

The Effects of an Educational Program on Using Dietary Approach to Reduce High Blood Pressure in Khartoum State, Sudan (2015)

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Abstract

Background: Sudan is considered one of the leading countries in Africa for the prevalence of hypertension. However, a proper national registry on hypertension is not available in Sudan and evaluation studies are rarely done. Nevertheless, a recent study showed an increase in incidences of hypertension in Sudan. The DASH (Dietary Approaches to Stop Hypertension) diet, which is rich in fruits, vegetables, and low-fat dairy foods, significantly lowers the blood pressure. **Objective:** To examine the effectiveness of dietary approach to reduce hypertension (DASH) in the reduction of high blood pressure among hypertensive patients. **Design:** This research is an interventional case control community base study which was carried in 100 patients; 69 females and 31 males were selected by convenient sampling method. They were divided into two groups by simple random sampling 50 patients assigned in the case group and 50 in control group then followed every one separately for ten months. **Intervention:** The case group were taught individually about dietary approach to reduce hypertension DASH and each participant in case group possessed a book for teaching program to eat food low in saturated fat, cholesterol, total fat and emphasize fruits, vegetables, and fat-free or low-fat milk and milk products; then blood pressure measured monthly for both case and control group for ten month. **Result:** The study shows decrease in systolic blood pressure among patients who followed dietary approach and received teaching significantly in 4th month ($p = 0.032$) and diastolic blood pressure became significantly in 6th month ($p = 0.032$) and became more significant in next four months without change in control group. **Conclusion:** The study concluded that a diet rich in fruits, vegetables, and low-fat dairy foods, reduced saturated and total fat can substantially lower blood pressure. **Recommendation:** It is necessary to apply a nutritional approach among all hypertensive patients because it could minimize both the healthcare workload

and the money cost for therapy in clinical area.

Keywords

Patient, Hypertension, Dietary Approach

1. Introduction

Blood pressure can be unhealthy even if it stays only slightly above the normal level of 120/80 mm·Hg. High blood pressure affects about 50 million or 1 in 4 adult Americans. High blood pressure is especially common among African Americans who tend to develop it at an earlier age and more often than Whites. It is also common among older Americans—Individuals with normal blood pressure at age 55 have a 90 percent lifetime risk for developing hypertension [1].

Worldwide, raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of the total of all deaths. This accounts for 57 million disability adjusted life years (DALYs) or 3.7% of total DALYs [2]. Raised blood pressure is a major risk factor for coronary heart disease and ischemic as well as hemorrhagic stroke. Blood pressure levels have been shown to be positively and continuously related to the risk of stroke and coronary heart disease [2]. In some age groups, the risk of cardiovascular disease doubles for each increment of 20/10 mm·Hg of blood pressure, starting as low as 115/75 mm·Hg. In addition to coronary heart diseases and stroke, complications of raised blood pressure include heart failure, peripheral vascular disease, renal impairment, retinal hemorrhage and visual impairment. Treating systolic blood pressure and diastolic blood pressure until they are less than 140/90 mm·Hg is associated with a reduction in cardiovascular complications [2].

As of 2000, nearly one billion people or ~26% of the adult population of the world had hypertension. It was common in both developed (333 million) and undeveloped (639 million) countries [3]. However, rates vary markedly in different regions with rates as low as 3.4% (men) and 6.8% (women) in rural India and as high as 68.9% (men) and 72.5% (women) in Poland [4]. In Europe hypertension occurs in about 30% - 45% of people as of 2013 [5]. In 1995 it was estimated that 43 million people in the United States had hypertension or were taking antihypertensive medication, almost 24% of the adult United States population [6]. The prevalence of hypertension in the United States is increasing and reached 29% in 2004 [7]. As of 2006 hypertension affects 76 million US adults (34% of the population) and African American adults have among the highest rates of hypertension in the world at 44% [8]. It is more common in black, Filipinos, and Native Americans and less in white and, Mexican Americans, rates increase with age, and is greater in the southeastern United States [3]. Hypertension is more common in men (though menopause tends to decrease this difference) and in those of low socioeconomic status.

Although hypertension remains more prevalent in economically developed

countries (37.3%) compared to developing nations (22.9%), it is a much bigger problem in developing countries, in terms of actual numbers, awareness, treatment and complications, prevalence is also rising more rapidly across developing countries where it is estimated that three quarters (1.17 billion) of cases will exist by 2025 [3]. Recent studies from African countries have shown prevalence being 15% - 50%, and higher in urban than in rural populations [9].

In Khartoum 1990 estimated prevalence was found to be 7.5%, with a positive correlation between blood pressure and age, weight, body mass index and duration of urban residence [10].

More recently, data from the Sudan Household Survey in 2006 of chronic disease risk factors in Khartoum found hypertension prevalence to be 20.1% and 20.4% respectively [11]. Of concern are the poor rates of knowledge and control of hypertension in sub-Saharan Africa. A systematic review of 25 studies across the region found that less than 40% of people knew they were hypertensive, less than 30% were on treatment and less than 20% of those on treatment had a controlled blood pressure [12].

In Kassala, Eastern Sudan, knowledge of hypertension was poor, compliance with antihypertensive drug treatment was 59%, and 36.8% said they could not afford to buy the drugs they were prescribed [13]. A recent article in the Sudan Tribune warned that rising levels of non-communicable diseases and an aging population will have major implications for health and socio-economic development in the world's newest nation [14].

According to the latest WHO data published in April 2011, Hypertension Deaths in Sudan reached 12,281 or 3.33% of total deaths. The age adjusted Death Rate was 67.67 per 100,000 of population ranks Sudan number 17 in the world [15].

This study aimed to use another method to reduce high blood pressure (hypertension) which is known as dietary approach to stop hypertension (DASH) in order to decrease the prevalence of hypertension. The DASH eating plan is rich in fruits, vegetables, fat-free or low-fat milk and milk products, whole grains, fish, poultry, beans, seeds, and nuts. It also contains less salt and sodium; sweets, added sugars, and sugar-containing beverages; fats; and red meats. This heart-healthy way of eating is also lower in saturated fat, trans fat, and cholesterol and rich in nutrients that are associated with lowering blood pressure—Mainly potassium, magnesium, and calcium, protein, and fiber [16].

1.1. Statement of the Problem

The mortality due to hypertension (HTN) account for 20% - 50% of all deaths and the projected number of adults who will have hypertension by 2025 is 1.56 billion, it was reported that the highest prevalence of HTN was in Africa and approximately 80% of deaths in low-middle income countries were due to commonest complication of HTN is cardiovascular disease. All published studies about hypertension in Sudan targeted small scale studies for different specific population, a study in some referral clinics in Khartoum had shown cardiac,

neurological and renal symptoms were the major presenting complaints [17]. Hypertension was detected in 18.2% of the population with different occupations in Khartoum State and 10.2% were known hypertensive. School based study in Khartoum State has shown 4.9% of obese primary school children in age group 6 - 12 years were hypertensive. Passive screening program in Northern state in Sudan has shown 28.5% of village inhabitants were known hypertensive and 39.6% were having hypertension after screening. Local studies were conducted in urban settings rather than rural and showed high prevalence of target organ damages and almost no data was available from rural areas in states [17].

A study was conducted into blood pressure in a sample of 510 urban Sudanese working in the post office in Khartoum. The mean age was 35 years and 65% of the workers came from Northern Sudan. Cigarette smoking and consumption of alcohol were commonest amongst those from Southern Sudan. Both systolic and diastolic BPs rose with age. The prevalence of hypertension (140/90 mm·Hg or greater) was 7.5%. BP levels in this study were lower than those reported in Nigerians or blacks in the Caribbean or the United States. There was a significant positive correlation between systolic blood pressure and diastolic blood pressure and age, weight, body mass index and duration of residence in the city. These data confirm that hypertension is becoming an important health problem in Sudan.

In 2010, about 58.6 million persons or 25.1 percent of adults age 18 and older were treated for hypertension. Direct medical spending to treat hypertension totaled \$42.9 billion in 2010, with almost half (\$20.4 billion) in the form of prescription medications. Annual expenditures for those treated for hypertension averaged \$733 per adult in 2010 (Agency for Healthcare and Research Quality April 2013).

1.2. Justification

- In spite of the availability of the hypertension treatment, the incidence and mortality rate of hypertension is rising up according to many studies.
- Hypertension medications are very costive in comparing with life-style changes (DASH).
- Dietary approach to reduce hypertension (DASH) is cheaper and more available than clinical management.
- This means that the drug alone is not enough to control and prevent complications of hypertension. So orientations of the patient about additional method of control blood pressure like dietary approaches to reduce hypertension DASH is more necessary to be applied.
- No previous study was done.

1.3. Research Question

This study sets out to answer the following question:

Can dietary approach and education program contribute to reduction of high blood pressure?

1.4. Objectives

1.4.1. General Objective

To study the effectiveness of an educational program using dietary approach to reduce high blood pressure among hypertensive patients in Khartoum state.

1.4.2. Specific Objectives

- 1) To apply dietary approach and an educational program for hypertensive patient in the study group.
- 2) To assess knowledge of hypertensive patients towards management of hypertension before intervention.
- 3) To compare the control of BP among patients using antihypertensive drugs plus dietary approach with those using antihypertensive drugs alone.

2. Methodology

2.1. Study Design

The study was an interventional case control community-based study. The case was received antihypertensive drug plus using dietary approach to stop hypertension (DASH) and the control received only antihypertensive drug.

2.2. Study Area

Khartoum is one of Sudan state. Although it is the smallest state in terms of area (22,142 km²), it is the most populated state (5,274,321 in 2008 census). It contains the country's largest city in terms of population, Omdurman, and the city of Khartoum, which is the capital of the state as well as the national capital of Sudan. The capital city contains offices of the state, governmental and non-governmental organizations, cultural institutions, and the main airport.

The state lies between longitudes 31.5° to 34° E and latitudes 15° to 16° N. It is surrounded by River Nile State in the north-east, in the north-west by the Northern State, in the east and southeast by the states of Kassala, Gedaref and Gezira, and in the west by North Kurdufan.

2.2.1. Administrative Divisions

The state is geographically divided into blocks (or clusters), which are further subdivided into localities. There are a total of three blocks and seven localities.

2.2.2. First Block: Jebel Aulia Locality and AL Khartoum Locality

This starts from the Morgan the confluence of the Blue Nile and White Nile, and extends southward between them to the boundaries of Gezira state. The block is characterized by Sundus and Soba agricultural schemes in both the Gebel Aulia and Khartoum localities, along with numbers of livestock, poultry, fishing, and fodder production projects, as well as vegetable and fruit farms.

2.2.3. Second Block: Khartoum North and Sharq An-Nil Locality (Blue Nile)

This is the northern block, between the Blue Nile and the River Nile. The largest

town in this block is Khartoum North. There are many agricultural projects, such as the Soba East and Seleit projects, and the largest dairy project in the state, the Kuku village project. The block also includes the largest industrial areas in Sudan. Omdurman Locality, Ombadda Locality (Um Badda) and Karari Locality (Karari).

For further clarification see **Figure 1**.

2.2.4. Health Services and Socioeconomic Status

The Khartoum state populations are composed of different tribes of Sudan which arrived at it from north, south, east and western of Sudan and the socio-economic status is varies from low, moderate and high. The people in Khartoum are employed in different jobs: Governmental job, labor, free business, etc.

The Khartoum state populations receive their medical health services from 48 public health centers which are divided into 16 public hospitals in Khartoum, 19 in Omdurman and 18 in Khartoum Bahari in addition to private clinics and hospitals.

2.3. Study Population

Hypertensive patients hospitalized and none hospitalized (out-patient clinic) and in the community without hypertension complication.

2.4. Sample Size and Sample Procedure

The total number of participant were 100 hypertensive patients divided into two groups, 50 person case and 50 person as control that is selected by a non-randomized method called convenience sample method.

Convenience sampling or accidental sampling is a type of non-probability sampling which involves the sample being drawn from that part of the population which is close to hand it has several advantages like expedited data collection, ease of research, readily available and cost-effective.

The researcher screened 130 potential participants by direct interview. The

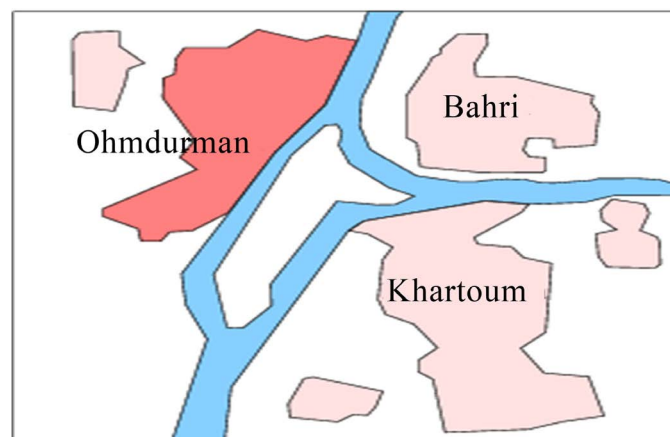


Figure 1. Shows the Khartoum state map and location of the main city Khartoum, Bahri and Omdurman.

study excluded 30 potential participants via direct intervention, 10 because of significant heart disease (heart failure and ischemic heart diseases) informed by patients, 9 because of refusal to participate in the study and 11 excluded due to renal disease (patients told). We obtained verbal consent from 100 potential participants; these 100 patients are divided into two groups, 50 eligible men and women were assigned to be intervention group while 50 patient men and women were assigned to be control group of the study (50 cases, 50 controls). This was done by simple random sampling.

During study 5 patients dropped from study (3 of them didn't want to continue more in the study and loss contact for 2 patients) and 45 patient completed as a case (intervention group). From the control group 7 patients dropped from study due to loss of contact and 43 patients completed as control group.

For further clarification see **Figure 2**.

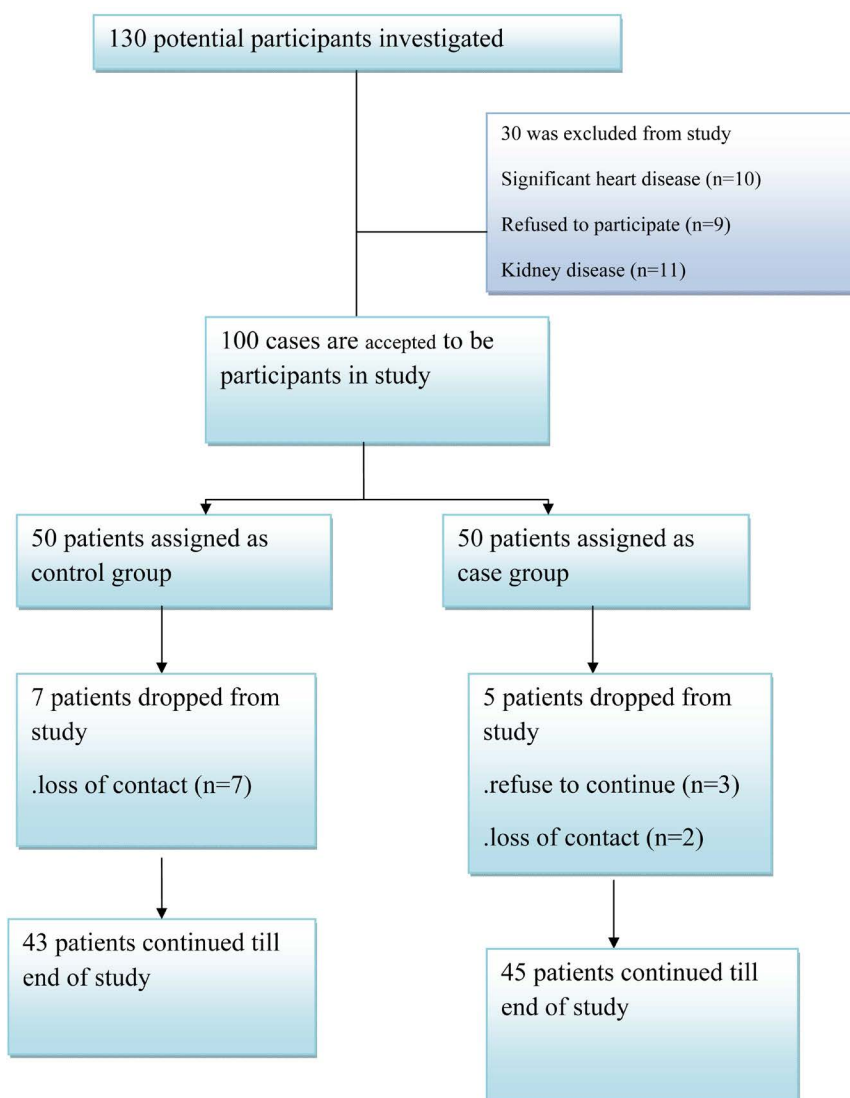


Figure 2. Shows the diagram of sample and sample procedure during study period. Note: n = number of the patient.

2.5. Inclusion Criteria

Any adult patient diagnosed as hypertensive male or female without complications, who respect and able to apply the plan and mentally sound is eligible to be included in this study.

2.6. Exclusion Criteria

Hypertensive patient child, adult mentally un-cognitive, who have complications and not able to apply the plan will be excluded from the study.

2.7. Interventions

Interventions were done as follow: (Measurement of blood pressure) potential participants were asked to refrain from smoking or ingesting caffeine for at least 30 minutes before their appointment time. Measurements were standardized for cuff size, position, environment, and time of day. After 5 minutes of quiet rest, 4 seated BP readings, each 2 minutes apart, were obtained using electronic sphygmomanometer.

The blood pressure was measured at the beginning as baseline date for both cases and control groups then every month for 10 months to compare the result.

The researcher discussed teaching program to be taught to the case group individually, each participant in case group should possess book for teaching program, in teaching program each patient was taught individually about DASH to eat food low in saturated fat, cholesterol, and total fat and emphasis was placed on fruits, vegetables, and fat-free or low-fat milk and milk products.

- ✓ The teaching book about dietary approach to stop hypertension.
- ✓ Follow up sheets for both case and control groups.

2.8. Methods of Data Collection

The data were collected by using two methods: Direct measurement of blood pressure and self-administrated questionnaire.

Self-Administrated Questionnaire

The questionnaire is designed to assess level of knowledge of patients under study about dietary approach to stop hypertension, life-style of patients, follow-up, strategies follow to maintain blood pressure is acceptable measure, type of diet and exercise.

The data collected by questionnaire for both case and control group to know the baseline information.

The blood pressure was measured at the beginning as baseline date for both case and control group then every month for 10 months to compare the result.

2.9. Data Analysis

The researcher was used Statistical Package for the Social Sciences (SPSS) to analyze the results.

2.10. Ethical Clearance

- ✓ Approval from EL Ribat University was obtained.
- ✓ Verbal consent of patients (participants) was obtained.

3. Result

The total population under study was 100 patients: 69 were female 35 in intervention group 34 control group and 31 were male 15 intervention group and 16 control group (**Table 1**).

(68%) of intervention group and (72%) of control group were in medial age between 31 years to 60 years and (28%) above 60 years while (4%) were 30 years and less in intervention group (**Table 2**).

The most of population included in the study were housewives (32%) in intervention group and (32%) in control group and (12%) were employees in control group and (10%) employee in intervention group (**Table 3**).

Most of patients under study had pre-hypertension stage which presented (44%) in case and (46%) in control group, (30%) have stage I hypertension in each cases and control while (16%) were stage II of hypertension in case and (18%) in control group, (10%) have 160/100 mm·Hg in case group and (6%) have more than 160/100 mm·Hg in control group (**Table 4**).

(52%) of patients had single antihypertensive medication in intervention

Table 1. Gender of population under study.

Gender	Intervention Group	Control Group
Male	15 (30%)	16 (32%)
Female	35 (70%)	34 (68%)
Total	50 (100%)	50 (100%)

Table 2. Age of the study population.

Age Group	Intervention Group	Control Group
Less than 30 Year	2 (4%)	0 (0%)
31 - 60 Year	34 (68%)	36 (72%)
More than 60 Year	14 (28%)	14 (28%)
Total	50 (100%)	50 (100%)

Table 3. Occupation of study population.

Occupation	Intervention Group	Control Group
Employee	5 (10%)	6 (12%)
Labor	4 (8%)	6 (12%)
Housewife	16 (32%)	16 (32%)
Others	25 (50%)	22 (24%)
Total	50 (100%)	50 (100%)

Table 4. Base line blood pressure of patients under study.

Base Line Blood Pressure	Intervention Group	Control Group
120 - 139/80 - 89 mm·hg	22 (44%)	23 (46%)
140 - 159/90 - 99 mm·hg	15 (30%)	15 (30%)
160/100 mm·hg	8 (16%)	9 (18%)
More than 160/100 mm·hg	5 (10%)	3 (6%)
Total	50 (100%)	50 (100%)

group and (46%) in control group, (32%) of patients have two antihypertensive medications in control, (28%) had two antihypertensives in intervention group and (20%) were on three antihypertensive drugs in case and control (**Table 5**).

The mean value of systolic blood pressure at basic measure in cases (n = 44) was 144.1 ± 12.29 while in control group (n = 44) was 140.3 ± 12.1 , which was not significantly different ($p = 0.159 > 0.05$) (**Table 6**).

The mean value of systolic blood pressure at first month measure in cases (n=44) was 142.0 ± 12.0 while in control group (n = 44) was 142.1 ± 11.2 , which was not significantly different ($p = 0.985 > 0.05$) (**Table 6**).

The mean value of systolic blood pressure at second month measure in cases (n = 44) was 140.2 ± 9.0 while in control group (n = 44) was 141.5 ± 11.5 , which was not significantly different ($p = 0.564 > 0.05$) (**Table 6**).

The mean value of systolic blood pressure at the third month measure in cases (n = 44) was 138.4 ± 11.1 while in control group (n = 44) was 142.3 ± 11.4 , which was not significantly different ($p = 0.109 > 0.05$) (**Table 6**).

The mean value of systolic blood pressure at the fourth month measure in cases (n = 44) was 137.5 ± 11.5 while in control group (n = 44) was 142.8 ± 11.2 , which was significantly different (lower in cases and higher in control) ($p = 0.032 < 0.05$) (**Table 6**).

The mean value of systolic blood pressure at the fifth month measure in cases (n = 44) was 137.4 ± 11.3 while in control group (n = 44) was 142.3 ± 10.9 , which was significantly different (lower in cases and higher in control) ($p = 0.045 < 0.05$) (**Table 6**).

The mean value of systolic blood pressure at the sixth month measure in cases (n = 44) was 136.8 ± 10.7 while in control group (n = 44) was 142.4 ± 11.1 , which was significantly different (lower in cases and higher in control) ($p = 0.019 < 0.05$) (**Table 6**).

The mean value of systolic blood pressure at the seventh month measure in cases (n = 44) was 136.2 ± 10.6 while in control group (n = 44) was 142.7 ± 10.4 , which was significantly different (lower in cases and higher in control) ($p = 0.005 < 0.05$) (**Table 6**).

The mean value of systolic blood pressure at the eighth month measure in cases (n = 44) was 136.2 ± 10.4 while in control group (n = 44) was 143.2 ± 10.2 , which was significantly different (lower in cases and higher in control) ($p = 0.032 < 0.002$) (**Table 6**).

Table 5. Number of antihypertensive medications used by patient.

Anti HTN Drugs	Intervention Group	Control Group
Single Antihypertension	26 (52%)	23 (46%)
Two Antihypertension	14 (28%)	16 (32%)
Three Antihypertension	10 (20%)	11 (22%)
Total	50 (100%)	50 (100%)

Table 6. The differences in systolic pressure between cases (intervention group) and control group (n = 88).

Months	Cases		Control		SE	CI 95%		t	DF	p
	Mean	SD	Mean	SD		Lower	Upper			
Basic BP	144.1	12.9	140.3	12.1	2.7	-1.5	9.1	1.4	86	0.159
First Month	142.0	12.0	142.1	11.2	2.5	-5.0	4.9	0.0	86	0.985
Second Month	140.2	9.0	141.5	11.5	2.2	-5.6	3.1	-0.6	86	0.564
Third Month	138.4	11.1	142.3	11.4	2.4	-8.7	0.9	-1.6	86	0.109
Forth Month	137.5	11.5	142.8	11.2	2.4	-10.1	-0.5	-2.2	86	0.032
Fifth Month	137.4	11.3	142.3	10.9	2.4	-9.5	-0.1	-2.0	86	0.045
Sixth Month	136.8	10.7	142.4	11.1	2.3	-10.2	-0.9	-2.4	86	0.019
Seventh Month	136.2	10.6	142.7	10.4	2.2	-10.9	-2.0	-2.9	86	0.005
Eighth Month	136.2	10.4	143.2	10.2	2.2	-11.4	-2.7	-3.2	86	0.002
Ninth Month	135.5	10.2	143.6	10.1	2.2	-12.4	-3.8	-3.8	86	0.000
Tenth Month	135.0	9.6	143.3	9.2	2.0	-12.4	-4.4	-4.2	86	0.000

The mean value of systolic blood pressure at the ninth month measure in cases (n = 44) was 135.5 ± 10.2 while in control group (n = 44) was 143.6 ± 10.1 , which was significantly different (lower in cases and higher in control) ($p = 0.000 < 0.05$) (**Table 6**).

The mean value of systolic blood pressure at the tenth month measure in cases (n = 44) was 135.0 ± 9.6 while in control group (n = 44) was 143.3 ± 9.2 , which was significantly different (lower in cases and higher in control) ($p = 0.000 < 0.05$) (**Table 6**).

The mean value of diastolic blood pressure at basic measure in cases (n44) was 92.1 ± 6.0 while in control group (n = 44) was 85 ± 1.6 , which was significantly different (higher in cases and lower in control) ($p = 0.001 < 0.05$) (**Table 7**).

The mean value of diastolic blood pressure at first month measure in cases (n44) was 90.4 ± 8.2 while in control group (n = 44) was 85.9 ± 9.3 , which was significantly different (higher in cases and lower in control) ($p = 0.018 < 0.05$) (**Table 7**).

The mean value of diastolic blood pressure at second month measure in cases (n = 44) was 86.6 ± 7.0 while in control group (n = 44) was 88.8 ± 7.1 , which was not significantly different ($p = 0.153 > 0.05$) (**Table 7**).

The mean value of diastolic blood pressure at the third month measure in

Table 7. The differences in diastolic pressure between cases (intervention group) and control group (n = 88).

Months	Cases		Control		SE	CI 95%		t	DF	p
	Mean	SD	Mean	SD		Lower	Upper			
Basic BP	92.1	6.0	85.0	8.5	1.6	4.0	10.2	4.5	86	0.001
First Month	90.4	8.2	85.9	9.3	1.9	0.8	8.2	2.4	86	0.018
Second Month	86.6	7.0	88.8	7.1	1.5	-5.1	0.8	-1.4	86	0.152
Third Month	87.9	5.6	88.2	8.0	1.5	-3.3	2.6	-0.2	86	0.817
Forth Month	88.1	5.7	90.2	6.8	1.3	-4.7	0.6	-1.5	86	0.134
Fifth Month	87.7	5.3	90.0	6.2	1.2	-4.7	0.1	-1.9	86	0.064
Sixth Month	87.5	5.4	90.2	6.0	1.2	-5.1	-0.2	-2.2	86	0.032
Seventh Month	86.8	5.2	90.4	6.1	1.2	-5.9	-1.1	-2.9	86	0.004
Eighth Month	86.4	5.1	90.9	5.1	1.1	-6.6	-2.3	-4.1	86	0.001
Ninth Month	86.5	5.2	91.2	5.7	1.2	-7.0	-2.3	-4.0	86	0.001
Tenth Month	86.5	5.2	91.2	5.5	1.1	-6.9	-2.4	-4.0	86	0.001

cases (n = 44) was 87.9 ± 5.6 while in control group (n = 44) was 88.2 ± 8.0 , which was not significantly different ($p = 0.817 > 0.05$) (Table 7).

The mean value of diastolic blood pressure at the fourth month measure in cases (n = 44) was 88.1 ± 5.7 while in control group (n = 44) was 90.2 ± 6.8 , which was not significantly different ($p = 0.134 > 0.05$) (Table 7).

The mean value of diastolic blood pressure at the fifth month measure in cases (n = 44) was 87.7 ± 5.3 while in control group (n = 44) was 90.0 ± 6.2 , which was not significantly different ($p = 0.064 > 0.05$) (Table 7).

The mean value of diastolic blood pressure at the sixth month measure in cases (n = 44) was 87.5 ± 5.4 while in control group (n = 44) was 90.2 ± 6.0 , which was significantly different (lower in cases and higher in control) ($p = 0.032 < 0.05$) (Table 7).

The mean value of diastolic blood pressure at the seventh month measure in cases (n = 44) was 86.8 ± 5.2 while in control group (n = 44) was 90.4 ± 6.1 , which was significantly different (lower in cases and higher in control) ($p = 0.004 < 0.05$) (Table 7).

The mean value of diastolic blood pressure at the eighth month measure in cases (n = 44) was 86.4 ± 5.1 while in control group (n = 44) was 90.9 ± 5.1 , which was significantly different (lower in cases and higher in control) ($p = 0.001 < 0.005$) (Table 7).

The mean value of diastolic blood pressure at the ninth month measure in cases (n = 44) was 86.5 ± 5.2 while in control group (n = 44) was 91.2 ± 5.7 , which was significantly different (lower in cases and higher in control) ($p = 0.001 < 0.05$) (Table 7).

The mean value of diastolic blood pressure at the tenth month measure in cases (n = 44) was 86.5 ± 9.6 while in control group (n = 44) was 91.2 ± 5.5 ,

which was significantly different (lower in cases and higher in control) ($p = 0.001 < 0.05$) (Table 7).

4. Discussions

This study was done on hypertensive patients to assess the effectiveness of (DASH) approach through reducing high blood pressures.

The results of this study show that (44%) of intervention group and (46%) of control group had pre-hypertension, (30%) of each control and intervention group had first stage hypertension and (10%) had blood pressure more than 160/100 mmHg in intervention group; all of them were on antihypertensive drug (52%) had single antihypertensive in intervention group, (28%) two antihypertensive drugs in intervention group and (20%) three antihypertensive drugs in intervention group while in control group (46%), (32%) and (22%) respectively (Table 4 and Table 5).

This study shows the mean value of systolic blood pressure at basic measurement in cases ($n = 44$) was 144.1 ± 12.29 while in control group ($n = 44$) was 140.3 ± 12.1 , which was not significantly different ($p = 0.159 > 0.05$) (Table 6).

The significant changes occurred in the mean value of systolic blood pressure at the fourth month measure in cases ($n = 44$) was 137.5 ± 11.5 while in control group ($n = 44$) was 142.8 ± 11.2 , which was significantly different (lower in cases and higher in control) ($p = 0.032 < 0.05$) (Table 6).

The changes became more significant in months after 4th month as the mean value of systolic blood pressure at the 10th month measure in cases ($n = 44$) was 135.0 ± 9.6 while in control group ($n = 44$) was 143.3 ± 9.2 , which was significantly different (lower in cases and higher in control) ($p = 0.000 < 0.05$) (Table 6).

DASH eating plan had the greatest effect in high blood pressure and blood pressure reduction came fast within 2 weeks of starting plan [18].

In 6th month trial period blood pressure occur 12 mmHg systolic in men and 11 mm·Hg in women while diastolic decreased by 6 mm·Hg in men and 7 mm·Hg in women [19].

More than 4th week low sodium intake is effective in reducing blood pressure [20].

Lowering sodium intake whatever eating plan can contribute in reduction of blood pressure [18].

The results of this study are in line with that study done on United State to compare diet containing low sodium and other with traditional eating of United State of America DASH eating plan, the result of that was reducing dietary sodium lowered blood pressure for both eating plans. The greatest blood pressure reductions were for the DASH eating plan at the sodium intake of 1500 milligrams per day. Those with high blood pressure showed the greatest reductions, importance to lowering sodium intake whatever your eating plan [18].

In the primary screening the mean value of basic diastolic blood pressure

measure in cases ($n = 44$) was 92.1 ± 6.0 while in control group ($n = 44$) was 85 ± 1.6 , which was significantly different (higher in cases and lower in control) ($p = 0.001 < 0.05$) (Table 7).

The changes became significant at the 6th month the mean value of diastolic blood pressure at the sixth month measure in cases ($n = 44$) was 87.5 ± 5.4 while in control group ($n = 44$) was 90.2 ± 6.0 , which was significantly different (lower in cases and higher in control) ($p = 0.032 < 0.05$) (Table 7).

The changes became more significant after 6th month the mean value of diastolic blood pressure at the 10th month measure in cases ($n = 44$) was 86.5 ± 9.6 while in control group ($n = 44$) was 91.2 ± 5.5 , which was significantly different (lower in cases and higher in control) ($p = 0.001 < 0.05$) (Table 7).

This result going with that done by (Whitt-Glover MC) in North Carolina which shows no significant changes occurred in blood pressure after 12th week of application of the DASH approach [21].

The results of this study were in line with that study done by (Blumenthal JA, Babyak MA) in the United States of America to assess the DASH diet alone and in combination with exercise and weight loss which shows that the blood pressure was reduced by 16.1/9.9 mm-Hg (DASH plus weight management); 11.2/7.5 mm-Hg (DASH alone); and 3.4/3.8 mm-Hg (usual diet controls) ($p < 0.001$) [22].

The important findings show significant changes ($p = 0.03$) occurred in systolic blood pressure after 4th month; while in diastolic blood pressure significant changes ($p = 0.032$) occurred after 6th month and became more significant in next months.

Some of studies done were different with this results in the time of blood pressure starting to decline, like study done by national institutes of health and national heart, lung and blood institute department of health and human services in U.S. (United States) participants who followed both the plan that included more fruits and vegetables and the DASH eating plan had reduced blood pressure. But the DASH eating plan had the greatest effect, especially for those with high blood pressure. Furthermore, the blood pressure reductions came fast within 2 weeks of starting the plan [18].

Based on the research findings, the DASH diet could be adopted as part of current national recommendations for the prevention and treatment of high BP.

The first line of prevention and management of hypertension is life-style change include dietary changes, physical exercise and weight reduction; potential affect is similar to single antihypertensive medication [20].

5. Conclusion

DASH eating plan is a diet rich in fruits, vegetables, and low-fat dairy foods, reduced saturated and total fat; application of this program leads to significant substantial changes, it is clear that both systolic and diastolic blood pressure of the cases (intervention group) decreased compared with control group, with no significant differences at basic measure, then significantly different by 4th month

in systolic BP and by 6th month in diastolic BP (lower in cases and higher in control).

Recommendations

According to the results of case control study the researcher recommends the following:

- 1) Education for health care workers, social workers and nutritionist about dietary approach to stop hypertension (DASH) should be rendered.
- 2) DASH is recommended to be introduced in curriculum of health, nursing and nutritional sciences.
- 3) Extensive education should be extended to the community on DASH especially to hypertensive patients.
- 4) It is necessary to apply a nutritional approach to all hypertensive patients because it could minimize both the healthcare workload and the high cost for therapy in clinical area.
- 5) Further studies should be conducted in a large group of patients to evaluate the possibility of clinical application to other chronic diseases like heart disease is recommended.
- 6) Government should support poor hypertensive patients to follow DASH and to have antihypertensive drugs in their hands.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Annex 1. Cases (Intervention Group) Follow up Sheet

Case name	Basic BP	First month	Second month	Third month	Four month	Five month	Six month	Seven month	Eight month	Nine month	Ten month	Notes
1	129/92	126/84	126/87	114/82	120/86	126/85	128/88	129/86	126/85	120/87	126/87	
2	130/100	129/97	130/87	130/92	130/97	130/97	130/97	130/87	130/87	130/92	130/92	
3	130/88	130/88	130/82	130/88	130/88	130/88	130/82	130/82	130/82	130/82	130/82	
4	160/100	156/125	150/95	160/100	160/100	160/100	160/100	156/95	150/95	156/95	126/95	
5	130/95	130/95	136/76	130/90	130/90	130/90	128/88	128/88	128/88	130/88	130/87	
6	110/90	111/80	137/82	136/84	116/82	137/82	136/84	137/82	137/82	130/82	130/82	
7	130/90	130/87	130/87	130/87	130/86	126/86	120/86	126/86	126/86	125/85	125/85	
8	136/97	136/95	157/90	129/89	130/90	130/90	130/90	127/89	130/89	130/89	130/89	
9	135/87	135/85	130/80	135/87	135/85	135/85	135/85	130/80	130/80	130/80	130/80	
10	139/90	139/87	135/87									dropped
11	160/100	160/95	160/95	155/95	155/95	150/95						dropped
12	180/110	180/110	140/80	170/105	170/105	170/100	170/100	175/100	175/100	165/100	165/100	
13	153/81	150/80	150/80	150/80	150/80	150/80	150/80	145/80	145/80	145/80	145/80	
14	160/85	140/80	140/80	135/80	130/80	130/80	130/80	128/79	130/80	130/80	130/80	
15	160/100	150/100	150/95	150/95	145/95	150/95	150/95	155/95	155/95	155/95	155/95	
16	140/90	140/90	140/88	135/87	135/87	135/88	135/88	135/88	135/88	130/86	136/86	
17	160/90	165/87	160/87	160/87	165/87	165/87	160/86	155/86	155/86	155/86	155/86	
18	130/87	130/86	130/87	130/87	130/87	130/85	130/85	130/85	125/80	125/80	125/80	
19	154/90	154/83	154/83	154/83	150/82	150/82	145/82	145/82	145/82	145/82	145/82	
20	140/95	140/90	140/90	135/90	130/90	130/90	130/90	130/90	130/90	125/90	125/90	
21	170/100	170/90	160/90	160/95	160/95	155/90	155/90	155/90	150/90	150/90	150/90	
22	140/90	140/90	130/90	130/80	130/85	130/85	135/85	130/80	130/80	130/80	130/80	
23	160/90	160/90	155/85	155/85	155/85	155/85	150/80	150/80	150/80	150/80	150/80	
24	140/80	140/80	135/80	130/80	130/80	130/80	130/80	130/80	130/80	130/80	130/80	
25	131/84	131/84	130/85	130/80	120/80	120/80	120/80	120/80	120/80	125/80	120/80	
26	150/95	150/95	145/95	145/90	145/90	145/90	140/90	140/90	140/90	140/90	140/90	
27	163/96	160/95	155/90	155/90	155/90	155/90	150/88	150/88	150/88	150/88	150/88	
28	150/100	145/95	145/95	145/95	140/95	140/95	135/95	135/95	135/95	130/90	130/90	
29	140/90	140/90	135/88	135/88	138/88	130/87	130/88	130/88	130/88	130/85	130/85	
30	130/86	136/86	130/85	125/85	125/85	125/85	125/85	125/85	125/85	125/85	125/85	
31	140/90	140/90	140/88	135/88	135/88	130/85	130/85	130/85	130/85	130/85	130/85	
32	130/85	130/80	125/80	125/80	130/80	125/80	125/80	125/80	125/80	125/80	125/80	
33	150/95	150/90	140/90	140/90	140/90	140/90	140/90	140/90	135/88	135/88	135/88	
34	140/90	135/88	135/88	130/85	130/85	130/85	130/85	130/85	130/85	130/85	130/85	
35	140/88	135/87	135/87	130/85	130/85	130/85	130/85	130/85	130/85	130/85	130/85	
36	150/90	140/85	140/85	140/85	140/85	140/85	140/85	140/85	140/84	140/84	140/84	

Continued

37	150/90	140/85	140/85	140/85	140/85	140/85	140/85	140/85	140/84	140/84	140/84	
38	150/100	145/95	140/95	140/95	140/95	140/95	140/95	140/95	140/95	140/95	140/95	
39	150/100	145/95	140/95	140/95	140/95	140/95	140/95	140/95	140/85	140/95	140/95	
40	160/110	150/110	150	100								dropped
41	160/100	155/100	150/97									dropped
42	150/90	145/88	145/88	140/88	140/88	140/88	140/88	140/88	140/88	140/88	140/88	
43	130/88	130/85	130/85	130/85	128/85	128/85	128/85	130/85	130/85	130/85	130/85	
44	140/90	140/90	140/85	130/85	130/85	130/85	130/85	130/85	130/85	130/85	130/85	
45	130/88	130/88	130/85	130/85	130/85	130/85	130/85	130/85	130/85	130/85	130/85	
46	150/88	150/88	140/85	140/85	140/85							dropped
47	160/100	155/98	155/98	150/95	150/95	150/95	150/95	140/95	140/95	145/95	145/95	
48	150/96	150/95	145/90	140/90	140/90	135/88	135/88	135/88	135/88	130/88	130/88	
49	150/96	150/95	145/90	140/90	140/90	135/88	135/88	135/88	140/88	140/88	140/88	
50	150/98	150/97	145/97	145/97	140/95	145/95	145/95	145/95	145/95	140/95	140/95	

Annex 2. Control Follow up Sheet

Case name	Basic BP	First month	Second month	Third month	Four month	Five month	Six month	Seven month	Eight month	Nine month	Ten month	Notes
1	128/73	130/80	111/71	110/80	111/80	110/80	110/82	120/82	120/82	120/82	120/82	
2	140/88	136/90										dropped
3	150/100	150/100	149/100	148/100	140/100	150/100	146/100	140/100	148/100	155/100	149/100	
4	136/72	138/80	130/80	130/80	130/80	130/80	130/80	130/80	130/80	130/80	130/80	
5	110/70	130/92	130/92	130/92	130/95	130/95	130/95	130/95	130/95	130/95	130/95	
6	128/88	128/88	130/88	130/88	130/90	130/90	130/90	130/88	130/88	130/88	130/88	
7	160/90	160/90	150/95	150/90	150/95	150/90	150/90	150/90	150/90	150/90	150/90	
8	129/87	129/88	130/85	130/85	130/87	130/87	130/87	130/87	130/87	130/87	130/87	
9	160/80	160/79	140/80	140/60	140/80	140/80	140/80	150/80	150/80	150/80	150/80	
10	134/86	134/86	140/90									dropped
11	128/77	130/80	120/80	120/80	125/80	125/80	120/80	120/77	120/88	133/85	140/90	
12	120/80	120/70	130/80	130/80	135/85	135/80	135/80	135/80	130/80	130/80	130/80	
13	140/90	140/90	140/90	140/90	140/90	140/92	140/92	140/92	140/92	140/92	140/92	
14	130/80	130/80	140/90	140/90	140/92	140/92	140/92	140/92	140/92	140/92	140/92	
15	133/66	133/66	140/80	140/80	140/80	140/80	140/80	140/80	140/85	140/85	140/85	
16	120/70	160/50	150/90	150/90	150/90	150/90	150/90	150/90	150/90	150/90	150/90	
17	138/79	138/79	140/92	140/90	140/90	140/90	140/92	140/92	140/92	140/92	140/90	
18	130/90	130/90	130/90	140/90	140/92	140/90	140/90	140/92	135/90	140/92	140/90	
19	140/80	140/80	140/92	140/92	140/95	140/95	140/95	140/95	140/95	140/95	140/95	
20	140/85	140/87	140/90	140/80	140/85	140/85	140/85	140/90	140/90	140/90	140/90	

Continued

21	139/78	140/80	139/78	139/75	140/80	139/80	139/80	130/80	140/88	140/88	140/87
22	157/100	155/100	157/100	157/105	156/100	140/105	150/100	150/100	150/100	150/100	150/100
23	160/100	160/100	160/105	160/110	160/100	150/100	150/100	150/100	150/100	150/105	150/105
24	140/80	140/80	140/80	140/85	140/85	140/85	140/90	140/88	140/90	140/90	140/90
25	160/99	160/100	169/99	160/98	160/105	160/100	160/98	160/100	160/98	150/100	150/100
26	130/80	130/82	130/80	130/80	130/85	130/86	130/86	130/88	136/90	130/88	133/90
27	140/90	140/90	140/95	140/95	140/95	140/95	145/95	150/95	150/90	150/95	150/95
28	160/100	160/100	160/105	160/100							dropped
29	130/80	130/80	130/80	135/80	140/80	140/85	140/85	140/85	140/85	140/85	140/85
30	150/96	150/96	155/100	155/100	155/100	155/100	155/100	155/100	155/100	155/100	155/100
31	150/96	150/96	155/100	155/100	155/100	155/100	155/100	150/98	150/98	155/100	155/100
32	130/80	130/82	130/82	130/82	130/82	130/85	130/85	140/90	140/90	140/90	140/90
33	138/80	130/82	130/82	130/82	130/82	130/85	130/85	140/90	140/90	140/90	140/90
34	150/90										dropped
35	140/88	140/88	140/88	140/90	140/90	140/90	140/90	140/90	140/90	140/90	140/90
36	140/80	140/88	140/88	140/90	140/90	140/90	140/90	140/90	140/90	140/90	140/90
37	160/90	157/93									dropped
38	140/88	140/88	145/90	145/90	145/90	145/90	145/90	140/90	140/90	140/95	145/90
39	140/88	140/88	145/90	145/90	145/90	145/90	145/90	140/90	140/90	140/95	140/95
40	150/90	150/90	150/90	155/90	155/92	155/92	155/92	155/92	155/92	155/90	155/92
41	150/90	150/90	150/90	155/90	155/92	155/92	155/92	155/92	155/92	140/90	155/92
42	140/88	145/90	145/90	145/90	145/95	145/95	145/90	140/90	140/90	140/90	140/90
43	140/88	145/90	145/90	145/90	145/95	145/95	145/90	140/90	140/90	140/90	140/90
44	140/88	150/88	150/85	150/85	150/88	150/88	150/88	155/88	155/88	155/88	155/88
45	145/98	140/100									dropped
46	160/90	160/92	160/99	160/94	160/90	160/92	160/92	160/90	150/93	163/93	156/98
47	150/90	150/90	155/92	155/92	160/95	160/95	160/95	160/95	163/96	160/95	160/95
48	160/90	160/92	160/90	160/90	160/90	160/92	160/92	160/90	160/92	160/92	160/92
49	150/98	160/100	160/105								dropped
50	150/96	150/90	155/92	155/92	160/95	160/94	159/93	157/98	160/92	163/98	154/100