peripheral vascular disease
ACE inhibitor	Heart failure LVH After MI Diabetic nephropathy		Pregnancy Hyperkalemia Renal artery stenosis	
Angiotensin II Antagonist	ACE inhibitor cough	Heart failure	Pregnancy Renal artery stenosis Hyperkalemia	
Calcium antagonist	Angina Elderly patient Systolic hypertension	Peripheral vascular Disease	Heart block	Congestive heart failure

3.2. Inadequate, and non-effective management of hypertension:

Many studies that investigate management of HTN among different countries demonstrate that despite the available pharmacological and non pharmacological strategies, HTN control at the population level remains disappointing. In the United Kingdom, only 6% of hypertensive subjects had their BP levels lowered to <140/90 mm Hg (Colhoun et al., 1998). Among treated hypertensive subjects in the United States, BP control was achieved in 27% of the subjects (Burt et al., 1995); While in France 24% of the subjects were inadequately controlled (Chamontin et al., 1998).

Previous studies on poor control of blood pressure have mainly focused on patient compliance with antihypertensive therapies and patients' characteristics associated with non-compliance. Recent data have shown that physicians may not have been aggressive enough in the management of HTN (Wang., 2004).

In the 1988–1991 National Health and Nutrition Examination Survey among US population (NHANES III), it was demonstrated that only 29 % of the patients with a diagnosis of HTN had BP of <140/90 mm Hg (Burt et al (1995). The NHANES III study has shown that 31% of Americans are prehypertensive, 29% are hypertensive, and just 39% are normotensive. Perhaps more alarming is the insidious nature of the disease among those with hypertension, 30% are unaware; among those who were aware, 11% are not being treated pharmacologically, and 25% are on medication but do not have their BP controlled (Chobanian et al., 2003) (Table 9).

Table 9. Trends in awareness, treatment, and control of high blood pressure 1976–2000.

	National Health and Nutrition Examination Survey			
	1976–80*	1988–91*	1991-94**	1999-2000***
Awareness	51%	73%	68%	70%
Treatment	31%	55%	54%	59%
Control	10%	29%	27%	34%

*Reference (Data from Burt VL, et al.,1995 Prevalance of hypertension in the US adult population).
From the third National Health and Nutrition Examination Survey, 1988–1991. Hypertension 1995;26:60–9.
** Data from The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Arch Intern Med 1997;157:2413–46.
*** The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. JAMA 2003;289:2560–71.

In cross sectional German study about Hypertension and Diabetes Risk Screening and Awareness (HYDRA), Pittrow et al (2004) have reported that BP control was poor. 70.6% of all patients were not normalized, (BP ≥140/90 mmHg). Physicians in primary care did not treat hypertension aggressively enough. Treatment was only intensified at a late stage, after complications had occurred.

Wolf-Maier et al (2004), showed that awareness, treatment and control of hypertension in Germany is poorer than in other European and North American countries.

Berlowitz et al, (1998) had evaluated the inadequacy of management of blood pressure in a hypertensive population in New England. They found that approximately 40 percent of the patients had a blood pressure of ≥ 160/90 mm Hg. Patients who had more intensive therapy had significantly ($P<0.01$) better control of BP. During the two-year period, systolic blood pressure declined by 6.3 mm Hg among patients with the most intensive treatment, while it has increased by 4.8 mm Hg among patients with the least intensive treatment.

Recent French study entitled "Poor Blood Pressure Control in General Practice" (Nicodème et al., 2009), included 479 hypertensive patients in a cross-sectional study by 27 general practitioners. The study aimed to understand why BP level greater than or equal to 140/90 mmHg does not lead to a change of treatment. They found that BP level was greater than or equal to 140/90mmHg in 57.4 % of patients. Treatment was changed in only 15% of those individuals. Systolic and diastolic BP levels were 150.9±1.7 and 84.8±1.3 mmHg in uncontrolled hypertensive patient respectively.

Al-Mehza et al, (2004) have studied the factors responsible for poor blood pressure control among patients on treatment for hypertension in Kuwait. They found that 64% out of 132 patients had uncontrolled hypertension. Seventeen percents of the uncontrolled hypertensives were non-compliant by pills count (taking < 80 % of prescribed pills) as compared to 2% of the controlled hypertensives ($p < 0.05$). Uncontrolled hypertensives had a decreased physical activity level as compared to the controlled hypertensives. The study concluded that patient's poor compliance with antihypertensive therapy and sedentary life style constitutes the major determinants of poor blood pressure control in hypertensive patients in Kuwait.

In an English study poor blood pressure control in the UK was responsible for 62, 000 unnecessary deaths per year (He and Macgrego, 2003). Controlling all hypertensive individuals to a systolic blood pressure of 140 mmHg would prevent approximately 21, 400 stroke deaths and 41, 400 ischemic heart disease deaths each year in the UK. Around half of those who suffer a stroke or ischemic heart disease survive. Controlling hypertension also will lead to approximately 42 800 strokes and 82 800 ischemic heart diseases saved, making a total of 125 600 events saved a year in the UK alone.

3.3. Factors affecting poor blood pressure control

There are many factors that contribute to poor blood pressure control. Compliance and persistence are among the major factors that have been extensively studied. Compliance represents the patient's actual drug-taking pattern in relation to the physician's directions, whereas persistence refers to the continuation of prescribing a drug treatment by the physician, and is measured as the accumulation of time from initiation to discontinuation of therapy

Both persistence with regular prescribing patterns of antihypertensive medicines and patients' compliance in taking the medicines as directed are essential preconditions for effective BP control.

Caldwell *et al.* (1983) examined the relationship of BP control with an index of compliance; they found that poor blood pressure control was associated with a lower compliance index ($P < 0.0001$).

Elzubier *et al*. (2000) studied the relationship between HTN control and patients compliance among hypertensive patients in Kassala, Eastern Sudan. Compliance was measured by using pill count method. They found that compliance was 59.6% among subjects, and 92% of compliant patients had their BP controlled.

Poluzzi et al (2005) have evaluated the adherence to therapy in general practice in Italy. Eighteen percent of the cohort received only one prescription over 3 years, 13% received more than one prescription but stopped the therapy during the first year, 69% were persistent during the second year and 60% also during the third year. Only 34% were covered during the first year and 24% also during the second year, whereas only 20% of the patients were covered throughout the 3 years. Among persistent patients, 41% maintained the same antihypertensive regimen throughout the 3 years, 25% added other drugs to the initial treatment and 34% switched to completely different regimens.

Krousel-Wood et al, (2004) reviewed the studies evaluating the factors influencing medication adherence, and summarized these results as follows; Medication adherence can be influenced by demographic factors like sex, age, race, socioeconomic factors, income, education, side effects of medication, patient knowledge and awareness, belief and attitudes, presence of depression, and the

national health care system. Identifying these factors in a target population or community, followed by developing intervention programs that aim to increase antihypertensive medication adherence based on these factors can be very helpful to control HTN.

Park et al. (2008) estimated adherence to antihypertensive drug medication of 2,455,193 hypertensive patients using cumulative medication adherence (CMA) during calendar year 2004 in South Korea, mean CMA of the study population was 81.4%, with 57.4% of study population having a CMA ≥80%, 17.9% of study population having a CMA <50%.

In recent years, the relatively new concept of persistence has received considerable attention with the aim of gaining a better understanding of the factors associated with better blood pressure control where poor persistence leads to poor blood pressure control.

Jones et al, (1995) carried out the first reported study on persistence with antihypertensive drug treatments. Their results revealed that after 6 months, 50–60% of new treatments had already been changed or completely discontinued.

Bittar, (1995) found that persistence rates are inversely correlated with the number of drugs prescribed, complexity of dosage regimen, and with the cost of drug; while they are directly correlated with the tolerability of the treatment, and with a strong and trusting physician–patient relationship.

Degli Esposti et al (2002) investigated "stay-on therapy" patterns over 3 years among patients prescribed different classes of antihypertensive drugs for the first time. A total of 57.9% of patients continued their initial treatment during the 3-year followup period, 34.5% discontinued the treatment, whilst 7.6% were restarted on a treatment

in the third year. Persistence with treatment was influenced by age of patient (persistence rate increasing proportionately with advancing years), type of drug first prescribed (persistence rate was higher with angiotensin II antagonists, progressively lower with ACE-inhibitors, beta-blockers, calcium channel blockers and diuretics), gender of patient (persistence was better in males), age of general practitioner (GP) (the younger the GP, the better the persistence rate) and gender of GP (better stay-on-therapy rate with male GP prescribing).

In A 3-year follow-up cohort study evaluating persistence with antihypertensive treatments in Germany. Hasford et al (2007) had indicated that across all treatment groups, persistence after 3 years was 15.2%. Persistence differs markedly among the drug classes, but that even persistence of the best drug class is not sufficient to provide for an adequate BP control in the population. The largest decline in persistence occurred in the first 3 months of treatment.

Rubio-Guerra *et al.* (2003) studied the effect of depression on poor control. They found that depressed people with high blood pressure are less likely to have their blood pressure under control compared to those who are not depressed. This study emphasizes that untreated depression might put hypertensive patients at higher risk for poor blood pressure control.

3.4. Prescription pattern and physicians awareness about guidelines.

Several studies investigated the prescription pattern, practice and utilization of antihypertensive drugs around the world. The prescribing pattern of drugs used for treating hypertension changes over time in response to changes in recommended guidelines and innovations in drug formulations.

A study by Xu et al (2003) that assessed adherence to JNC V guidelines found that diuretics and β-blockers were used in 36.72% of patients, whereas CCBs and ACEIs were used in 67.49%. The authors concluded that compliance to JNC guidelines was low and that increasing compliance might reduce the costs of prescriptions and other medical services. Henderson et al (2003) concluded that overall treatment of Black and Latino respondents did not correspond closely to JNC VI, based on the high rates of ACEI and CCB use and low β-blocker use.

A Nigerian study by Etuk et al (2008) examined the pattern of physicians' prescription of antihypertensive drugs and its possible effects on blood pressure control as well as physicians' compliance with recommended guidelines. Of the 145 patients studied, 20% were on monotherapy and 80% on combination therapy. Of the patients on combination therapy, 61.2%, 33.6% and 5.2% were on 2, 3 and 4 drugs, respectively. Diuretics were the most frequently prescribed drugs either as a single agent (44.8%) or as combination therapy (88.8%). Mean reductions in both systolic and diastolic blood pressures were more in patients on calcium channel blocker than those on diuretic monotherapy ($t=2.5$ and 3.6 for reductions in systolic and diastolic BP, respectively; $P<.05$ for both), and in patients on combination therapy than those on monotherapy ($t=3.64$ and 3.27 for reductions in systolic and diastolic BP, respectively; $P<.01$ for both). Blood pressure control rate was 30.5%.

Cuspidi et al (2002) using 12 explicit criteria to evaluate physician adherence to the 1999 World Health Organization/International Society of Hypertension Guidelines, found poor adherence to the minimum recommended clinical and laboratory evaluation work-up, high use of ACEIs (65.6%), lower use of diuretics (49.1%), and

poor patient outcomes, with only 18.7% of patients having a controlled blood pressure.

A pilot study by Tiwari et al (2004) was conducted in order to establish the trend of drug prescribing of anti-hypertensive drugs at Panjab University Health Center (PUHC) in India. This study revealed that most of male patients were on monotherapy (60 percent). In the monotherapy category, four classes of drugs were used, calcium channel blockers (48.1 percent), beta-blockers (46.2 percent), ACE inhibitors (3.9 percent) and diuretics (1.9 percent). Among those who were treated with drug combinations, 92.1% received two drugs and 7.9 percent received three drugs. In combination therapy, a two-drug combination consisting of beta-blockers and calcium channel blockers was given to the majority of the patients. Overall, 57.8 percent of patients were treated with a single anti-hypertensive drug and 42.2 percent were treated with anti-hypertensive drug combinations.

Wallenius et al (1996) studied the prescribing of antihypertensive drugs in Finland. Of all the prescriptions , 30% were for beta blocking agents, 24% for diuretics, 22% for calcium channel blocking agents, 20% for ACE inhibitors or ACE inhibitor + diuretic combinations, and 4% for other antihypertensive drugs. Two thirds of the men received a drug from a antihypertensive group; nearly half were prescribed a beta blocking agent, and 27% a diuretic. Among women, the distribution of the different drug groups was even. More than half the women (55%) were prescribed hypotensives while beta blocking agents and diuretics were prescribed for 43% and 44 %, respectively. Due to the different treatment profile between men and women the expenses of treatment also differed. The cost of prescriptions for female patients was, on average, 17% less than that for male patients.

Gu et al (2006) using NHANES data compared the Antihypertensive Medication Use among US Adults with Hypertension between two time intervals 1988–1994 and 1999–2002 and found that when monotherapy and polytherapy were considered together, diuretics remained the most commonly used antihypertensive drug class during 1988–1994 (27.8%) and 1999–2002 (28.7%). Use remained stable across both time periods for most drug classes, except for ACE inhibitors, for which there was a significant increase in use (23.8% versus 15.2%). Polytherapy among hypertensives increased significantly between 1988–1994 and 1999–2002 from 29.1% to 35.8% . Between 1988–1994 and 1999 to 2002, significant increases were only observed for polytherapies containing an ACE inhibitor. They found that the use of multiple antihypertensive drugs either in a single combination pill or in more than one pill significantly increased and accounted for use by more than half of all antihypertensive medication users by 1999–2002. The most common combinations were a diuretic plus an ACE inhibitor, β blocker, or CCB. Diuretic polytherapy accounted for >80% of total drug use in 1988–1994 and >90% in 1999–2002. Triamterene and hydrochlorothiazide (a single pill combination) was the most commonly used antihypertensive agent, with a 14.4% prevalence However, its use significantly declined after 1988–1994 to 7.5%, making it the seventh most commonly used antihypertensive in 1999–2002.

Al Khaja et al (2001) studied the trends of antihypertensive drugs prescription in primary health center in Bahrain. They concluded that the general pattern of antihypertensive utilization appears to be in accordance with the guidelines of WHO and Joint National Committee (JNC) issued in 1990s. They also found that 62.9% of the study population were on monotherapy, whereas 37.1% were on antihypertensive

combination therapy. Among overall utilization pattern, β-blockers were the most frequently prescribed (65.5%), diuretics ranked second (27.4%), followed by ACE inhibitors (20.6%), Calcium channel blockers (19.9%) and α-methyldopa (8.5%). Within each class used, the most frequently used individual agents were as follow: Among ß blockers 97.7% use atenolol; among diuretics, indapamide (35.4%); Hydrochlorothiazide HCTZ (32.7%), HCTZ in combination with triametrene (25.7%); among ACE inhibitors captopril (44.9%), enalpril (29.7%) and lisinopril (19%); among CCBs nifedipine (98.2%). They found significant age and gender related deference's in prescribing patterns. Short acting nifedipine monotherapy was inappropriately prescribed in significant number of patients above the age of 50 years. ACE inhibitors accounted for approximately two-third of total antihypertensives expenditure, although these drugs represent only one-fifth of overall antihypertensive used. They found that there is a trend toward excessive use of expensive thiazide-like diuretics such as indapamide which seems to be unjustifiable practice, particularly in a study population free from diabetic hypertensive patients.

Abaci et al (2007) investigated the practice of antihypertensive medications in primary care units in Turkey depending on data from cross-sectional screening study conducted in 1000 primary care units TURKSAHA. Of the 12,897 patients, 75.7% were receiving monotherapy, 19.7% two drugs, 4.1% three drugs and 0.5% four or more drugs. The rate of successful blood BP (<140/90 mmHg; for diabetics <130/80 mm Hg) in relation to the increasing number of drugs received was 26.3, 25.9, 24.5 and 26.2%, respectively. Among the patients receiving monotherapy, the most frequently used antihypertensive drug class was ACEIs (30.1%), followed by β-blockers (20.6%), CCBs (17.9%), diuretics (15.4%) and ARBs (14%).

4. Methodology:

This study was conducted on hypertensive patients attending the Family Practice Clinic at Jordan University Hospital in Amman Jordan, during the period from April 2008 to August 2009. Two methods were used to ascertain the pattern of antihypertensive drug prescription and use. The first one obtained data from the patient's medical record. The second constituted a questionnaire that was filled by the researcher through an interview with the patients. Patients gave a verbal consent for participation in the study.

4.1 Inclusion criteria

1. Patients diagnosed hypertensive ≥ 18 years old.

2. Patients on antihypertensive medications/ or life style modification..

4.2 Clinical setting

The study started in April 2008 and was continued until end of August 2009, it was carried out at the all four Family Practice Outpatient Clinics at Jordan University Hospital. All patients arrived to nursing station where their BP was measured. There are four clinics, three of them covered by resident physicians and one clinic by consultant. The nurses divide the patients between the four clinics and treatment prescribed by residents and some time after they take the consultant opinion.

4.3 Sample size calculation

Sample size was determined depending on Daniel (Biostatics: A Foundation for Analysis for Health Sciences, 2005, 8th ed)

$N= Z^2PQ/d^2$

Z= 1.96 at 95% CI, P≤0.05

P= prevalence of hypertension among Family Medicine Clinics.

(P = 0.2 from experience)

Q= 1-p

d= desired interval 0.05 0.20±.05

N=$(1.96)^2$ *0.2* 0.8/$(0.05)^2$

=246 patients

- Data obtained from the patients medical records included:

Data Sheet for Hypertension Project

File number: ---------- Patient's Age (years): ----------

Patient's sex: □ Male □ Female

Weight (Kg): ---------- Height (cm): ---------- BMI: ----------

BP (mmHg): □ Before treatment started: ----------

□ After treatment (last visit): ----------

Duration of Hypertension (years): ----------

Concomitant Medical Problems (Diseases):

Number	Medical Problem	Duration (years)
1		
2		
3		
4		
5		
6		
7		

Laboratory Investigations:

Lab Investigation	Value before treatment	Value after treatment
Blood sugar		
Creatinine		
Uric acid		
Total cholesterol		
LDL		
HDL		
Triglycerides		
T3 or T4		
TSH		
ALT		
AST		
Alk Phosphatase		
CPK		
Bilirubin		
K+		
Na+		
Ca2+		
Mg 2+		
Phosphorous		
Other tests		
Urine analysis:		
pH		

RBC		
WBC		
Protein		
Crystalls		
Bacteria		
Other		

Drugs Prescribed:

Drug	Dose	Frequency	Duration

Potential adverse effects of antihypertensive therapy:

Hypokalemia: □ **Yes** □ **No**

Hyperkalemia: □ **Yes** □ **No**

Hyperglycemia: □ **Yes** □ **No**

Ectopic beats: □ **Yes** □ **No**

Impotence: □ **Yes** □ **No**

Cough: □ **Yes** □ **No**

Bradycardia: □ **Yes** □ **No**

Tachycardia: □ **Yes** □ **No**

Flushing: □ **Yes** □ **No**

Constipation: □ **Yes** □ **No**

Postural hypotension: □ **Yes** □ **No**

Lower limp edema □ **Yes** □ **No**

Others: List

- Data obtained from patient's interview (questionnaires) included the following:

Antihypertensive Drugs Project

Questionnaire

Serial number: ……..

File number:……. Patient's Age (years):……..

Patient's sex: □ Male □ Female

Weight (Kg): ---------- Height (cm): ---------- BMI: ----------

Duration of Hypertension (years): ----------

Source of Medical Care (drugs):

□ Family Practice Clinic □ Other JUH Clinic

□ Private physician □ Ministry of Health

□ Military Medical Services □ UNRWA

□ Others (specify) ----------

Concomitant Medical diseases and duration:

□ Diabetes mellitus □ Renal disease □ Heart failure

□ Cardiac arrhythmias □ Angina pectoris and myocardial infarction

□ Cerebrovascular disease □ Eye disease □ Follow up with ophthalmologist

□ Deep vein thrombosis or pulmonary embolism □ Hyperurecemia and gout

□ Bronchial Asthma □ COPD □ Prostate disease

□ Hepatic disease □ Musculoskeletal disorders

□ Peptic ulcer disease

Others (list): ----------

Life Style:

Physical activity

□ No physical activaty □ Walks 30 minutes /day for at least 4 times /week

□ Other (specify):

Weight changes:

□ Obese □ Lean □ Weight increase

□ Weight decrease □ No change on weight

Alcohol consumption:

□ Yes □ No

Smoking habits(duration):

□ Not smoker □ Passive smoker □ Smokes less than 10 cigarettes/day

□ Smokes 10-20 cigarettes/day □ Smokes more than 20 cigarettes/day

□ Argila smoking (time/week) □ Other type of smoking :…….

Dietary habits (duration):

Salt intake:	□ low	□ Moderate	□Adds extra salt
Consumption of fat:	□ low	□ Moderate	□High
Consumption of sugar	□ low	□ Moderate	□High
Consumption of vegetables	□ low	□ Moderate	□High
Consumption of fruit:	□ low	□ Moderate	□High
Consumption of liquorice:	□ low	□ Moderate	□High

Potential side effects:

Palpitation:	□ Yes	□ No
Impotence:	□ Yes	□ No
Cough:	□ Yes	□ No

Flushing: □ **Yes** □ **No**

Constipation: □ **Yes** □ **No**

Postural hypotension: □ **Yes** □ **No**

Swelling of lower limb: □ **Yes** □ **No**

The total number of patients who were evaluated during the study period was 416 patients

- A coding key was prepared and used to enterer data to the SPSS program Descriptive statistics was used to analyze the results.

5. RESULTS

5.1 Demographic Data

Demographic data are presented in Table 10. The study sample was 416 hypertensive patients, 259 (62.3%) of them were females and 157 (37.7%) were males. The age of the patients ranged from 18 to 94 years with a mean ±SD of 59.2 ± 10.2. The age distribution was such that 86.3 % were above 50 years of age and 0.2% less than 30 years of age. The mean duration of hypertension was found to be 8.7 years.

5.2. Concomitant illness:

Most patients had other concomitant diseases in addition to hypertension as shown in Table 11. Hyperlipidemia was found in 34% of patients, diabetes mellitus in 31.4%, osteoporosis in 18%, while IHD was found in 12% of patients.

5.3 Prescription pattern:

Two patients (0.5 %) were not receiving any drug treatment at the time of evaluation. Mono antihypertensive therapy was given to 190 patients (45.7%) as shown in Table 12. One hundred fifty seven (37.7%) of patients were on two antihypertensive drugs. The combinations are presented in Table 15. The most frequent combinations are beta blockers with a diuretic which constitute 21% of patients on ditherapy. Fifty two (12.5%) of patients were on triple antihypertensive therapy, 21% of whom were on beta blocker with diuretic and ARBs. The rest of the triple therapy combinations are shown in Table 16.

6.3.1. Monotherapy:

Overall drug prescribed 45.7 % of patients (190 patients) were prescribed as monotherapy. Drugs prescribed as monotherapy were ACE inhibitors 43.7% (83 patients) then β blockers 22% (42 patient), CCBs 20.2% (38 patients), ARBs 10.6 % (19 patients), diuretics 3.7% (7 patients). Data are shown in Table (12) and Figure (1).

Table 10: Demographic data of the study patients (N=416).

		number	Percent %
Gender	Males Females	157 259	37.7 62.3
Age (mean ± SD) years	Males Females	59.78 ±10.78 58.91 ±9.86	
age group	< 30 30-49 50-64 ≥ 65	1 56 237 122	0.2 13.5 57 29.3
Weight (Kg) (mean ± SD)	Males Females Total	85.4 ± 14.8 80.7 ± 13.2 82.52± 14.06	
Body mass index BMI (mean ± SD)	Males Females Total	29.15 ± 4.71 31.47 ± 5.06 30.6 ± 5.06	
Duration of HTN (years) (mean ± SD)	Males Females Total	8.43 ± 7 8.92 ±6.97 8.73±6.97	

SD: Standard Deviation

Table 11. Frequency of concomitant medical problems.

Medical problem	Number	Percent	Medical problem	Number	Percent
Hyperlipidemia	143	34	Epilepsy	7	1.7
Diabetes mellitus	131	31.4	Eye diseases	5	1.2
Osteoporosis	75	18	Cardiac arrhythmias	5	1.2
Ischemic heart disease	51	12	hyperthyroidism	3	0.7
Hypothyroidism	25	6	COPD	2	0.5
Arthritis	22	5	Parkinson	2	0.5
Vertebral Disc	17	4	Anemia	2	0.5
Bronchial asthma	14	3.4	Irritable bowel syndrome	2	0.5
Allergic rhinitis	14	3.3	Migraine	2	0.5
Gout	12	3	Leukemia	1	0.2
Peptic or duodenal ulcers	8	2	CA colon	1	0.2
Renal disease	8	2	Lung cancer	1	0.2
Depression	8	2			

Table 12: Drugs prescribed as monotherapy (N=190).

Drug	Frequency	Percent from Monotherapy (n=190)	Percent from total patients (n=416)
ACE inhibitors	83	43.7%	20%
B Blockers	42	22%	10%
Ca^{2+} channel blockers	38	20%	9.1%
Angiotensin receptors blockers	20	10.6%	4.8%
Diuretics	7	3.7%	1.7%
	190	**100%**	**45.7%**

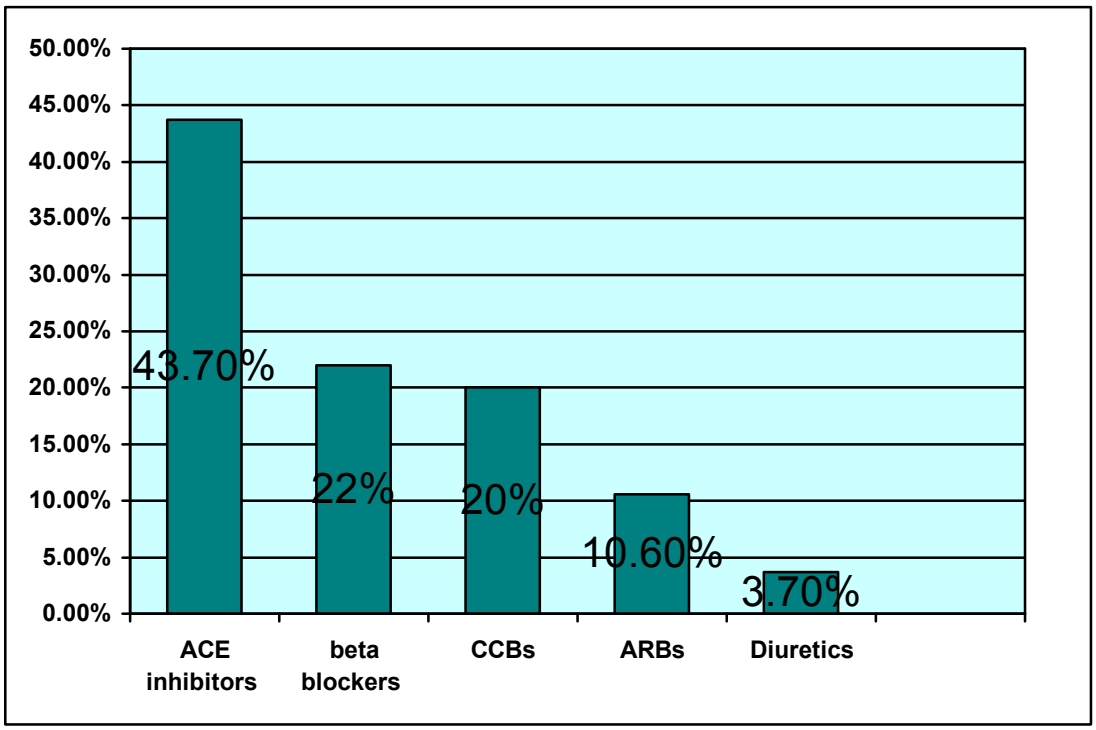

Fig 1: Percent of drug group prescribed from monotherapy.

6.3.2. Combination Therapy:

222 patients (53.4 %) received two or more drugs, 157 patient (37.7%) received two drugs, 52 patients (12.5%) received three antihypertensive drugs and 13 patients (3.1%), received four or more antihypertensive drugs. The most frequent combinations observed were ß-blocker and diuretics.

Table 13 represents the prescription pattern and rate of anti-hypertensive drugs prescribed for hypertensive patients, both as monotherapy and overall utilization (monotherapy and combination therapy). Among the monotherapy category, only five classes of drugs were used, namely: ACE inhibitors (43.7%), β-blockers (22%), calcium channel blockers (20%), Angiotensin receptors blockers (13%) and diuretics (3.7%). In the overall utilization pattern, ACE inhibitors (46.2%) and β-blockers (41.6%) were both the most frequently prescribed classes, followed by diuretics (38.2%), and calcium channel blockers (33%) and Angiotensin receptors blockers (17.8%). Table 14 shows the frequency of antihypertensive classes of drugs when prescribed only as combination therapy, while Table 15 shows the frequency of specific combinations of two antihypertensive classes of drugs. 157 patients were receiving two-drug combinations. Diuretics were the most prescribed class with other antihypertensive classes as combination of two drugs; especially with β blockers (21%) followed by β blockers with ACE inhibitors (14%).

Table 16 shows the three drug combinations; β blockers were found to be the most frequently class used in triple theraby (39 patients) or 75% of patients who received 3 drugs combinations. This was followed by diuretics (36 patients). The most prescribed combination seen was ß blocker with diuretics and ARBs (11 patients) 21.2%.

Table 13: Overall Drugs prescribed either as monotherapy or combinational therapy (N=414).

Drug class	Frequency	Percent
ACE inhibitors	184	44.4
ß blockers	166	40
Diuretics	151	36.4
Ca^{2+} channel blocker	136	32.8
ARB	74	17.9
Alpha blocker	2	0.48
Others*	2	0.48
No drug	2	0.48

Others: Brinerdine (dihydroergocristine + resirpine+clopamide)

Table 14: Drugs prescribed as combination therapy.

Drug	Frequency	Percent
Diuretics	144	34.8%
β-Blocker	124	30%
ACE inhibitors	101	24.4%
Ca^{2+} channel blockers	98	23.7%
Angiotensin receptors blockers	54	13%
α- adrenergic blockers	2	0.5%
Total	523 *	**

Notes:
* The total exceed the total number of patient (416) because some Patients received two or more drugs.
**Total exceeds 100% because data are overlapping due to multiple use of medication.

Table 15: Frequency of two drug Combination therapy (N=157).

Drug combination	***Frequency***	***Percent***
ß blocker + Diuretics	33	21
ß blocker + CCBs	12	7.6
ß blocker + ACE inhibitors	22	14
ß blocker +ARBs	5	3.2
ACE inhibitors + CCBs	21	13.4
ACE inhibitor +Diuretics	21	13.4
ACE inhibitors +A blockers	1	0.6
Diuretics + ARBs	19	12.1
CCBs +ARBs	3	1.9
CCBs + Diuretics	19	12.1
CCBs +A blockers	1	0.6
Total	**157**	100%

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; CCB, calcium channel blockers.

Table 16: Three drugs combinational therapy (N=52).

Drug combination	***Frequency***	***Percent***
ß blocker + CCBs+ ACE inhibitors	7	13.5
ß blocker + Diuretics+ ARBs	11	21.2
ß blocker + Diuretics + ACE inhibitor	8	15.4
ß blocker +ACE inhibitors + ARBs	2	3.8
ß blocker +CCBs + Diuretics	7	13.5
ß blocker + ARBs + CCBs	4	7.7
Diuretics +ACE inhibitor + CCBs	9	17.3
Diuretics + CCBs + ARBs	3	5.8
Diuretics + ACE inhibitors +ARBs	1	1.9
Total number of patient received three antihypertensive drug	52	**100**

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; CCB, calcium channel blocker.

Table 17 shows prescriptions of four or more drugs combination, the most prescribed classes were β blockers and diuretics which were prescribed for all the patients(13 patients) who received four or more drugs, followed by calcium channel blockers. The most prescribed combination was diuretics with ACEIs and β blockers and calcium channel blockers.

Table 18 and Figure 2 show the details of prescribed classes either as monotherapy or as combinations and overall drug utilization frequency, ACE inhibitors were the most common prescribed drugs as monotherapy (43.7%), followed by β lockers which prescribed to (22%), and diuretics were the fewer drug prescribed as monotherapy (3.7%). While diuretics were the most prescribed drugs as a combination therapy (36.5%) followed by β lockers 31.5%. Overall, ACE inhibitors were the most prescribed (46.2%) followed by β blockers (41.6%). Angiotensin receptors blockers were the least prescribed as a combination or in overall prescription. Figure 3 shows the summary of the entire management of BP and the utilization of antihypertensive drugs.

Table 17. Drug combinations of four or more drugs (N=13).

Drug combination	***Frequency***	***Percent***
Diuretics + ACE inhibitor+ ß blocker+ CCBs	7	53.8
Diuretic +ARBs + ß blocker + CCBs	4	30.8
Diuretics+ ß blocker + ARBs+ ACE inhibitors	1	7.7
* Diuretics +ß blocker+ ARBs+ACE inhibitors+CCBs	1	7.7
Total	**13**	

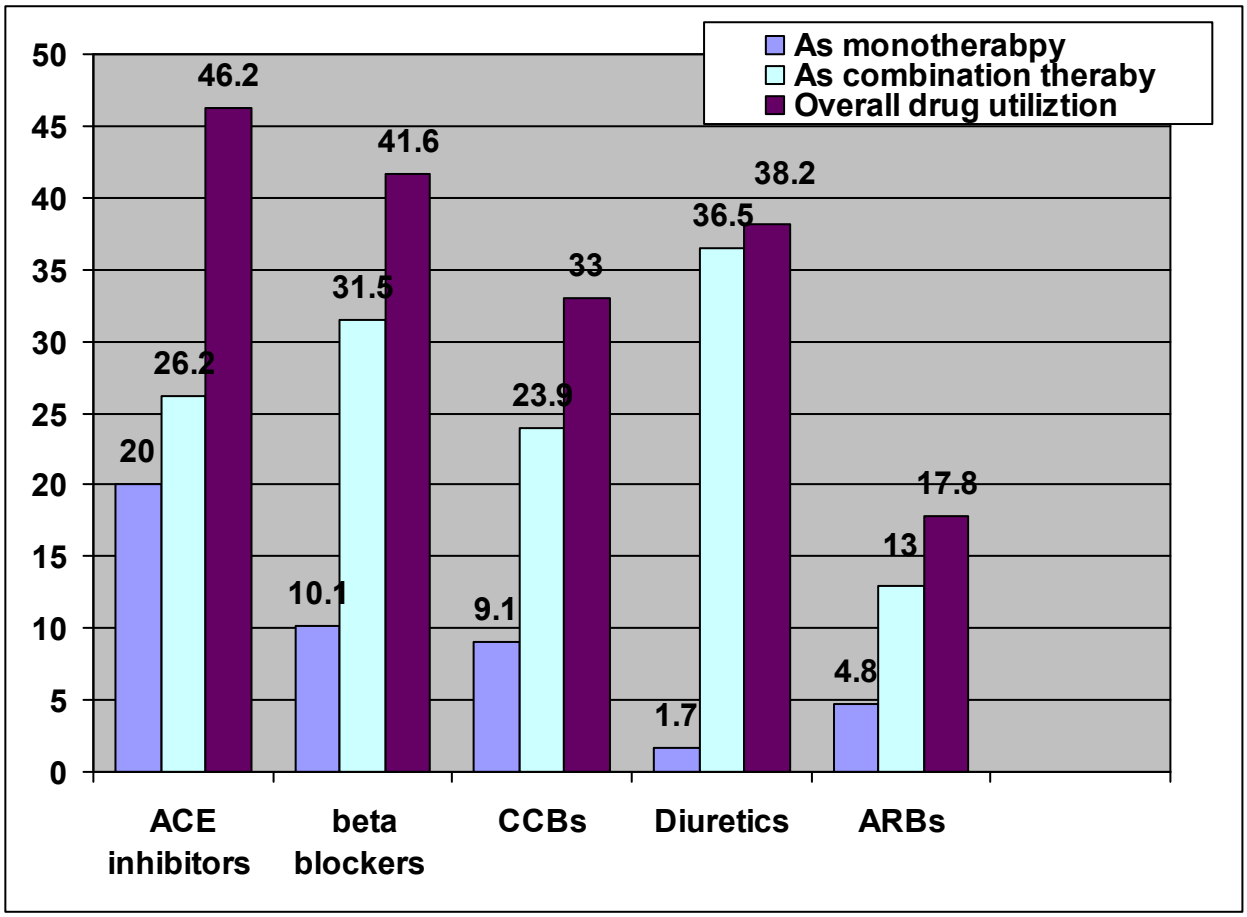

Fig 2. Percent of drugs prescribed as monotherapy and as combination and overall utilization.

Table18. Frequency of drugs prescribed either as monotherapy or as combination and overall utilization.

Drug group	***As Monotherapy***	***As combination therapy***	***Overall drug Utilization frequency (%)****	
ACE inhibitors	**83**	109	192	**46.2** %
ARB	**20**	54	74	**17.8** %
B blockers	**42**	131	173	**41.6** %
Diuretics	**7**	152	159	**38.2** %
CCBs	**38**	99	137	**33** %
Total	**190**	545	**735**	

* Total exceeds 100%, since the average patient received more than one drug**.**

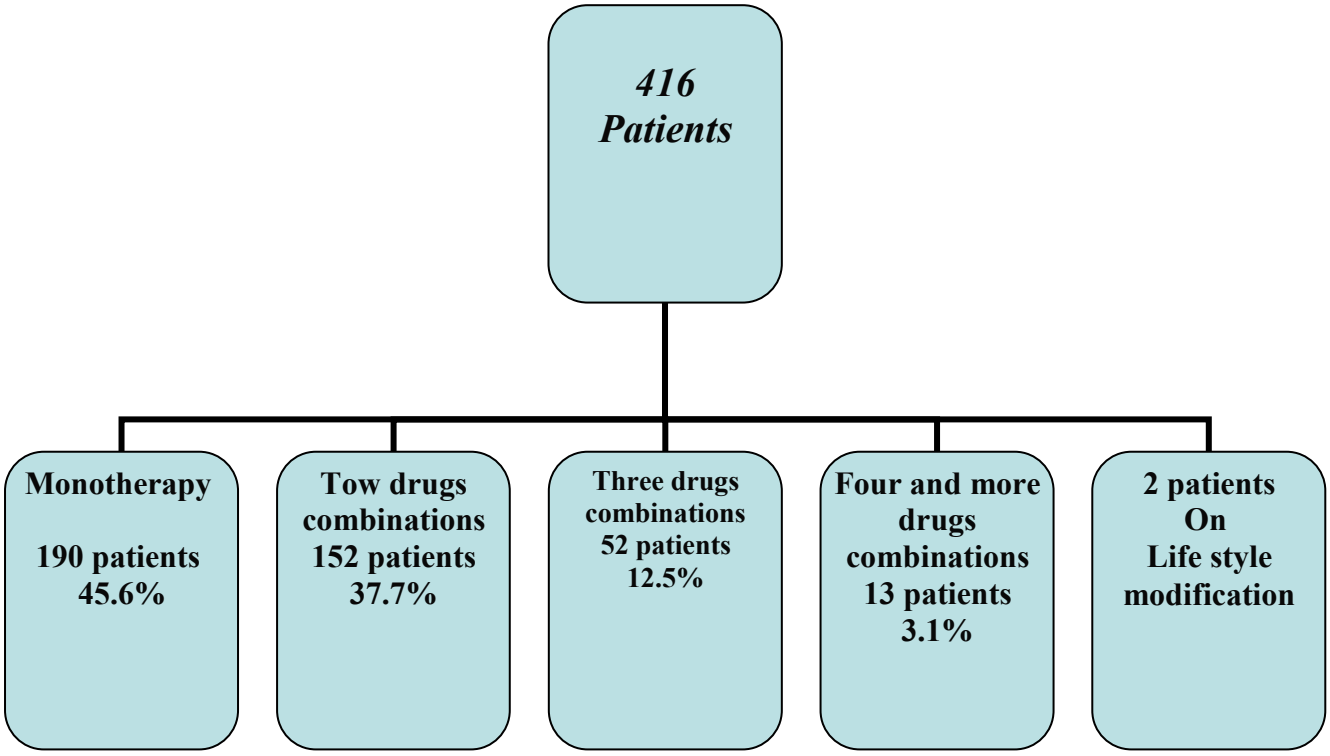

Fig 3. Summary of overall management of hypertensive patients and prescription pattern

6.3.3. Specific antihypertensive drug prescribed

Tables 19 and 20 represent the individual drugs prescribed from each antihypertensive drug class either as single agent or in combination. In this study the most prescribed drug was enalpril which was prescribed to 148 patients (35.6%) followed by atenolol which was prescribed to 111 patients (26.7%), amlodipine ranked third which was prescribed to 109 patient (26%), indapamide to 65 patient (15.6%), candesartan was prescribed to 44 patient (10.6%), and bisoprolol to 42 patients (10%)

6.3.4. Utilization of antihypertensive drugs among diabetic patients

Table 21 show the utilizing of antihypertensive drugs among patients with diabetes mellitus. The most utilized drugs as monotherapy were ACE inhibitors (26.7%), while β blockers most utilized drugs as combinations therapy among diabetic patients.

Table 19. Specific drugs prescribed in overall prescription.

ß blockers	ACE Inhibitor	ARBs	CCBs	Diuretics
Atenolol 26.7%	Enalpril 35.6 %	Candesartan 10.6%	Amlodipine 26%	Indapamide 15.6%
Bisoprolol 10%	Ramipril 2%	Valsartan 4.7 %	Nifedipine 2.2%	HCT 13%
Carvedilol 2%	Lisinopril 2%	Telmisartan 1.2%	Felodipine 1.4%	Fursomide 7.7%
Propranolol 1%	Captopril 1.7%		Diltiazem 0.7%	Amiloride 4.8%
Metoprolol 0.5%	Perindopril 1.2%			
	Fosinopril 0.7%			

HCT: Hydrochlorothiazide

Table 20.List of drugs prescribed from each class of antihypertensive agent.

Class	Drugs
Beta blockers	Atenolol, bisoprolol, carvidiolol, propranolol, metoprolol,
ACE inhibitors	Ramipril, enalapril, lisinopril, fosinopril, quinapril, perindopril, captopril , trandolapril
Angiotensin receptor Blockers	Valsartan, candesartan, losartan, telmisartan
Calcium channel Blockers	Amlodipine, nifedipine, felodipine, diltiazem and verapamil
Diuretics	Amloride, hydrochlorothiazide, indapamide, fursomide Spironolactone
Others	Brinerdine*, Doxazosin

Brinerdine (dihydroergocristine + resirpine+clopamide)

Table 21. Antihypertensive drug prescribed for diabetic patients: (n=131)

	As monotherapy		As combinations therapy	
	Number	**percents**	**Number**	**percents**
ACE inhibitors	35	(26.7%)	30	(23%)
Angiotensin receptors blockers	7	(5.3%)	20	(15.3%)
β Blockers	8	(6%)	38	(29%)
Diuretics	--		37	(28.2%)
Ca^{2+} channel blockers	6	(4.5%)	37	(28.2%)

6.4. Blood pressure control

Blood pressure measured after the first visit and after the last visit was found to be as shown in Table 22.

Table 23 compares the blood pressure level in first and last visit to Family Medicine Clinics according to "ESH/ESC Definitions and Classification of Blood Pressure Levels" presented in table (1). These results express the effectiveness of treatment and management of hypertension in Family Practice Clinics. In 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 % had high-normal blood pressure.

Table 22. Systolic and diastolic blood pressure at first visit and last visit.

	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 significant (p-value of <0.05 was considered statistically significant)

Table23. Comparison between blood pressure in first *VS* last visit.

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 (sever)	63 (15.1%)	13(3.1%)
Isolated systolic hypertension	16 (3.8%)	21(5%)
Hypotension*		12 (2.9%)

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

The mean SBP± SD in first visit in males was 156± 13.72 mmHg and in females was 158± 14.04 mmHg, DBP in first visit in males was 94±8.03 mmHg and in females was 95±8.27 mmHg. In last visit SBP±SD in males was 133.6± 18.15 mmHg, close to females133.22±18.62 mmHg, while DBP in male was 83.89±9.88 mmHg close to the females 82.82±10.26 mmHg.

6.5. Other drugs prescribed

Concomitant medical illnesses:

The study group was found to be suffering from different diseases: 31% were diabetic, 34% were having hyperlipidemia, 12% had ischemic heart diseases and 18% had osteoporosis (table 11). Therefore patients received in addition to antihypertensive drugs, other drug such as antiplatlets, antihyperlipidemia and hypoglecemic drugs. About 52% of our study population received antiplatlet drugs and 45% received antihyperlipedmia and 26% received hypoglycemic agents and 18.5% received proton pump inhibitors (PPIs) and other drugs as prescribed are shown in Table (24).

Table 24. Other drug prescribed to patient in addition antihypertensive drugs.

Drug prescribed	Frequency	Percent (%)
Antiplatlet Drugs	215	52%
Drug for hyperlipidemia	185	45%
Hypoglycemic agent	110	26%
Proton pump inhibitors	77	18.5%
Drug for osteoporosis	61	14.6%
H2 blockers	27	6.5%
Antithyroid drugs	26	6.3 %
NSAIDs	31	7.3%
Antiallergic drugs	5	1.2%
Nitrates	28	6.7%
Drug for gout	14	3.4%
Antidepressant	2	0.5%
Alpha blockers	10	2.4%
Anticonvulsant	9	2%
Antiarrythmic drugs	7	1.7%
Bronchodilators	5	1.2

Note: the percent exceeds 100% because some patients may received more than one drug at the same time.

6.6. Laboratory investigations:

Table 25 shows the laboratory investigations performed for the patients included in the study. Among the 416 patients (N=416); 93% of the sample had base line readings of fasting or random blood glucose level, 29.8% of them had a blood glucose level outside the reference range. the last reading of blood glucose level observed that 48.6% of the sample had level outside reference range. Total cholesterol was above the reference range in 37% and 28.6% in first and last visit respectively. High density lipoprotein (HDL) dose not within reference range in 68.5% of patients in first visit and 55.8% in last visit. Low density lipoprotein (LDL) was found to be above the reference range in 66.8% in first visit and 50.5% in last visit. Serum potassium was not measured in 13.9% of patient in first visit and on 41.8% in last visit. Other details are presented in Table (26).

6.7. Side effect:

Table 26 show the documented side effect related to antihypertensive drugs use. Postural hypotension found to be the most recorded side effect which appears in 47.4% of patients followed by lower limp edema 35.1% of patients followed by palpitation 30.5% of patients. While Hyperkalemia the least documented side effect (3.6%) of patients.

Table 25. Lab test in first and last visit.

	First visit		Last visit	
Blood glucose	Out side reference range Within reference range Not done	29.8% 63.5% 6.7 %	Out side reference range Within reference range Not done	48.6% 24.5% 26.9%
Total cholesterol	Out side reference range Within reference range Not done	37 % 48.6% 15.9%	Out side reference range Within reference range Not done	28.6% 38.5% 32.9%
LDL	Out side reference range Within reference range Not done	66.8% 14.9% 18.3%	Out side reference range Within reference range Not done	50.5% 15.1% 34.4%
HDL	Out side reference range Within reference range Not done 17.5%	68.5% 13.7%	Out side reference range Within reference range Not done	55.8% 10% 34.1%
Triglyceride	Out side reference range Within reference range Not done	40.4% 41.6% 18%	Out side reference range Within reference range Not done	30.8 % 34.6 % 34.6 %
Serum potassium	Out side reference range Within reference range Not done	4.1% 82% 13.9%	Out side reference range Within reference range Not done	4.6% 53.6% 41.8%
BUN	Out side reference range Within reference range Not done	59.1% 10.3% 30.5%	Out side reference range Within reference range Not done	9.1% 45 % 45.9 %
HbA1c	Out side reference range Within reference range Not done	9.9 % 6.5 % 83.7 %	Out side reference range Normal Not done	8.7% 4.8% 86.5%
Protein in urine	Out side reference range Within reference range Not done 38.9 %	14.7 % 46.4 %	Out side reference range Within reference range Not done	10.1 % 28.8 % 61.1 %
Serum Creatnine	Out side reference range Within reference range Not done	15.6 % 72.6 % 11.8 %	Out side reference range Within reference range Not done	16.1 % 51 % 32.9%

Note: HDL, high-density lipoprotein; LDL, low-density lipoprotein; BUN, blood urea nitrogen

Table 26.Frequancy of documented side effect in the study population (N=416).

Side effect	Yes (N)(%
Postural hypotension	**197 (47.4%)**
Swelling of lower limb	**146 (35.1%)**
Palpitations	**127 (30.6%)**
Flushing	**96 (23.1%)**
Constipation	**79 (19%)**
Cough	**72 (17.3%)**
Impotence*	**70 (16.8%)**
Hypokalemia	**17 (4.1%)**
Hyperkalemia	**15 (3.6 %)**

*Note: impotence calculated for male patients(N=157).

6.8. Life style modification:

Among 416 patients involved in the study, 218 (52.4 %) were found to be obese and 166 (39.9%) were over-weight. Only 71 patients (17.1%) had a reduction in their weights and 152 patients (36.5%) reported an increase in their body weight, while 194 patients (46.6%) had no change in their body weight. Eleven percent of the study population found to be smoker (cigarette or argila) and 38.5% were passive smokers. Only 2 patients (0.5%) were found to be EX- smokers. Alcohol drinking was reported by 1.4% of patients. No physical activity reported in146 patient (35.1%).

Concerning salt consumption 269 patients (64.7%) use low salt intake, 144 patients (34.6%) used moderate salt intake, and 4 patients (0.7 %) add extra salt to their food.

There were 231 patients (55.5%) who use low fat diet and 172 patients (41.3%) on moderate fat consumption, while 13 patients (3.1%) use high fatty diet. 172 patients (41.3%) follow sugar intake 211 patients (50.7%) use moderate sugar diet, 33 patient (7.9 %) us high sugar diet, 203 patients (48.8%) use high vegetable diet and 208 (50%) use moderate vegetables consumption and 5 patient 1.2% use low vegetable diet, 172 patient (41.3 %) use high fruit diet 232 of them (58.8 %) use moderate fruit diet and 10 patient (2.4%) use low fruit diet 88 patients (21.2%) use liquorices 3 of them consume it frequently and 85 patient use it occasionally this result give indication that the health education and lifestyle modification were not achieved in all patients as advised by international hypertension management guidelines.

Table 27.Adherance to lifestyle modification among the study population.

		Frequency	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	36.6
	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	38.5
	Smoker	42	10
	Ex smoker	25	6
	Argila smoker	4	1
	Not smoker	185	44.5
	Total	416	100
Physical activates	No physical activates	146	35.1
	Physically active *	270	64.9
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
	Moderate fat diet	172	41.4
	High 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

* walks 30 min a day for at least 4time weekly.

6. Discussion

HTN is considered of the main risk factors for cardiovascular diseases (Glasser, 2001) (Pocok et al., 2001)(Palatini et al., 2001), heart failure (Tocci et al., 2008), stroke (Rodgers et al., 2004) and kidney disease (Toto, 2005). Consequantly the incidence rates of stroke and ischemic heart disease are reduced in proportion to BP reduction (Ostfeld and Wilk, 1990)(Sung et al., 2002), (Wachtell et al., 2002). It is important to identify the major causes of failure to control HTN and explain the poor BP control in patients under medical care.

Hypertension is one of the most prevalent conditions in Jordan; with 20.6% of people suffering from this chronic disease (Al-Safi et al., 2006). This 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. A study about awareness of physicians in Jordan about treatment of HTN showed that only 60% of the physicians interviewed have heard about the JNC VII guidelines without necessarily following their updates regarding recommendations. The study of utilization of antihypertensive drugs was not previously well investigated in the literature both in Jordan and around the world. There are few studies in Jordan and within Arab countries that address this problem. Also utilization of antihypertensive drugs and BP control in Jordanian population was not previously well investigated. We interviewed and checked medical records data of 416 patients about prescription pattern and efficacy of antihypertensive therapy.

In this study, it has been observed that hypertension was more prevalent in females than in males, where 62.3% of the study populations were females and 37.7% were males, it was reported that the prevalence of hypertension in females is higher than in

males in Jordanian population (Jaddou *et al*., 1996). This is similar to data obtained in Bahrain where 57.9% were females (Al Khaja et al., 2001), and also similar to a study from Kuwait, where 59.8% were females (Al-Mehza et al., 2004). However, these results differ from a similar study in Palestine where only 46.2% were females (Sweileh, 2003). In the current study most of the study population (86.3%) were above or equal to 50 years of age and 57% of them were in the age group (50-64) years.

Prescription pattern:

The study of the prescription pattern and utilization of antihypertensive drugs gives 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 gives an overview about the prescription behavior of physicians and the factors that affect the antihypertensive drug utilization. It also investigates the rational selection of antihypertensive drug therapy and identify points for future intervention and improvements and avoid the related health complications.

The present study revealed that the majority of patients were receiving ACE inhibitors (44.4%), followed by ß blockers (40%) and diuretics were prescribed to (36.4%) of study population.

Monotherapy:

In the current study, we reported that about half of patients (45.6%) were treated with monotherapy. This is consistent with increased drug compliance and decreased incidence of side effects. As monotherapy, the most prescribed drugs were ACE inhibitors in 20% of population followed by beta blockers (10%) and diuretics were prescribed alone to only 1.7 % of the patients. According to 2003 European Society of

Hypertension–European Society of Cardiology guidelines for the management of arterial hypertension (2003 ESH/ESC), monotherapy is likely to be successful more frequently for grade1 hypertensives. In ALLHAT, which recruited grade1 and 2 hypertensives mostly on monotherapy, about 60% of the patients remained on monotherapy. In the HOT study, which recruited grade 2 and 3 hypertensives, monotherapy was successful in only 25–40% of patients, according to the target diastolic blood pressure.

In Bahrain a study on antihypertensive drugs prescription trends at the primary health care centers, reported that (62.9%) of the study population were on monotherapy and β blockers the most prescribed class as monotherapy (58.8)%, followed by ACE inhibitors (14.2%), CCBs (11.1%), diuretics (8.1%) and methyldopa (7%) while ARBs were not prescribed in this survey (Al Khaja et al., 2001). These data were not compatible with our study, where ACE inhibitors were extensively used (43.7%) followed by β blockers (22%), CCBs (20%), ARBs (10%) and diuretics (3.7%). Another study in Egypt showed that 75.0% of the participants were managed with a single drug (Youssef and Moubarak, 2002).

Sweileh (2003) studied prescription pattern of antihypertensive drugs dispensed at community pharmacies in Palestine and revealed that the percentage of monotherapy prescriptions was 48.25%. Among the monotherapy prescriptions, ß-blockers were the most commonly prescribed drugs.

Another Palestinian study by Sweileh et al., (2009) involved antihypertensive therapy in diabetic and IHD patients in Palestine. A total of 11 (10.1%) patients were on no pharmacologic therapy, 45 (41.3%) on monotherapy and 53 (48.6%) were on combination therapy. ACE inhibitors were the most commonly (22.9%) prescribed.

The data about monotherapy in the present study is similar to what has been found in primary care patients in Italy, where 33.7% of patients were on monotherapy (Sturani et al., 2002). In France, a general practice survey revealed that 58% of all hypertensive patients received monotherapy (Chamontin et al., 1998). Many others studies suggest that monotherapy was not sufficient, and aggressive therapy with two or more drug combinations was required. In the PRATIK study about half of patients with uncontrolled hypertension, were on monotherapy (Amar et al., 2002). Likewise, in the ABC-GP, 31% of uncontrolled patients were on monotherapy and 43% on two drugs (Stergiou et al., 2003).

Despite that diuretics being the most extensively recommended as a first line therapy for hypertension, diuretics were prescribed as monotherapy to only (1.7) % of patients which dose not agree with the JNC7 recommendations. The published international guidelines for antihypertensive treatment, JNC7 in 2003 and 2003WHO/ISH (Whitworth, 2003) recommended low dosages of thiazide diuretics and β blockers as first-line therapy for treatment of essential HTN with no compelling indications.

A Jordanian study showed that only 47.6% of physicians recommended the use of thiazide diuretics as an initial drug for treatment of high BP, although it is recommended as the first drug of choice for hypertensive patients with an appreciable CVD risk (Al-Azzam et al., 2007).

Diuretics also have been found to be the mainly prescribed class of antihypertensive drugs in the United Kingdom (Walley et al., 2003), Denmark (Fretheim and Oxman., 2005) and the United States (Ma et al., 2006). In our study diuretics alone were administered alone to only 7 patients (1.7%), and they were the fifth most prescribed

antihypertensive drugs. However, overall utilization of diuretics increased to 38.2% which is in accordance with international guidelines.

Combination therapy:

In the current study 54.3% of patients were on combination therapy. Two antihypertensive drug regimen was prescribed to 37.7% of patients, while 12.5% of patients were on three drug regimen. Diuretics with Beta-blockers were the most prescribed combination in the current study (17.3%) either as two or more drugs combinations, followed by ACE inhibitors with β blockers (11.5%) and ACE inhibitors with diuretics (11.5%). Overall, diuretics were the most prescribed drug as combination therapy and significantly increased from 1.7% as monotherapy to 32.8% as combination therapy.

The most recent HTN guidelines (JNC7; 2003WHO/ISH) recommend combination therapy as the first-line treatment, especially in patients with severe HTN. The rationale for combination pharmacotherapy in HTN is to maximize antihypertensive efficacy and to minimize side effects (Chobanian et al., 2003, ESH/ESC, 2003).

The 2003 ISH/WHO guidelines, recommended ‘‘all available drug classes for the initiation and maintenance for antihypertensive therapy’’ (i.e., diuretics, β-blockers, calcium channel blockers, ACE inhibitors, ARBs and alpha blockers), but indicated that the choice of drugs is influenced by many factors such as socio-economic, cardiovascular risk factors, co-existing diseases, patient responses, interactions, and strength of evidence. According to our data, it is likely that those differential considerations are applied in a limited manner. For example, age was a compelling indication for the selection of diuretics (Whitworth, 2003).

Despite that the majority of international HTN guidelines (Chobanian *et al.,* 2003),(ESH/ESC,2003) recommended combination therapy as a first line therapy and despite that the large, randomized studies have demonstrated that most patients require two or more agents to control BP (Hansson et al, 1998, Cushman et al., 2002), and that combination therapy seems to be a rational approach to reduce the cardiovascular mortality (Mancia and Grassi., 1998), our study revealed that nearly half of our study population (45.6%) were on single antihypertensive drug.

This study revealed that ACE inhibitor were the drugs of choice for hypertensive patients as a single drug therapy (43.7%) with an overall utilization of 46.2%, followed by β-blockers which were less prescribed as a monotherapy (22%) and less prescribed in overall utilization (41.6%), followed by calcium channel blocker which ranked third as single therapy (20%). Diuretics were found to be the most drug prescribed as combination therapy followed by β-blockers followed by ACE inhibitors then calcium channel blocker and finally ARBs.

According to Sweileh (2003), combination therapy prescriptions were 51.75%. Among the combination therapy, the β-blockers / diuretics were most common (this is consistent with our data on the current study). Also irrational combination therapy of β-blockers /ACE-I was noticed.

An Egyptian study showed that only 25% of patients receive a combination of 2 (23.4%) or 3 (1.6%) drugs of different classes (Youssef and Moubarak, 2002).

Al Khaja et al (2001) found that in Bahrain combination therapy was used in 37.1% of cases and diuretics were the most commonly prescribed drugs in combinations (20.3%), while β blockers were the most commonly prescribed drugs in overall

utilization. The most prescribed individual agent was atenolol in beta blockers (97.7%) and indapamide in diuretics (35.4%).

There was a tendency to use combination therapy, 53.4 % received two or more drugs, while 45.6 % received Monotherapy. Although large, randomized studies have demonstrated that most patients require two or more agents to control BP (Hansson et al., 1998, Cushman et al., 2002). Accordingly, the most recent hypertension guidelines recommend combination therapy as the first-line treatment, especially in patients with severe HTN (Chobanian et al., 2003) (ESH/ESC, 2003). The 2008 Canadian HTN Education Program (CHEP) guidelines now recommend combination therapy as a first line option in patients with initial blood pressure ≥20/10 mmHg above target (Khan et al., 2008). Despite these recommendations, nearly half (45.6%) of the patients in our study were receiving monotherapy.

A study conducted in USA revealed that twice the number of patients (7.3 million) were taking ACE-I and CCB compared to diuretics and β-blockers (3.1 million) as the first line therapy, which is in sharp contrast to the JNC VI guidelines (Guo et., 2003).

Hypertension control:

In the current study, 31.4% of patients were diabetic, 12% were having IHD, 34% had hyperlipidemia and 2% were having chronic kidney diseases in addition to HTN. This indicates that our patients need more aggressive treatment or/and drugs modification to reach the acceptable BP level. In our study mean systolic blood pressure in first visit was SBP±SD (157.4±13.9 mmHg) and in last visit mean SBP±SD was (133.4±18.4 mmHg). Mean DBP in first visit found to be (94.6±8.2 mmhg) and mean (DBP) in last visit was (83.22±10.12mmhg). There were only limited gender differences in first and last visit. The international Guide lines 2003 WHO/ISH and

JNC7 recommended goal of the treatment to be below 140/90 mmHg. Large majority of all hypertensive patients received drug treatment; in accordance to recommended goal by international guidelines, control rates were acceptable for patients without complication. American Heart Association 2007 recommended blood pressure goal <130/80 for patients with diabetes mellitus, IHD and chronic kidney disease, known coronary artery disease (myocardial infarction, stable angina, unstable angina) and noncoronary atherosclerotic vascular disease (Owan et al., 2006), (Dipiro et al., 2009).

In a Jordanian study, HTN was not controlled to the recommended levels of blood pressure in about one-half (50.4%) of patients (Mubarak et al., 2008).

In the PRATIK study about half of patients with uncontrolled hypertension, were on monotherapy (Amar et al 2002). Likewise, in the ABC-GP study, 31% of uncontrolled patients were on monotherapy and 43% on two drugs (Stergiou et al 2003), suggesting that the potential of antihypertensive treatment has not been exhausted. The most recent outcome trials in HTN showed that an intensive up titration treatment strategy together with a systematic use of full doses of multiple drug combinations might improve control rates up to 70% (Julius et al., 2004) (Pepine et al., 2003).

A German study by Pittrow et al (2004) found that control rates were poor and 70.6% of all hypertensive patients were not controlled and mean BP levels were 144.5/84.5 mmHg.

Concomitant problems:

The present study revealed that HTN was more prevalent in females than in males. The most frequent health problems and co-morbidities were hyperlipidemia (34%),

Diabetes mellitus (31.4%), osteoporosis (18%), ischemic heart disease (12%) and chronic kidney diseases (2%). Studying concumitant heath problems with hypertension is very important for proper strategy in selecting convenient antihypertensive therapy.

Antihypertensive Drugs related side effects

Patients complained from many side effects related to antihypertensive drugs use. We found that 30.6 % of population complained of palpitations and 16.8% complained from impotence (male) and 17.3% complained of cough. Flushing which appeared in 23.1% of patients and 19% of patients had constipation, 47.4% of patients complained of postural hypotension and 35.1% complained of lower limb edema, 3.6% with hyperkalemia and 4.1% with hypokalemia.

Laboratory investigation:

In this study, it appears that there are some important basic investigations that should be perform red to hypertensive patients both in first visit and last visit. Serum potassium level is an important blood test and should be measured both as a screen for mineralocorticoid-induced hypertension and to provide a baseline before beginning diuretic therapy. In this study, serum potassium was not measured in 11.8% of the patient in the first visit and not measured for 32.9 % of patients in the last visit.

We observed that LDL and HDL are abnormal in more than half of study population in (66.8% and 68.5% respectively) and total cholesterol was abnormal in 37% of patients. Triglycerides found to be out side reference range in 40.4% in first visit, in last visit triglycerides out side reference range 30.8 %.Serum creatinine was abnormal in 15.6% of patients and BUN was abnormal in 59.1% of the patients.

Lifestyle

The result of current data reported that no lifestyle modification was followed by patients or recommended by physicians. The data showed that among our patients, nearly 49.5% were smokers or passive smokers, half (52.4%) were obese, 39.9% were overweighs, and 35.3% did not follow low salt diet. The majority of patients followed sedentary lifestyle and consumed inappropriate diet. Therefore, non-pharmacological treatment needs more attention from both physicians and patients.

7. Recommendations

1. A continuing education program for physicians regarding current international guidelines is recommended.

2. Physicians should be more serious and aggressive on management of hypertension.

4. More attention for combination therapy by physicians is recommended.

5. Lifestyle modification needs more attention by physicians and patients.

8. Conclusions

1. We concluded from this study that there was relatively equal use of combination and monotherapy among hypertensive patients in general.
2. The majority of patients were not on target blood pressure.
3. Patterns of antihypertensive therapy were generally but not adequately consistent with international guidelines especially JNC7.
4. Further studies and researches needed to focus on this important subject.

9. Limitations

The result of this study can not guarantee that the prescriptions being analyzed originated from Family Practice Clinic only. Many of them were prescribed drugs where else and usually patients come to Family Practice Clinics only for refill.

10. References

Abaci, A., Kozan, O., Oguz, A., Sahin, M., Deger, N., Senocak, H., Toprak, N., Sur, H., Erol, C. (2007). Prescribing pattern of antihypertensive drugs in primarycare units in Turkey: results from the TURKSAHA study. ***Eur J Clin Pharmacol***: 63:397–402

Al-Safi, S.A., Aboul-Enein., F.H., Aboul-Enein., B.H.(2006). Influence of family history and lifestyle on blood pressure and heart rate in young adults in Jordan. ***Public Health.***120, 1027–1032

Appel, L.J., Moore, T.J., Obarzanek, E., Vollmer, W.M., Svetkey L.P., Sacks, F.M., Bray, G.A., Vogt, T.M., Cutler, J.A., Windhauser, M.M., Lin, P.H., Karanja, N. (1997). "A Clinical Trial of the Effects of Dietary Patterns on Blood Pressure". ***New England Journal of Medicine.*** **336** (16): 1117-1124. http://content.nejm.org/cgi/content/full/336/16/1117.

Al- Mehza A.M,. Al-Yahya A .A., Al-Qattan M .M. Al-Duwaisan H ,S,. Al-Otaibi D .NMB.2004. Determinants of Poor Blood Pressure Control in Hypertensive Patients - An Area-based Study***. Kuwait Medical Journal***, 36 (4):270-274

Al Khaja, J.K.A, Sequeira, R.B., Abdul Wahab, A.W.M., Mathur, V.S.2001. Antihypertensive drug prescription trends at the primary health care centers. ***Pharmacoepidimilogy and Drug Safety.***10: 219-227

Al-Azzam, S.I., Najjar, R.B., Khader, Y.S. (2007). Awareness of physicians in Jordan about the treatment of high blood pressure according to the seventh report of the Joint National Committee (JNC VII). ***European Journal of Cardiovascular Nursing***. 6 223–232

The ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group. Major outcomes in high-risk hypertensive patients randomized to angiotensin-converting enzyme inhibitor or calcium channel blocker vs diuretic: The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). ***JAMA.*** 2002;288:2981-2997.

Amar, J., Vaur, L., Perret, M., et al. 2002. PRATIK study investigators.Hypertension in high-risk patients: beware of the underuse of effective combination therapy (results of the PRATIK study). ***J Hypertens***; 20: 779–784

Amann., B., Tinzmann., R.and Angelkort, B.(2003).ACE Inhibitors Improve Diabetic Nephropathy Through Suppression of Renal MCP-1. ***Diabetes Care***.26:2421–2425

American Diabetes Association. 2003. Treatment of hypertension in adults with diabetes. ***Diabetes Care*** ;26:S80-2.

Anne, M., Kimble, K. 2008.Applied therapeutic the clinical use of drugs, 9th ed. Lippincott, Williams & Wilkins.

Approaches to Stop Hypertension (DASH) diet.DASH-Sodium Collaborative Research Group.*N* ***Engl J Med***;344 :3-10.

Bakris, G.L., Williams, M., Dworkin, L., Elliott W.J., Epstein, M., Toto, R., Tuttle K., Douglas, J., Hsueh, W., Sowers, J.(2000). preserving renal function in adults with hypertension and diabtes :a consensus aproch .national kidney foundation hypertension and diabetes executive committees working group. **Am J Kidney Dis**: 36: 646–661.

Bahou, Y., Hamid, H., Raqab, M.Z. Ischemic Stroke in Jordan 2000 to 2002.(2004). A Two-year, Hospital-based Study. ***Journal of Stroke and Cerebrovascular Diseases***.Vol. 13, No 2. pp 81-84.

Barnett, A.H. 1994. Diabetes and hypertension. **Br Med Bull**.; 50:397-407

Bittar N.1995. Maintaining long-term control of blood pressure: the role of improved compliance. ***J Clin Cardiol*** ; **18** (Suppl III): 12–16.

Burt VL, Whelton P, Roccella EJ, et al. Prevalence of hypertension in the US adult population: results from the Third National Health and Nutrition Examination Survey, 1988–1991. *Hypertension*. 1995;25:305–313.

Berlowitz DR, Ash AS, Hickey EC, Friedman RH, Glickman M, Kader B, Moskowitz MA. 1998. Inadequate management of blood pressure in a hypertensive population. ***N Engl J Med***.; 339:1957–1963.

Burt, V.L., Culter, J.A., Higgins, M., Horan, M.J., Labarthe, D., Whelton, P., Roccella, E.J. Trends in the prevalence, awareness, treatment, and control of hypertension in the adult US population. Data from the health examination surveys, 1960 to 1991. **Hypertensio**n. 1995;26:305-313 .

Braunwald, E et al .2002..ACC/AHA2002 guideline update for the management of the patients with unstable angina and non ST-segment elevation myocardial infarction –summary article:a report of the American college of Cardiology /American heart Association task force on practice guideline (committee on the management of patient with unstable angina). **J Am coll Cardiol**;40:1366

Bulpitt C.J., Fletcher, A.E, Beckett, N, Coope J, Gil-Extremera B, Forette F, Nachev C, Potter J, Sever P, Staessen J, Swift C, Tuomilehto J.2001, Hypertension in the Very Elderly Trial (HYVET): protocol for the main trial. ***Drugs md Aging***. 2001;18 (3):151-64.

Brown, D.W., Mokdad, A.H., Walke, H., As'ad, M., Al-Nsour, M., Zindah, M., et al. .(2009).Projected Burden of Chronic, Noncommunicable Diseases in Jordan. [letter]. **Prev Chronic Dis**;6 (2). http://www.cdc.gov/pcd/issues/2009/apr/08_0162.htm .

Caldwell, J.R., Theisen, V., Kaunisto, C.A., Reddy, P.J., Smythe, P.S. and Smith, D.W.(1983). Psychosocial factors influence control of moderate and severe hypertension. **Social Science & Medicine**, 17(12), 773-782

Chamontin, B., Poggi, L., Lang, T., et al.(1998). Prevalence, treatment, and control of hypertension in the French population: data from a survey on high blood pressure in general practice, 1994. ***Am J Hypertens***.;11:759–762

Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Green, L.A., Izzo, J.L., Jones, D.W., Materson, B.J., Oparil, S., Wright, J.T. Jr. and Roccella, E.J.(2003). Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. ***Hypertension,*** 42, 1206 –1252.

Cuspidi C, Michev I, Lonati L, Vaccarella A, Cristofari M, Garavelli G, Palumbo G, Meani S, Leonetti G, Magrini F, Zanchetti A. (2002).Compliance to hypertension guidelines in clinical practice: a multicentre pilot study in Italy. ***J Hum Hypertens*.;**16:699–703.

Chiang, W.K., Jamshahi, B. "Asymptomatic hypertension in the ED".(1998). ***The American Journal of Emergency Medicine* .16** (7): 701–4. PMID 9827753.

Chrysant, G.S., Oparil, S. (2001),Treatment of hypertension in the patient with cardiovascular disease. In: Antman EM (editor): ***Cardiovascular Therapeutics: A Companion to Braunwald's Heart Disease***. Philadelphia, PA: W.B. Saunders;. pp. 768-95.
Colhoun, H.M, Dong W., Poulter, N.R. Blood pressure screening, management and control in England: results from the Health Survey for England 1994. ***J Hypertens.*** . 1998; 16: 747–752.

Cushman WC, Ford CE, Cutler JA et al, ALLHAT Collaborative Research Group (2002) Success and predictors of blood pressure control in diverse North American settings: the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT**) .J Clin Hypertens**. 4:393–405

Daniel, W.W.(2005), Biostatics: A Foundation for Analysis for Health Sciences, 2005, 8th ed. John Wiley & Sons.

Degli Esposti, E., Sturani ,A., Martino, M.D., Falasca, P., Novi, M.V., Baio, G., Buda, S., and Volpe, M. (2002). Long-term persistence with antihypertensive drugs in new patients. **Journal of Human Hypertension**. 16, 439–444

Dickson, M.E., Sigmund, C.D. (2006). "Genetic basis of hypertension: revisiting angiotensinogen". ***Hypertension***. 48 (1): 14–20.
http://hyper.ahajournals.org/cgi/content/full/48/1/14.

Decker, W.W., Godwin, S.A., Hess, E.P., Lenamond, C.C., Jagoda, A.S. (2006). "Clinical policy: critical issues in the evaluation and management of adult patients

with asymptomatic hypertension in the emergency department**".** ***Annals of Emergency Medicine***. 47 (3): 237–249. http://linkinghub.elsevier.com/retrieve/pii/S0196-0644(05)01790-7.

Djoussé, L., Mukamal, K.J. (2009), "Alcohol Consumption and Risk of Hypertension: Does the Type of Beverage or Drinking Pattern Matter?". ***Rev Esp Cardiol* .** 62 (6): 603-605. http://www.revespcardiol.org/cgibin/wdbcgi.exe/cardio/mrevista_cardio.pubmed_full?inctrl=05ZI0113&vol=62&num=6&pag=603

Dipiro, J.T., Talbert, R.L., Yee, G.C., Matzke,G.R., Wells, B.G., Posey, L.M. (2009).Pharmacotherapy a pathological approach .7th ed. New York: McGraw-Hill Companies, Inc.

Dahlof, B., Devereux, R.B., Kjeldsen, S.E., Julius, S., Beevers, G., de Faire, U., et al. LIFE Study Group. Cardiovascular morbidity and mortality in the Losartan Intervention For Endpoint reduction in hypertension study **(LIFE):** a randomised trial against atenolol. **Lancet**. 2002; 359: 995–1003.

Elzubier, A..G., Husain, A.A., Suleiman, I.A. and Hamid, Z.A. (2000). Drug compliance among hypertensive patients in Kassala, eastern Sudan..**East Mediterranean Health Journal**, 6 (1), 100-105.

Eouropian Society of Hypertension and Eouropian Sciety of Cardiololgy Guidelines committee .2003 eouropian society of hypertension – eourpian society of cardiology guidlinees for management of arterial hypertension **.J Hypertens**. 2003 ; 21 : 1011-1053.electronic version : http:/www.esholine.org/documents/2003_guidelines.pdf last consulted September 2006.

Eselin, J.A., Carter, B.L. (1994).hypertension and left ventriclar hyperatrophy: is strong therapy beneficial ? .**Pharmacotherapy** :14:60.

Elley, C.R, Arroll, B. (2002). "Review: aerobic exercise reduces systolic and diastolic blood pressure in adults". ***ACP J. Club* 137** (3): 109. PMID 12418849. http://www.acpjc.org/Content/137/3/Issue/ACPJC-2002-137-3-109.htm.

Ernst, M.E., Moser, M. 2009.Use of Diuretics in Patients with Hypertension. **N Engl J Med ;**361:2153-64.

Etuk E, Isezuo SA, Chika A, Akuche J, Ali M.(2008). Prescription pattern of anti-hypertensive drugs in a tertiary health institution in Nigeria. ***Ann Afr Med.***7(3):128-32.

Fauci., Braunnald., Kasper and Longo.2006. Harrison's Principle of Internal Medicine . 17th ed. McGraw Hill Medical. New York

Fretheim A, Oxman AD.(2005).International variation in prescribing antihypertensive drugs: its extent and possible explanations. ***BMC Health Serv Res***. 2005, 5:21.

Garg, R., Yusuf, *S.* Overview of randomized trials of angiotensin-converting enzyme inhibitors on mortality and morbidity in patients with heart failure.1995. ***JAMA;***273:1450-1456

Glen, S.K.,(1996).Whit-coat hypertension as a cause of cardiovascular dysfunction .**Lancet**;348:654.

Glasser, S., P.(2001). Hypertension syndrome and cardiovascular events; high blood pressure is only one risk factor. Postgrad Med; 110:29-36.

Gorelick, P.B.(1995).Stroke prevention. **Arch Neurol** 52:347-355,

Gibbons, R.J., Abrams, J., Chatterjee, K., Daley, J., Deedwania, P.C., Douglas, J.S., et al. 2003. ACC/AHA 2002 guideline update for the management of patients with chronic stable angina—summary article: A report of the American College of Cardiology/American Heart Association Task Force on practice guidelines (Committee on the Management of Patients with Chronic Stable Angina). ***J Am Coll Cardiol***.41:159-68.

Grossman, E., Messerli, F. H.(1996). Diabetic and Hypertensive Heart Disease .**Annale of Internal Medicine**,125(4),304-310.

Guidelines Committee (2003) European society of Hypertension- European Society of Cardiology guidelines for the management of arterial hypertension. **J Hypertens** 21:1011–1053

Gu, Q., Ram, R. P., Dillon, C., Burt, V.2006. Antihypertensive Medication Use Among US Adults With Hypertension. ***Circulation*;**113;213-221. http://circ.ahajournals.org/cgi/content/full/113/2/213

Gueyffier F, Bulpitt C, Boissel J, Schron E, Ekbom T, Fagard R., Casiglia, E., Kerlikowske, K., Coope, J.(1999).Antihypertensive drugs in very old people: a subgroupmeta-analysis of randomised controlled trials. **Lancet**;793-6.

Guo, JD., Liu, GG., Christensen, DB., Fu, AZ., "How well have practices followed guidelines in prescribing antihypertensive drugs: the role of health insurance", ***Value Health***, **6(1)**, Jan-Feb (2003), 18-28

Hammoudeh A.J., Al-Tarawneh, H., Elharassis, A ., Haddad, J., Ziad Mahadeen, Z., Badran, N., Izraiq, M., Al-Mousa, E.(2005) .Prevalence of conventional risk factors in Jordanians with coronary heart disease: The Jordan Hyperlipidemia and Related Targets Study (JoHARTS).**International Journal of Cardiology** .110 :179–183.

Henderson, S.O., Bretsky, P., DeQuattro, V., Henderson, B.E.(2003).Treatment of hypertension in African Americans and Latinos: the effect of JNC VI on urban prescribing practices. ***J Clin Hypertens***.;5:107–112.

Hansson, L., Zanchetti, A., Carruthers, S.G., Dahlof, B., Elmfeldt, D., Julius, S., Menard, J., Rahn, K.H., Wedel, H. and Westerling, S. (1998). Effects of intensive blood-pressure lowering and low-dose aspirin in patients with hypertension: Principal results of the Hypertension Optimal Treatment (HOT) randomized trial. HOT Study Group. ***Lancet***, 351, 1755-1762.

He F, J. and MacGregor G,A .2003.Cost of poor blood pressure control in the UK: 62 000 unnecessary deaths per year**.** ***J Human Hypertens***.17, 455–457

Hasford ,J,. Schröder-Bernhardi, D., Rottenkolber M., Kostev, K., Dietlein, G. (2007). Persistence with antihypertensive treatments: results of a 3-year follow-up cohort study. ***Eur J Clin Pharmacol***. 63:1055–1061

Haslam, D.W., James, W.P. (2005). "Obesity". ***Lancet*** **.**366 (9492): 1197–209..

Herings RMC, de Boer A, Stricker BHCh, et al. 1995. *Hypoglycaemia associated with use of inhibitors of angiotensin converting enzyme inhibitors***.** ***Lancet***. 1995;345:1195-1198.

Huether, S.E. Understanding Pathophysiology, 3rd edition .2004. Elsevier Science Health sciences.

Jacob RG, Chesney MA, Williams DM, Ding Y, Shapiro AP. Relaxation therapy for hypertension: design effects and treatment effects. ***Ann Behav Med***.. 1991;13:5-17.

Jaddou, H.Y., Bateiha, A.M.and Ajlouni, K.M. (1996).Prevalence and associated factors of hypertension: results from three community based survey, Jordan**.** ***J Hum Hypertens***.10(12), 815-821.

Jaddou, H.Y., Bateiha, A.M.and Ajlouni, K.M. (2000). Prevalence, awareness and management of hypertension in a recently urbanized community, eastern Jordan. ***J Hum Hypertens***. 14(8), 497-501

Jaddou, H.Y., Bateiha, A.M., Al-Khateeb, M.S., Ajlouni, K.M. (2003) Epidemiology and management of hypertension among Bedouins in Northern Jordan. ***Saudi Med J***;5:472–6.

Jones JK, Gorkin L, Lian JF, Staffa JA, Fletcher AP (1995) .Discontinuation of and changes in treatment after start of new course of antihypertensive drugs: a study of a United Kingdom population. ***Br Med J*** 311:293–295.

Jones, W.J, Williams, L.S., Bruno,A. and Biller,J.(2003). ***Hypertension and Cerebrovascular Disease*** .Seminars in Cerebrovascular Diseases and Stroke .Vol. 3 No.3.

Julius S, Kjeldsen SE, WeberMet al. VALUE trial group. Outcomes in hypertensive patients at high cardiovascular risk treated with regimens based on valsartan or amlodipine: the VALUE randomised trial. ***Lancet*** 2004; 363: 2022–2031.

Kearney, P.M., Whelton, M., Reynolds, K ., Muntner, P., Whelton, P.K., He, J.(2005). Global burden of hypertension: analysis of worldwide data. ***Lancet***; 365: 217–223.

Khan NA, Hemmelgarn B, Herman RJ et al.(2008). for the Canadian Hypertension Education Program. The 2008 Canadian Hypertension Education Program (CHEP) recommendations for the management of hypertension: Part 2-Therapy. ***Can J Cardiol***;24(6):465-476.

Kim, J., Bosworth, H., Voils, C., Olsen,M., Dudley, T., Gribbin, M., Adams M., Oddone, E. (2005). "How well do clinic-based blood pressure measurements agree with the mercury standard?". ***J Gen Intern Med.*** **20** (7): 647–9

Kidney Disorder Outcomes Quality Initiative **K/DOKI**. (2002).clinical practice guidelines for chronic kidney disease :evaluation ,classification ,and stratification .kidney disease outcome quality initiative .***Am J Kidny Dis***.2002;39:S1

Klaus,D, Böhm M, Halle M, *et al.* (2009). "[Restriction of salt intake in the whole population promises great long-term benefits]" (in German). ***Deutsche Medizinische Wochenschrift (1946)*** **134 Suppl 3**: S108–18. doi:10.1055/s-0029-1222573. PMID 19418415. http://www.thieme-connect.com/DOI/DOI?10.1055/s-0029-1222573

Krousel-Wood M, Thomas S, Muntner P, Morisky D. 2004. Medication adherence: a key factor in achieving blood pressure control and good clinical outcomes in hypertensive patients. ***Curr Opin Cardiol***;19:357–62

Kyle PM, Redman CW. (1992).Comparative risk-benefit assessment of drugs used in the management of British Hypertension Society 591 hypertension in pregnancy. ***Drug Safety***; **7**: 223–234.

Kosugi T, Nakagawa T, Kamath D, Johnson RJ (February 2009). "Uric acid and hypertension: an age-related relationship?". ***J Hum Hypertens.*** 23 (2): 75–6.

Kyrou, I., Chrousos, G.P., Tsigos, C. (2006). "Stress, visceral obesity, and metabolic complications**". *Ann. N. Y. Acad. Sci.*** 1083: 77–110. doi:10.1196/annals.1367.008..

http://www3.interscience.wiley.com/resolve/openurl?genre=article&sid=nlm:pubmed&issn=0077-8923&date=2006&volume=1083&spage=77

Lewington S, Clarke R, Qizilbash N et al.2002. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in61 prospective studies. **Lancet** ; 360: 1903–1913.

Lee JH, O'Keefe JH, Bell D, Hensrud DD, Holick MF (2008). "Vitamin D deficiency an important, common, and easily treatable cardiovascular risk factor?". ***J. Am. Coll. Cardiol.* 52** (24): 1949–56.

Luma GB, Spiotta RT (May 2006). "Hypertension in children and adolescents". ***Am Fam Physician.*73** (9): 1558–68.

Lewis, E.J. Hunsicker, L.G., Bain, R.I., Rohde, R.D.(1993). The effect of angiotensin – converting enzyme inhibition on diabetic nephropathy. the collaborative study group .**N Eng J Med;**329:1456-1462,

Mayor S. NICE removes beta blockers as first line treatment for hypertension. (2006).*BMJ* **333** (7557): 8

Messerli, F.H, Grossman, E., and Goldbourt, U.(2001). Antihypertensive Therapy in Diabetic Hypertensive Patients. American Journal of Hypertension. Volume 14, Issue 5, Supplement 1, Pages S12-S16

Messerli, F.H, Grossman, E., and Goldbourt, U. (2001), Antihypertensive Therapy in Diabetic Hypertensive Patients. American Journal of Hypertension. Volume 14, Issue 5, Supplement 1, Pages S12-S16

Messerli, F.H., Grossman, E., and Goldbourt, U. (1998).Are beta-blockers efficacious as first-line therapy for hypertension in the elderly? A systematic review. **JAMA**.279;:1903-7.

Materson, B.J., Reda, D.J., Cushman, W.C., Massie, B.M., Freis, E.D., Kochar, M.S., et al.1993. Single-drug therapy for hypertension in men. A comparison of six antihypertensive agents with placebo. The Department of Veterans Affairs Cooperative Study Group on Antihypertensive Agents. **N Engl J Med**;328:914-21.

Ma, J, Lee, K.V, Stafford RS. (2006).Changes in antihypertensive prescribing during US outpatient visits for uncomplicated hypertension between 1993 and 2004. ***Hypertension***.(2006). 48:846-852.

McDonagh, M., Bradley, M., and Shirley A .(2000).Drug treatment of hypertension in older people: relieving the pressure .***Pharm World Sci ;****22(2): 31-32.*

Mancia G, Grassi G. Antihypertensive treatment: past, present and future. 1998. **J Hypertens**; 16:S1-7.

Mubarak, F. M. Froelicher, E.S. Jaddou, H.Y. Ajlounia, K.M.(2008). Hypertension among 1000 patients with type 2 diabetes attending a national diabetes center in Jordan**. Ann Saudi Med**. 2008; 28(5): 346-351

Mulrow, C., Lau, J., Cornell, J., and Brand, M. Antihypertensive drug therapy in the elderly (***Cochrane Review*****)**. Update Software 1997

National Kidney Foundation Guideline. K/DOQI . (2002).clinical practice guidelines for chronic kidney disease: Evaluation, classification, and stratification. Kidney Disease Outcome Quality Initiative. ***Am J Kidney Dis***, 2002;39:S1-246.

National Kidney Foundation (2004) K/DOQI clinical practice guidelines on hypertension and antihypertensive agents in chronic kidney disease. ***Am J Kidney Dis***. 43[Suppl 1]:1–290

Neal, B., MacMahon, S. and Chapman, N.(2000). Effects of ACE inhibitors, calcium antagonists, and other blood-pressure-lowering drugs: Results of prospectively designed overviews of randomized trials. Blood Pressure Lowering Treatment Trialists' Collaboration. ***Lancet***; 356, 1955-1964

Nicodème R ,. Albessard A,. Amar J , .Chamontin B, .Lang T. (2009).Poor blood pressure control in general practice: In search of explanations. ***Archives of Cardiovascular Disease*** 102, 477— 483

Neutel, J.M., Black, H.R., Weber, M.A., (1996) "Combination therapy with diuretics: an evolution of understanding", ***American Journal of Medicine***.**101.(Suppl. 3A)**, 61S-70S.

Oparil, S., Zaman, M.A., Calhoun, D.A. (2003). "Pathogenesis of hypertension**".** ***Ann. Intern. Med.*** 139 (9): 761–76. PMID 14597461.

Opie, L.H., Schall, R. 2004. Old antihypertensives and new diabetes. **J Hypertens**; 22: 1453–1458

Ostfeld AM , Wilk E . Epidemiology of stroke , 1980 - 1990 : **a progress report . Epidemiol Rev**. 1990; 12:253-256.

Owan TE, Hodge DO, Herges RM, et al.2006. Trends in prevalence and outcome of heart failure with preserved ejection fraction. **N Engl J Med** .;355:251–259.

Owan TE, Hodge DO, Herges RM, et al.2006. Trends in prevalence and outcome of heart failure with preserved ejection fraction. **N Engl J Med** .;355:251–259.

Park J H, Shin Y b, Sang-Yi Lee S Y, and Lee S .2008 . Antihypertensive drug medication adherence and its affecting factors in South Korea **.** ***I J Cardiol*** .128: 392–398

Palatini P, Frigo G, Vriz O, *et al*. (2001). Early signs of cardiac involvement in hypertension. **Am Heart J**; 142:1016-1023.

Pickering T. (1996) .Recomondation for the use of home (self) and ambulatory blood pressure monitoring .American society of hypertension Ad Hoc Panel. **Am J Hypertens**:9:1.

Psaty, B.M., Lumley, T., Furberg C.D., Schellenbaum G., Pahor, M., Alderman, M.H., Weiss, N.S. (2003).Health outcomes associated with various antihypertensive therapies used as first-line agents: a network meta-analysis. ***JAMA.***, 289:2534-2544.

Pitts, S.R., Adams, R.P. (1998). "Emergency department hypertension and regression to the mean". ***Annals of Emergency Medicine*****. 31** (2): 214–8. PMID 9472183.

Pepine, C.J., Handberg, E.M., Cooper-DeHoff R.M. et al. INVEST Investigators. A calcium antagonist vs a noncalcium antagonist hypertension treatment strategy for patients with coronary artery disease. The International Verapamil–Trandolapril Study (**INVEST**): a randomized controlled trial. **JAMA**. 2003; 290: 2805–2816.

PROGRESS Collaborative Group: Randomised trial of a perindopril-based blood pressure lowering regimen among 6105 individuals with prior stroke or transient ischemic attack. **Lancet** 358:1033-1041, 2001

Pittrow, D., Kirch, W., Bramlage, P., Lehnert, H., Hofler, M., Unger., T., Sharma, A. M.. Wittchen, H.-U. (2004) Patterns of antihypertensive drug utilization in primary care**. Eur J Clin Pharmacol**. 60:135–142

Pitts, S.R., Adams, R.P. (1998). "Emergency department hypertension and regression to the mean". ***Annals of Emergency Medicine*****. 31** (2): 214–8. PMID 9472183.

Pitt B, Zannad F, Remme WJ, Cody R, Castaigne A, Perez A, et al**.(1999).** The effect of spironolactone on morbidity and mortality in patients with severe heart failure. Randomized Aldactone Evaluation Study Investigators**.** ***N Engl J Med.*** ;341:709-17.

Poluzzi E ,. Strahinja P,. Vargiu , A., Chiabrando, G,. Silvani M ,C,. Motola,D,. Cellini, G. S,. Vaccheri , A,. De Ponti, F,.and Montanaro N,.2005 .Initial treatment of hypertension and adherence to therapy in general practice in Italy. **Eur J Clin Pharmacol .**61: 603–609

Pocok SJ, Mccormack V, Gueyffier F, *et al.* (2001). A score for predicting risk of death from cardiovascular disease in adults with raised blood pressure, based on individual patients data from randomized controlled trials. **BMJ**; 323:75-81.

Raymond, J.L, Smith, C.S. (1997). Trends in Alpha-Blocker Treatment of Patients with Benign Prostatic Hyperplasia and Hypertension: Dosing Regimens and Cost Comparisons. **J Clin Therap**. VOL. 19, NO. 4.

Ramsay, L.E., Williams B., Johnston., G.D., MacGregor, G.A., Poston , L ., Potter, J.F., Poulter., N.R and Russell., G.(1999). BHS GUIDELINES Guidelines for management of hypertension: report of the third working party of the British Hypertension Society. **Journal of Human Hypertension.** 13, 569–592

Rubio-Guerra, A.F., Lozano-Nuevo, J. J., Rodriguez-Lopez, L.,Vargas-Ayala, G. and Juarez-Perez, A. (2003). Depression may worsen high blood pressure. XVth Scientific Meeting of the Inter-American Society of Hypertension.

Rodgers A, Ezzati M, Vander Hoorn S, Lopez AD, Lin RB, Murray CJ. Distribution of major health risks: findings from the Global Burden of Disease study. *PLoS Med.* 2004; 1:e27

Ruilope L M.,Coca A., Volpe M ,Waeber B. 2002. ACE inhibition and cardiovascular mortality and morbidity in essential hypertension: The end of the search or a need for further investigations?. **Am J Hypertens.** 15(4): 367-371.

Remme, W.J. (2001). The Carvedilol and ACE-Inhibitor Remodelling Mild Heart Failure Evaluation Trial (CARMEN)— rationale and Design. **Cardiovasc Drugs Ther**. 15:69–77**.**

Rogers, R.L., Anderson, R.S. (2007). "Severe hypertension in the geriatric patient-is it an emergency or not?". ***Clinics in Geriatric Medicine***. **23** (2): 363–70 http://journals.elsevierhealth.com/retrieve/pii/S0749-0690(07)00009-2. Retrieved 2009-06-18.

Rodriguez-Iturbe, B., Romero, F., Johnson, R.J. (2007). "Pathophysiological mechanisms of salt-dependent hypertension". ***Am. J. Kidney Dis***. **50** (4): 655–672. doi:10.1053/j.ajkd.2007.05.025.. http://linkinghub.elsevier.com/retrieve/pii/S0272-6386(07)00945-6.

Sacks, F.M., Svetkey, L.P., Vollmer, W.M., Appel, L.J., Bray, G.A., Harsha, D., et al. 2001. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. ***N Engl J Med.*;**344 :3-10.

Siscovick, D.S., Raghunathan T.E, Psaty BM, Koepsell TD, Wicklund KG, Lin X, et al. (1994). Diuretic therapy for hypertension and the risk of primary cardiac arrest. ***N Engl J Med*** **,**330:1852-1857.

Sibai, B.M. (1996), Treatment of hypertension in pregnant women. **N ENG J MED**.335:257-265.

Schneider, R.H; Staggers;F., Alexander; C. N., Sheppard; W., l Rainforth; M., Kondwani;K. and Smith; S., King., C.G.(1995).A Randomized Controlled Trial of Stress Reduction for Hypertension in Older African Americans. ***Hypertension***.;26:820.

Stergiou, G.S., Karotsis, A.K., Symeonidis, A., Vassilopoulou, V.A. (2003). for the ABC–GP Study Group. Aggressive blood pressure Control in General Practice (ABC–GP) study: can the new targets be reached? **J Hum Hypertens**;17: 767–773.

Staessen, J.A., Fagard, R., Thijs, L., Celis, H., Arabidze, G.G., Birkenhager, W.H., et al. (1997). Randomised doubleblind comparison of placebo and active treatment for older patients with isolated systolic hypertension. The Systolic Hypertension in Europe (Syst-Eur) Trial Investigators. ***Lancet***;350:757-64.

Staessen, J.A,. Sowski, J.G, and Wang ,J.G. (1999).Treatment of isolated systolic hypertension in the elderly: evidence from three clinical trials. **European Journal of Internal Medicine** .10,82–87.

Stergiou , G. S. (2006). Combination pharmacotherapy in hypertension. **International Urology and Nephrology.** 38:673–682 _ Springer 2006
Stergiou, G.S., Karotsis, A.K., Symeonidis, A., Vassilopoulou, V.A. (2003). for the ABC–GP Study Group. Aggressive blood pressure Control in General Practice (ABC–GP) study: can the new targets be reached? **J Hum Hypertens**;17: 767–773.

Staessen, J.A., Fagard, R., Thijs, L., Celis, H., Arabidze, G.G., Birkenhager, W.H., et al. (1997). Randomised doubleblind comparison of placebo and active treatment for older patients with isolated systolic hypertension. The Systolic Hypertension in Europe (Syst-Eur) Trial Investigators. ***Lancet***;350:757-64.

Smith, S.C., Jr et al .2001 .AHA/ACC scientific statement :AHAA/ACC guidelines for preventing heart attack and death in patients with atherosclerotic cardiovascular disease :2001 update :a statement for health care professionals from the American heart association and the American college of cardiology .**Circulation**;104:1577

Sung J, Ouyang P, Bacher AC, *et al*. Peripheral endothelium- dependent flow - mediated vasodilatation is associated with left ventricular mass in older persons with hypertension - Am Heart J 2002; 144:39-44.

Sweileh, W.M, Sawalha, A.F, Zyoud, S.H, Al-Jabil SW, Tameem EJ, Shraim NY. Evaluation of antihypertensive therapy indiabetic hypertensive patients: impact of ischemic heart disease. Pharmacy Practice (Internet) 2009 Jan-Mar;7(1):40-46. **www.pharmacypractice.org** (ISSN: 1886-3655)

Sweileh, W. (2003). Pharmacotherapeutic Analysis and Prescription Pattern of Antihypertensive Drugs Dispensed at Community Pharmacies in Palestine. **An-Najah Univ. J. Res.** (N. Sc), Vol. 17(2),

Sturani A, Esposti ED, Serra M et al .(2002). Assessment of antihypertensive drug use in primary care in Ravenna, Italy, based on data collected in the PANDORA project. **Clin Ther** .24:249–259

Stergiou, G.S., Karotsis, A.K., Symeonidis, A., Vassilopoulou, V.A. (2003). for the ABC–GP Study Group. Aggressive blood pressure Control in General Practice (ABC–GP) study: can the new targets be reached? **J Hum Hypertens**;17: 767–773.

The Multicentre Diltiazem Postinfarction Trial Research Group. The effect of diltiazem on mortality and reinfarction after myocardial infarction. (1988), **N Engl J Med** .1988;319:385-92.

Tiwari H , Kumar A, Kulkarn S K .(2004). Prescription monitoring of antihypertensive drug utilization at the Panjab University Health Centre in India. **Singapore med J.** vol 45 (3):117.

Tuohimaa, P. (March 2009). "Vitamin D and aging". ***The Journal of Steroid Biochemistry and Molecular Biology*. 114** (1-2): 78–84.

Tierney, L.M., McPhee, S.J., Papadakis MA.(2003) Current medical diagnosis & treatment 2003, 42nd ed. Lange Medical Books/McGraw-Hill, New York, pp 409–434.

Toto, R.D. (2005). Treatment of hypertension in chronic kidney disease. ***Semin Nephrol***. 2005;25:435-9.

Tocci G, Sciarretta S, Volpe M. Development of heart failure in recent hypertension trials. *J Hypertens*. 2008;26:1477-1486.

Tortorice, K.L., Carter, B.L. (1993). Stroke prophylaxis :hypertensive managmenet and antithrombotic therapy .**Ann Pharmacother** ; 27:471.

Vollmer, W.M., Sacks F.M., Ard, J., Appel, L.J., Bray G.A., Simons-Morton DG, Conlin P.R., Svetkey, L.P., Erlinger, T.P., Moore, T.J., Karanja, N.2001. Effects of diet and sodium intake on blood pressure: Subgroup analysis of the DASH-sodium trial. ***Ann Intern Med*** ;135:1019-28.

Weinberger, M.H. **Seminars in Cerebrovascular Diseases and Stroke**. (2003).Vol. 3 No.3

Whelton, P.K,. He ,J,. Appel, L.J, Cutler, J.A, Havas ,S,. Kotchen, T,A,. et al 2002 . Primary prevention of hypertension:Clinical and public health advisory from The National High Blood Pressure EducationProgram. ***JAMA***;288:1882-8

Wühl, E., Schaefer.,F. (2008) . Therapeutic strategies to slow chronic kidney disease progression.**Pediatr Nephrol**.23:705–716
DOI 10.1007/s00467-008-0789-y

Widimský, J. The combination of an ACE inhibitor and a calcium channel blocker is an optimal combination for the treatment of hypertension. (2009). (in Czech). ***Vnitřní Lékařství***. **55** (2): 123–30. PMID 19348394

Wang L .2004.Physician-Related Barriers to Hypertension Management. **Med Princ Pract**;13:282–285

Wachtell K, Palmieri V, Olsen MH, *et al*. Urine albumin/ creatinine ratio and echocardiographic left ventricular structure and function in hypertensive patients with electrocardiographic left ventricular hypertrophy: The LIFE
Study . Am Heart J 2002; 143:319-326.

Wolf-Maier, K., Cooper, R.S., Kramer, H., Banegas, J.R., Giampaoli, S., Joffres., M.R ., Poulter, N., Primatesta, P., Stegmayr, B., Thamm, M. (2004). Hypertension treatment and control in five European countries,Canada, and the United States. **Hypertension**; 43: 10–17.

Wühl, E., Schaefer.,F. (2008) . Therapeutic strategies to slow chronic kidney disease progression.**Pediatr Nephrol**.23:705–716
DOI 10.1007/s00467-008-0789-y

Wallenius S., Peura S., Klaukka T., Enlund H. (1996). Who is using antihypertensive drugs?: A prescription analysis from Finland .***Scandinavian Journal of Primary Health Care.*** *Volume* 14, Issue 1 March, pages 54 – 61.

Whitworth JA: (2003). 2003 World Health Organization (WHO)/ International Society of Hypertension (ISH) statement on management of hypertension. ***J Hypertens.*** 21:1983-1992.

Walley T, Duggan AK, Haycox AR, Niziol C.J.(2003). Treatment for newly diagnosed hypertension: patterns of prescribing and antihypertensive effectiveness in the UK. ***J R Soc Med*** 2003; 96: 525–531.

Xin, X., He, J., Frontini., M,G., Ogden, L.G., Motsamai, O.I., Whelton, P,K. 2001. Effects of alcohol reduction on blood pressure: A meta-analysis of randomized controlled trials. ***Hypertension*** ;38:1112-7.

Xu KT, Moloney M, Phillips S. (2003). Economics of suboptimal drug use: cost-savings of using JNC-recommended medications for management of uncomplicated essential hypertension. ***Am J Manag Care***.;9: 529–536

Youssef, R.M. and. Moubarak,I.I.(2002).Patterns and determinants of treatment compliance among hypertensive patients. ***Eastern Mediterranean Health Journal*** . Volume 8, No. 4&5

Zanchetti A. 1999. Contribution of fixed low-dose combinations to initial therapy in hypertension. **Eur Heart J**; 17(suppl A), 8–15.

" دراسة استخدام مضادات ارتفاع ضغط الدم في عيادة لطب الأسرة في مستشفى الجامعة الأردنية"

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الملخّص

يُعتَبرُ ارتفاع ضغط الدم أحد أكثر المشاكل الصحيةِ انتشاراِ في العالم. كما إن أسلوب الوصف الدوائي للأدوية المضادة لارتفاع ضغط الدم في المجتمع الأردني لَمْ يتم دراستها بشكل وافي سابقاً ، كما أن التوصيات الصادرة عن المؤسسات العالمية لعلاج ارتفاع ضغط الدم كالدليل الأمريكي لعلاج ضغط الدم والدليل الصادر عن منظمة الصحة العالميةِ تَتبدّلُ بشكل مستمر كما أن الأدوية المستخدمة لعلاج ارتفاع ضغط الدمِّ تتغير أيضاً، وتساعد دراسة ألأدوية المستخدمة للسيطرة على ضغط الدمِّ والنظام المتبع لصرف هذه الأدوية ومدى الالتزام بالتوصيات العالمية المعتمدة على زيادة فعالية علاج ارتفاع ضغط الدم والسيطرة عليه في المجتمع الأردني.

الأهداف

الهدف الأساسي من هذه الدراسةِ هو معرفة الأدوية المستخدمة لعلاج ارتفاع ضغط الدم و النمط المتبع لصرف هذه الأدوية في عيادات طب الأسرة بمستشفى الجامعة الأردنية في عمان. تمت مقابلة أربع مائه وستة عشر من مرضى ارتفاع ضغط الدم ممن هم بسن 18 عام أو أكثر لتعبئة استبيان معد مسبقا بالإضافة إلى المعلومات التي تم استخراجها من الملفات الطبية الخاصة بالمرضى الموجودة في السجلات الطبية لعيادات طب الاسره.

النّتائج

كَشفتْ النتيجة النهائية الرئيسية لهذه الدراسةِ بأنّ مِنْ ضمن 416 مريضا شملتهم الدراسة، 62.3 % منهم كن إناثا والعُمرَ المتوسطَ للمرضى كَانَ 59 ±10 سَنه. استخدمت ستّة من المجموعات الرئيسية للأدوية المضادة لارتفاع ضغط الدم في عيادات طب الاسره وهي مثبطات الإنزيم المعدل للانجوتنسين، مثبطات بيتا، مثبطات قنوات الكالسيوم، مثبطات مستقبلات الانجوتنسين، ومدرّات البول و مثبطات ألفا. تلقى 45.6 % من المرضى دواء واحدا لعلاج الضغط. من بين أولئك الذين تلقوا وصفه تحتوى أكثر من دواء، 37.7 % تلقوا دواء ين، 12.5 % تلقوا ثلاثة أدويه و3.1 % تلقوا أربعة أدويه أو أكثر. من بين الذين تلقوا علاجا أحاديا، كانت مثبطات الإنزيم المعدل للانجوتنسين الأكثر استخداما (43.7 %)، بينما كانت مدرّات البول أقلّ الأدوية استخداما (3.7 %). بينما وجد في الوصفاتً المتعددة (المحتوية على دوائين أو أكثر) أن مدرّات البول هي الأكثر صرفا (36.5 %)، تليها مثبطات بيتنا (31.5 %). الأدوية المركبة التي تَشْملُ مدرّاتِ البول مع مثبطات بيتا كانت الأكثر تكرارا. اذا اخذ بعين الاعتبار مجمل الاستهلاك فان، مثبطات الإنزيم المعدل للانجوتنسين كانت أكثر الأدوية وَصْفاً (192) 46.2 %. على الرغم مِنْ وجود تحسن ملحوظ في ضغطِ الدمّ عند المرضى بين الزيارة الأولى والزيارة الثانية، إلا أن 73.4 % مِنْ المرضى لم يصلوا إلى المستوى الطبيعي لضغط الدم .

الخاتمة

تمثل الدراسةُ الحاليةُ التوجه العام والأسلوب المتبع لوصف الأدوية المضادة لارتفاع ضغط الدم في عيادات طب الأسرة بمستشفى الجامعة الأردنية في عمان. بالرغم من أن هنالك انخفاضا مهما في ضغط الدم في الزيارة الثانية بعد استعمال أدوية الضغط ألا أن معظم المرضى لم يحققوا المستويات المطلوبة لضغط الدم والموصى بها من قبل المؤسسات العالمية المعتمدة لعلاج ضغط الدم. وعلى الرغم من معظم التوصيات الصادرة عن المؤسسات العالمية لعلاج

ضغط الدم التي توصي بعدم كفاية العلاج الأحادي للسيطرة على ضغط الدم، إلا أن نسبة كبيرة من المرضى استمروا بتلقي العلاج الأحادي للسيطرة على ضغط الدم .كما ان تعديلُ نمط الحياة يحتاج الى مزيد من الاهتمام سواءَ مِن قِبل الأطباء أو من قبل والمرضى.