

EFFECT OF TYPES OF MEDICATIONS, PHYSICAL ACTIVITIES, AND DRINKING WATER ON CONTROLLING BLOOD PRESSURE IN HYPERTENSIVE PATIENTS

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ABSTRACT

Background: Hypertension is a chronic disease that affects the lives of more than 30% of the population worldwide. Regulating blood pressure within the acceptable ranges is the key element to reduce the risks of collateral damages of hypertension on hypertensive people. **The aim of the study:** to survey the effect of types of hypertension medications, physical activities, water consumption on controlling blood pressure in hypertensive people. **Material and Methods:** - In this study, a questionnaire was carried on a total of 32 males and females aged 38 to 90 years. The effects of types of medications, performing daily physical activities, and consuming adequate amounts of water were examined on these patients. **Results:** Since the causes of hypertension is not known in the vast majority of cases (essential hypertension), medications such as ACEI that can give desirable results in controlling blood pressure for some patients were not effective for some other patients. Combining two or more types of medications could improve their effect on controlling blood pressure. Physical activity and regular exercise are very effective in reducing blood pressure and control it at a moderate level. Drinking adequate amounts of water also might help in controlling blood pressure. The results suggest that life style of hypertensive patients should include regular physical activities and drinking adequate amounts of water. Medications, on the other hand, are case specific where one type of medication is suitable and adequate for some patients and have small or no effect for some others. Furthermore, some patients need to take multiple medications in order to have the required effect. And some patients might be resistant to all types of medications.

KEYWORDS: Hypertension, Age, Medications, Physical activities, Water consumption, Zawi.**INTRODUCTION**

Blood pressure is the force of blood pushing against the walls of blood vessels. If the blood pressure exceeds the acceptable levels, it will be considered as high and usually referred to as hypertension. Hypertension can be defined as an increase in the force exerted on the walls of blood vessels by blood, as a result of the increase of blood vessels' resistance to blood flow through the body. Blood pressure is usually expressed in form contains two numbers; the first known as the systolic pressure and the second is diastolic pressure. The normal range for the systolic pressure is 110-140 mm Hg and the diastolic pressure range is 70-80 mmHg. Blood pressure usually increases with age 2- or 3-mm Hg every 10 years due aging related decrease in blood vessels flexibility.^[1,2]

Hypertension affects the lives of more than 30% of the population worldwide.^[3] Hypertension affects many organs such as heart, blood vessels, kidneys and brain; it increases the risk of having heart attack, stroke, heart failure, myocardial infarction, cardiomyopathy and kidney disease.^[4] Hypertension can be divided into two types the first type (known as primary or essential hypertension) has unknown cause but there are some

factors increase the chance of its occurrence such as: age (over 44 in males and over 65 in females), obesity, smoking, genetics, origin, high salt and fat diet, low potassium diet, consuming a lot of caffeine beverages, low physical activity and not getting enough sleep.^[5-7] The second (known as the secondary hypertension) occurs when the direct cause for hypertension is known.

Some medications are used to control levels of blood pressure; these medications include primarily drugs prescribed by doctor such as *Diuretics, ACEI, and ARBs*. Each group of these drugs work in lowering the blood pressure by different mechanism that can be described as follow:

Diuretics: works to reduce blood pressure by increasing loss of water and electrolytes through kidney which reduce extracellular fluid and amount of blood leading to lowering the blood pressure.^[8]

ACEI (Angiotensin Converting Enzyme Inhibitors) This group works by inhibiting the effect of angiotensin converting enzyme. Which will prevent converting angiotensin I to angiotensin II, angiotensin is a peptide hormone that causes vasoconstriction and increases

blood pressure and angiotensin I converts from angiotensinogen to angiotensin I by renin enzyme (secretion by kidney), then to angiotensin II by ACE enzyme (in lungs).^[9]

ARBs(angiotensin II receptor blockers): are used for patient who are unable to tolerate ACE inhibitor, drugs that block the action of angiotensin. Specifically, ARBs prevent angiotensin II from binding to the angiotensin II receptor on blood vessels and other tissues.^[10,11]

Despite the type of drug that is used to control blood pressure, it is very important to consider the effect of age, water consumption, and physical activity rule in managing the blood pressure. According to a study conducted by specialists and doctors of blood pressure on 463 patients in which they stressed the importance and the impact of daily and regular exercise on reducing systolic and diastolic BP, the rate of systolic and diastolic BP after exercise was decreased by 6-7 mmHg.^[12]

The aim

The aim of our project is to survey the types of hypertension medications used and their effectiveness in controlling blood pressure, and also the effectiveness of consuming adequate amounts of water and performing suitable physical activities on blood pressure of hypertensive patients in the city of Zawia and surrounding area.

The experiment

This study was designed to examine the effectiveness of day to day management of life style of hypertensive people in regulating their blood pressure. The participants were contacted directly to ensure that the patients will respond and the questions were understood by them. A total of 32 participants from Hypertension Clinic in Joddaem Dispensary and City of Zawia Diabetes Center were interviewed and the results were classified, analyzed and represented in figures.

RESULTS AND DISCUSSION

The patients participated in study were 22 females and 10 males, and aged between 38 and 90 years. Both of the female patients and male patients were classified according to their age into two groups; the first group are patients younger than fifty years contains 3 males and 7 females, and the second group contains patients older than fifty years 7 of them were males and 15 of them were females. All participants in the study were Libyan citizens live in the city of Zawia and its surrounding areas.

The effect of age on both systolic and diastolic pressures

The percentages of patients 50 years and younger for both the female patients and male patients are close to each other (30% of males and 31.8% of female). This suggests that both genders were equally vulnerable to hypertension. The data (as can be seen in figure 1) showed higher diastolic and systolic pressures in male patients 50 years and younger (means 93.3 and 151.7 respectively) compared to male patients older than 50 years (means 90 and 140 respectively). In fact, both the systolic and diastolic pressures for males older than 50 are lower than them in the younger group. The female patients younger than 50 also showed higher diastolic and systolic pressures (means 94.2 and 157.5 respectively) compared to the female patients older than 50 years (means 85.4 and 143 respectively). The findings contradict with previous studies that suggest that older people in both genders have higher systolic and diastolic blood pressures than the younger people^[1,13]; this is not the case in our study where the results showed higher systolic and diastolic blood pressure in younger people compared to older people. This might be due to the types of medications used by these patients or may be the older people obey the doctor's directions more than the younger people. The other possibility that these younger patients are more stressed than the older patients and the psychological attitudes make their blood pressure higher.

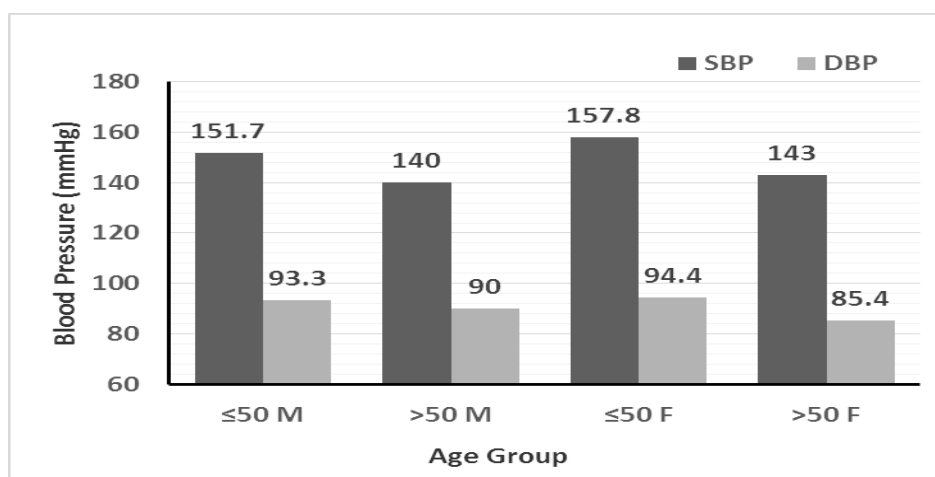


Figure 1: The relationship between age and blood pressure, As can be seen in this figure males and females older than 50 have a lower blood pressure both in the systolic and diastolic (means 140, 143 and 90, 85.4 mm Hg respectively) than the males and females younger than 50 (means 151.7, 157.8 and 93.3, 94.4 mm Hg respectively).

The effect of types of medications on blood pressure

According to the data collected, there are 11 different medications used by these patients in the study sample. The highest percentage (31%) are using a combination of (ARBs +diuretics medications), the next is 12.5% are using ARBs only and the same 12.5% do not use any medicines, then 9.375% are using ACEI only, then 6.25% are using Beta Blocker drugs, diuretics drugs and ARBs + ACEI combination, and only one case(3.125%) for each combination of ARBs +Beta Blocker, CCB, ACEI + CCB, ACEI +DIURETICS +Beta Blocker and ARBs + CCB medications. Similar types and combinations have been used in South Korea to treat hypertensive patients, usually ARBs and CCB are the preferred drugs for doctors to start with for the new patients.^[14]

The data (figure 2) showed variations in both systolic and diastolic blood pressures. Three medications maintained diastolic blood pressure at 80 or less (ACEI, ACEI +Diuretic + β -blocker, ARBs +CCB) and three other medications kept the diastolic blood pressure between 80 and 90 (ACEI +ARBs, ARBs +Diuretic, CCB) all the other medications (ARBs, Diuretic, ARBs + β -blocker, ACEI +CCB, β -blocker) did not lower the diastolic blood pressure under 90. Five medications maintained systolic blood pressure at 140 or less (ACEI, ACEI +CCB, ACEI+Diuretic, ARBs +ACEI, ARBs) and all other medication (ARBs +CCB, CCB, Diuretic, ARBs + β -blocker, ARBs +Diuretic, β -blocker) did not lower the systolic blood pressure under 140. According to our findings, all the different medicine combinations used by the participants can be divided into 5 groups of medicine (Diuretics, ACEI, ARBs, CCB, β -blocker) prescribed by their doctors to treat hypertension.

Diuretics: help the body to get rid of fluids and minerals resulting in reduced BP and it is used as the first choice at the beginning of treatment of hypertension^[8,15]; however, in this study, diuretics alone did not have the desired effect on blood pressure and better results were achieved when diuretics were combined with other medications.

ACEI: inhibits conversion of angiotensin 1 to angiotensin 2, to prevent more vasoconstriction by angiotensin 2 which will aid in lowering blood pressure.^[16,17] In this study ACEI was used alone or combined with other medicine such as ACEI+ Diuretics+ β blocker.

ARBs: are angiotensin 2 antagonists and they compete with angiotensin 2 to prevent its effect on vasoconstriction.^[18,19] In our study, ARBs were used (as a replacement of ACEI for patients who cannot tolerate ACEI) in combination with other medications.

CCB (Calcium Channel Blocker): Calcium is very important in muscle contraction in all muscle types and calcium channel blocker will reduce the amount of calcium available for muscle contraction leading to less vasoconstriction and lowers the blood pressure.^[20] In our study, that hypertensive patients who used CCB had a blood pressure 150/90 which was slightly elevated. Even though, ACEI and ARBs have similar effect with different mechanisms, CCB combined with ACEI showed a better effect on SBP than CCB+ ARBs, while CCB + ARBs had a better effect on DBP than ACEI+ CCB.

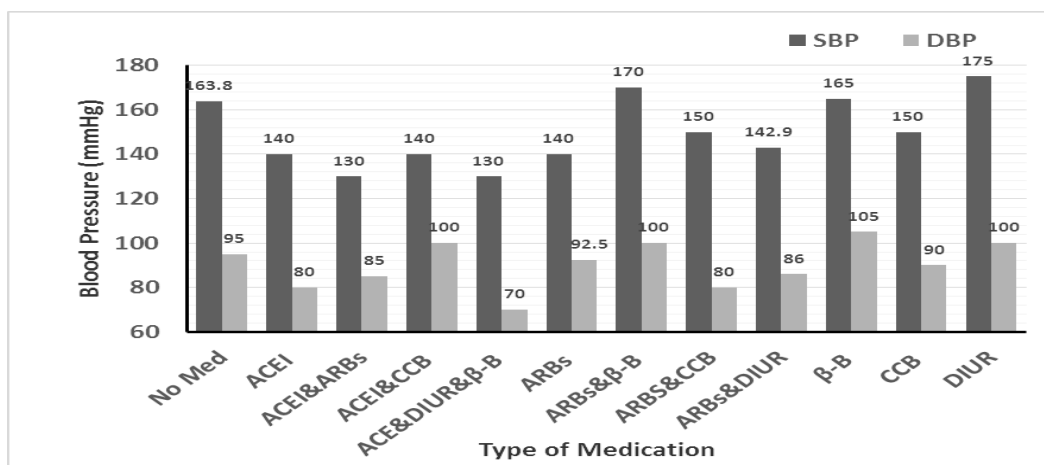


Figure 2: The relationship between type of medication and blood pressure, As can be seen in this figure the medication that lower systolic blood pressure (ACE +Diuretics + β -blocker and ARBs + ACEI = 130) next medication is (ACEI + CCB and ARBs and ACEI = 140), and then (ARBs + Diuretics = 142.9), then (ARBS + CCB and CCB =150), then (β -blocker =165), then (ARBs + β -blocker =170), then (Diuretics = 175), and the patients who do not use medication there systolic is (163.75), while the medication that lowering diastolic blood pressure in respectively is (ACEI + Diuretics + β -blocker = 70), the next is (ARBS +CCB and ACEI = 80), then (ARBS +ACEI = 85), then (ARBS +Diuretics =86), then (CCB =90), then (ARBS = 92.5), then (ACEI +CCB and ARBS + β -blocker and Diuretics = 100), and the highest level found in patient who use (β -blocker = 105), finally patients who do not use medication theirDBP is 95 mmHg.

β -blocker: usually have a direct effect on the heart since it blocks beta receptors of noradrenaline and reduces the effect of the sympathetic nervous system on both the heart rate and heart contraction. It reduces the pulse rate and myocardial stress, which will result in reducing BP in the whole vascular system.^[21] The best results in controlling the blood pressure were achieved by using the combination of ACEI+ Diuretic+ β -blocker compared to all the medicines that were used by participant.

The data also showed that 8 out of 12 groups have pulse pressures between 60- and 75-mm Hg, and the other 4 groups have pulse pressures between 40- and 56.9-mm Hg. The high pulse pressures for two thirds of the groups might be due to decrease in arterial compliance or decreased viscosity of the blood if the patients are taking Aspirin and / or having anemia. Further investigations are needed to find out the most likely reason for having high pulse pressures. However, Some studies suggested that about 10% of the hypertension patients are resistant to all types of medications.^[22]

The effect of Physical Activities on blood pressure

The results showed that 62.5% of the participants are engaged in physical activities (walking), (12.5%) less than half an hour a day, (25%) for half an hour a day, and (25%) more than half hour a day. The rest (37.5%) were not engaged in any physical activities. All the three

groups who are engaged in daily physical activities showed lower diastolic blood pressures compared to the people who did not have a daily physical activity. On the other hand, the systolic blood pressures in all groups were very proximate (figure 3). The results suggest that physical activities have a positive effect on lowering blood pressure which is consistent with previous studies which found that a regular physical activity such as walking helps to reduce BP.^[23] The data also unexpectedly suggested that there were more patients are engaged in physical activities since about 70% of them are older than 50 years and Libyan people after this age tend to decrease their physical activities.

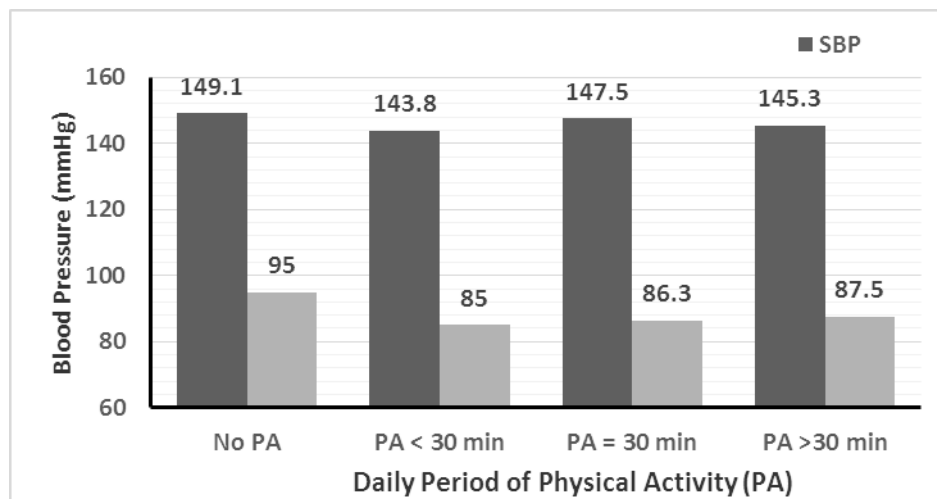


Figure 3: The relationship between physical activity and blood pressure, As can be seen in this figure, all patients engaged in physical activities had an average DBP less than 90, while those who are not engaged in any physical activities had an average DBP 95. The average of SBP values are proximate in all groups.

The effect of water consumption on blood pressure

The vast majority of participants were drinking bottled water whereas only few of them drink tap water. This is a healthy practice since bottled water contains less minerals compared to tap water, and many studies suggested that extra minerals in drinking water increase blood pressure.^[24] As we all need to drink water and vary in the amounts we consume per day, the results showed that some of the patients drink as little as half a liter per day and others drink as much as four liters per day. The

patients were divided according to the amounts of water they consume per day into 3 groups. first group was consuming less than or equal to 1 liter per day (28.12%) who's had a systolic and diastolic BP average (138.9/92.2 mm Hg), the second group consumes from 1.1liter to 2 liters per day (43.75%) who's had a systolic and diastolic BP average(152.8/88.6 mm Hg) and the last group was consuming more than 2 liters per day (28.12%) who's had a systolic and diastolic BP average (152.5/88.3 mm Hg) as illustrated in figure 4. Water is needed by every

cell in the body and the amounts of water that are consumed by each patient in different categories depending on his daily needs, especially who are using diuretics or engaged in long periods of physical activities. In our study the patients' consumption of water were from 0.5 liter to more than 2 liters daily as was shown in figure 4, these results showed that patients who consumed less than 1 liter per day had the lowest SBP (138.9 mmHg) and the highest DBP (92.2 mmHg), while patients in the other two groups have a higher SBP and the lower DBP. In fact, as it was shown in the figure, both groups who are consuming one to two litters of water daily and more than two litters of water daily have very proximate SBP (152.8 and 152.5 respectively) and DBP (88.6 and 88.3 respectively). These results are very hard to interpret and seem controversial, but other studies showed controversial results as well which might help in explaining these results. Some studies suggest that drinking water has a direct effect on elevating blood pressure^[25] and other studies suggested that salts especially Sodium salts might be an important factor in elevating blood pressure^[24]; while other studies suggested that water aids in lowering blood pressure if it contains Calcium, Potassium and Magnesium.^[26] Since the Sodium, Calcium, Magnesium, and Potassium contents in the bottled water in the city of Zawia differ depending on producers and some might produce water with very low salt contents, whereas others might have mild salt contents, the water source might be an effective factor on hypertension. This cannot be confirmed

without further investigation on the water sources that supply water to these hypertensive patients.

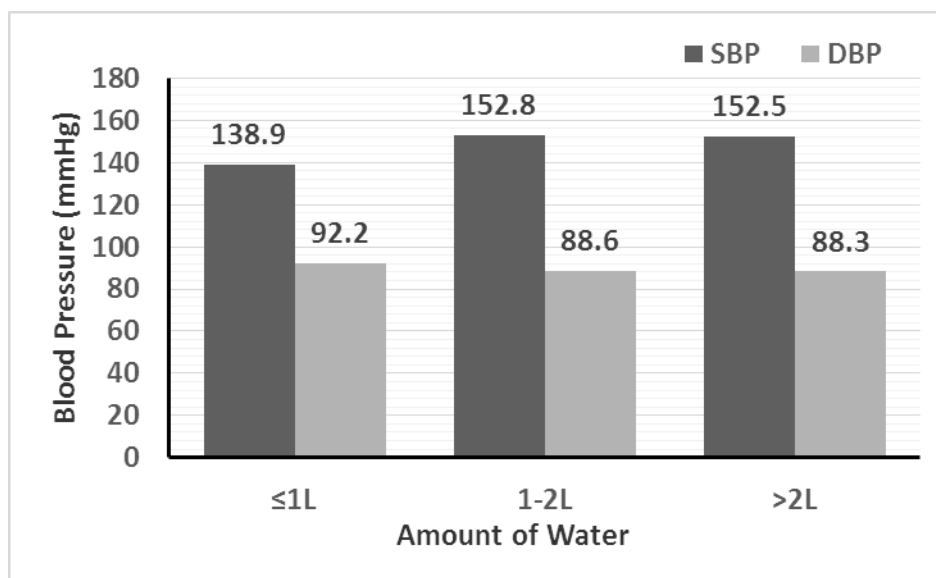


Figure 4: The relationship between water consumption and BP, in this figure, the patients who are consumption less than or equal to liter of water have the lowest systolic BP and the highest diastolic BP values, the patients who are consumption from 1 to 2 liters and the patients who are consumption more than 2 liters have higher systolic BP and the lower diastolic BP values.

GENERAL DISCUSSION AND CONCLUSION

This study was conducted to investigate the age and sex distribution of hypertensive patients in the city of Zawia. Among these patients there were about two thirds females and one third males suggesting that females have

a higher risk of being hypertensive compared to males. Two thirds of these patients were older than 50 years which agrees with previous studies that suggest that age is a risk factor for hypertension. This study also investigates the types of medications and their

combinations that are prescribed to hypertensive patients to control their blood pressure. The study showed that half of the patients are using combinations of two or more medications to control their blood pressures and only three patients are not using any medications and since they were visiting the Hypertension Center, they most likely new patients and medications were not prescribed for them yet. The physical activity on daily basis proven to be effective in lowering the blood pressure and even though most of the patients were old, the percentage of patients who were engaged in daily walking activity is about two thirds of the study sample. Water as a magic and vital substance needs further investigations to comprehend its role in blood pressure regulation since there are many variables that can affect its role such as amounts of proteins and Sodium in the diet and the use diuretics which might elevate the water loss through urine, physical activities and working in hot places also increase water loss through sweating which requires consuming more water.

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