

# The effectiveness of a follow-up program on blood pressure and cardiovascular risk factors for hypertensive patients

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## KEY WORDS

hypertension, cardiovascular risk factors, follow-up, nursing

## ABSTRACT

### Objective

The purpose of this study was to evaluate the effectiveness of a follow-up program on blood pressure and cardiovascular risk factors in hypertensive patients.

### Design

A time series (one group pretest-posttest) quasi-experimental study was used.

### Setting

This study was conducted at the Hypertension, Obesity and Diabetes Center of a State Hospital in Turkey.

### Subjects

Forty-five (45) hypertensive patients were recruited.

### Intervention

An education program was implemented with hypertensive patients whereby patients were monitored at each month for a total of six times following an initial appointment. Follow-up by nurses included checking weight and blood pressure (BP), reviewing of diaries, education, counseling or referrals to other disciplines.

### Measurement

Patients' BP and cardiovascular risk factors were assessed at the baseline and six months later. The findings were then compared to evaluate the effects of intervention on the patient's BP and cardiovascular risk factors.

### Results

After intervention there was a significant decrease between the mean systolic BP and diastolic BP when compared with the baseline. BMI was decreased from  $29.6 \pm 3 \text{ kg/m}^2$  to  $29.3 \pm 3 \text{ kg/m}^2$  ( $p=0.033$ ). Total cholesterol did not change. Triglycerides decreased. However, LDL-cholesterol increased and HDL-cholesterol decreased.

### Conclusion

To manage hypertension and to reduce cardiovascular risk factors, a program is needed and should be implemented which includes antihypertensive treatment options, lifestyle changes and lipid-lowering drug therapy. The long term effects of such a program should be monitored while implementing.

## INTRODUCTION

High BP is one of the major risk factors for coronary heart disease and the most important risk factor for cerebrovascular disease (Chobanian et al 2003). In Turkey, hypertension prevails in one-third of adults. For those aged between 40-69 years the current prevalence of hypertension reaches one-half of subjects, 43% in men and 56% in women (Onat 2001). The control of hypertension and prevention of the age-related increase in BP remain major public health priorities (Apel et al 2003).

Significant progress has been made in increasing the awareness, detection, treatment and control of hypertension; however it has been reported that approximately 30% of adults are unaware of their hypertension (Chobanian et al 2003). Only half of affected patients receive treatment and just half of these achieve a BP rating of <140/90 mmHg (Oakeshott et al 2003). The goals of managing hypertensive patients are to improve their quality of life and prevent complications, thereby decreasing morbidity and mortality.

Cardiovascular risk factors which lead to coronary artery disease are quite common in hypertensive patients. Some studies have found significant associations between hypertension and low HDL cholesterol, increased LDL cholesterol, hypertriglyceridaemia (Stern et al 2000) obesity and impaired glucose tolerance (Borde-Perry et al 2002; Silaste et al 2000). Data support the clinical management of multiple risk factors as well as the achievement of BP control (Kastarinen et al 2000). Moreover, the presence of multiple risk factors is often implicated in the increased coronary morbidity and mortality observed in effectively treated hypertensive's (Stern et al 2000).

The guidelines for prevention, detection, evaluation, and treatment of high BP have been emphasised the reduction of the BP and cardiovascular risk factors which lead to hypertension (Chobanian et al 2003; Turkish Cardiology Society 2000). Pharmacologic and nonpharmacologic treatments for patients with hypertension are effective in lowering the BP of many

people who follow the recommendations and may also reduce other risk factors for cardiovascular disease (Chobanian et al 2003). However, patients' non-compliance with their medical treatment is one of the problems of controlling hypertension (Li et al 2008; Aminoff and Kjellgren 2001). Adherence to therapeutic regimens is becoming a significantly important step in the campaign to control high BP (Chen et al 2009; Li et al 2008). Furthermore, there is still an enormous task in promoting non-pharmacological treatment (Silaste et al 2000).

Hypertensive patients should be educated and monitored at the beginning of the treatment to achieve better compliance (Chobanian et al 2003). Patients meet physicians or nurses at follow-up appointments over a long period of time (Aminoff and Kjellgren 2001). Primary goals of this follow-up are to reduce the cardiovascular risk factors associated with high BP, to encourage patient compliance with the medical treatment and to control BP (Chobanian et al 2003; Aminoff and Kjellgren 2001).

Nurses play a critical role in caring for people with cardiovascular disease and nurse coordinated programs have been shown to improve clinical outcomes (Park et al 2010; Irmak and Fesci 2010). Practice nurses conduct interventions such as education, assessment, consultation, and regular follow up for cardiovascular disease management or reduction of cardiac risk factors. Some systematic reviews provide evidence for the efficacy of the practice nurse-led clinics and general practice nurse interventions in reducing cardiac risk factors in healthy adults, as well as those with established disease or known cardiac risk factors. The use of the practice nurse-led clinics is particularly supported for blood pressure management, cholesterol reduction, dietary modification, and increasing physical activity (Halcomb et al 2007; Page et al 2005). Further, it has been shown in several studies on hypertensive patients that the programs which include assessment, education, and follow-up increase the compliance with the treatment (Aminoff and Kjellgren 2001). When, BP is brought under

control (Mohammadi et al 2006; New et al 2003; Clark et al 2000), mean total cholesterol decreases (Osterbrink and Münzinger 2005) and physical activity increases (Drevenhorn et al 2007).

Recognised roles of nurses need to be further developed regarding hypertension management and cardiovascular risk reduction in hypertensive patients. There are several studies in western countries evaluating BP control of hypertensive patients with programs including education and follow-up (McClellan and Craxton 2008; Drevenhorn et al 2007; Osterbrink and Münzinger 2005; Clark et al 2000). However, in these countries, there was a little reported evidence concerning the effects of interventions carried out solely by nurses on both BP and cardiovascular risk factors (especially cholesterol) in the hypertensive population. In Turkey, diagnosis, treatment, and follow-up on hypertensive patients is generally done by physicians. Nurses have not taken an active role in the care of hypertensive patients. In addition, there are no studies conducted by nurses on the application and evaluation of the results of a program constituting assessment, education and follow-up.

The purpose of this study was to examine the effectiveness of a follow-up program including multiple nursing interventions such as assessment, intensive education, counselling on BP and cardiovascular risk factors of hypertensive patients.

## METHODS

### Design

This study was conducted at the Hypertension, Obesity and Diabetes Centre of Mugla State Hospital in Turkey. A time series (one group pretest-posttest) quasi-experimental design was used (Polit and Hungler 1999).

### Sample

For the test of difference between two means, an effect size of 0.60, with a power of 0.80 and alpha level 0.05, the sample size needed was 44 subjects (Polit and Hungler 1999). However, 45 consecutive patients were recruited in this study. The data were collected from September 2005 and May 2006.

Inclusion criteria required patients had to be taking one or more antihypertensive agents, the main diagnosis was hypertension and they had to be living in the city of Mugla. Patients with these criteria were recruited automatically without any further selection process.

The participants were informed about the purpose of the study and were assured their identities and responses to the questionnaire were confidential. In addition, informed consent was obtained from those patients who had agreed to participate in the study. Obtaining written permission from the state hospital administrators, patients with hypertension and attending The Hypertension, Obesity and Diabetes Centre were referred to researchers by a physician after clinical examination. After an initial appointment patients were followed up at the hospital by the researchers for six months at one-month intervals.

### Intervention and follow-up

Before intervention, an education program was developed by the researchers. Its purpose and goal was to assist patients to control hypertension and to reduce their risk of cardiovascular disease. This program was based on the basic national (Turkish Cardiology Society 2000) and international guidelines (Chobanian et al 2003) and other literature (Apel et al 2003; Morgan and Capuzzi 2003; Suter et al 2002; Padwal et al 2001). The program consisted of three sessions which was outlined as the topic of hypertension, the risk factors (20 min), the lifestyle changes (30min) including dietary approaches to stop hypertension (DASH), smoking, physical activity, and medication (20 min).

The causes and complications of hypertension were addressed in the first session of the education program. The second session covered lifestyle changes. The importance of the consumption of fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat was emphasised and the reduction of salt, sweets, and sugar-laden beverages was recommended in the DASH diet. Moreover, consumption of alcohol was restricted, and the importance of weight control was also emphasised. Other topics were covered including

the benefits of regular aerobic exercise, physical activity such as cycling, brisk walking, or swimming (at least 30 min per day) and the effects of smoking on hypertension and cardiovascular disease. In the third session the effects and side effects of different groups of medications were also discussed.

The intervention was done with three researchers. At the start of the study the patients' current medication was documented, and their BP and cardiovascular risk factors were assessed. Then, individualised education sessions on the patient's recommended treatment were given. When the education program was completed, the purpose of the visits was explained, and goals for their pharmacologic and non-pharmacologic treatment were discussed. Patients were asked to work towards the goals for healthy eating abiding by the DASH diet, smoking cessation, increased exercise and regularly taking their medications.

Over a six-month period, participants kept diaries of food, exercise, and medications. Food diaries were used to record all food patients consumed in a week (seven-day food records). Exercise diaries were used to assess type, intensity, duration, and frequency of exercise performed weekly, and medication diaries were used to record dose and frequency of medications taken daily.

At each follow-up session, diaries and advised goals were reviewed and, if necessary, education and reinforcement of diet, exercise, medication, and smoking adjustment recommendations were continued. BP and weight measurements were taken. If target BP levels had not been achieved, patients were referred to their physician for medication adjustments (nurses do not have prescribing authority in Turkey). Those patients who did not comply with the recommended diet regimen and whose weight was uncontrolled were referred to their dietician, and appropriate recommendations were given. Patients who were referred to the dietician and the physician were followed up with implementation of the given suggestion. All follow-up sessions lasted 20 to 25 minutes. After six months the patients BP and cardiovascular risk factors

were reassessed at the Hypertension, Obesity, and Diabetes Centre. Physicians were requested to assess pharmacological management of the patients whose LDL-cholesterol had increased after a six month intervention.

### Measurements

The BP measurement protocol was similar to used in previous studies (Woodward et al 2006; Apel et al 2003). A calibrated mercury sphygmomanometer was used to measure BP while the individual was seated and resting five minutes with the arm held at heart level. The first measurements were taken in both arms; unless there was a significant difference, the right arm was used for subsequent measurements. The mean of two consecutive measurements taken at two-minute intervals was recorded.

Weight was measured using a calibrated scale, and height was measured using a wall-mounted stadiometer. Lipid value measurements were taken after a 12-hour fast.

### Analytic Strategy

The Paired-Samples T Test was used to test quantitative data and McNemar's Test was used to test categorical data. Comparisons of repeated BP measurements were assessed by repeated measurement analysis of variance. Statistical significance was taken as  $p < 0.05$ .

## RESULTS

### Demographics

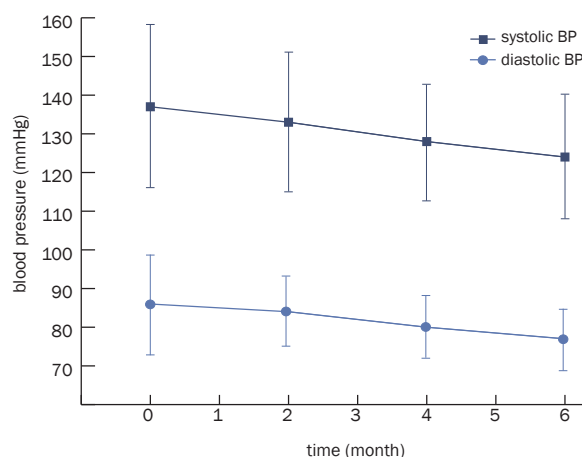
The mean age of patients ( $\pm$ SD) was 51.0 (9.9) years, 64.4 % were women, 53.3 % had graduated from primary school and 84.4 % were married. Duration of hypertension ( $\pm$ SD) was 4.3 (4.9) years. Before intervention, 64.4 % of patients were taking one and 35.6 % were taking two antihypertensive drugs. After intervention, there was no change in these percentages. In addition, only 7.1 % were taking lipid-lowering drugs.

### Blood pressure

The measured value of mean systolic BP before intervention was  $137 \pm 21$  mmHg; after intervention

it decreased to  $124 \pm 16$  mmHg ( $p < 0.001$ ). There was a decrease in the mean diastolic BP from  $86 \pm 13$  mmHg to  $77 \pm 8$  mmHg ( $p < 0.001$ ). At the baseline the proportion of patients with controlled BP  $< 140/90$  mmHg was 46.7%; after intervention it had increased to 73.3% ( $p = 0.002$ ) (table 1). BP was measured monthly for six months, but the measurements in the graph were taken at a two-month interval. At the baseline in the 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> months the mean systolic BP readings were  $137 \pm 21$ ,  $133 \pm 18$ ,  $128 \pm 15$  and  $124 \pm 16$  mmHg, respectively ( $F = 11.07$ ,  $df = 3$ ,  $p < 0.001$ ). The mean diastolic BP readings were  $86 \pm 13$ ,  $84 \pm 9$ ,  $80 \pm 8$  and  $77 \pm 8$  mmHg, respectively ( $F = 11.70$ ,  $df = 3$ ,  $p < 0.001$ ) (figure 1).

**Figure 1: Change of systolic and diastolic blood pressures before and after intervention during a six month follow up.**



**Table 1: Blood pressure and cardiovascular risk factors, at the baseline and after six months.**

Variable	Baseline	After six months	t	p
Systolic blood pressure (mmHg)	137.55 ± 21.73	124.33 ± 16.29	5.50	0.000
Diastolic blood pressure (mmHg)	86.77 ± 13.23	77.88 ± 8.88	4.96	0.000
Blood pressure $< 140/90$ (mmHg)	21 (46.7%)	33 (73.3%)		0.002
Body mass index ( $\text{kg}/\text{m}^2$ )	29.69 ± 3.84	29.33 ± 3.87	2.19	0.033
Total cholesterol (mg/dl)	205.88 ± 40.17	208.00 ± 46.43	2.97	0.687
HDL-cholesterol (mg/dl)	50.08 ± 6.57	46.77 ± 10.44	2.58	0.013
LDL-cholesterol (mg/dl)	119.02 ± 42.91	133.93 ± 41.39	-2.47	0.017
Triglycerides (mg/dl)	181.40 ± 121.77	131.60 ± 75.42	2.97	0.005

### BMI and blood lipids

At the baseline, the body mass index (BMI) was  $29.6 \pm 3$   $\text{kg}/\text{m}^2$ . After intervention the BMI had decreased to  $29.3 \pm 3$   $\text{kg}/\text{m}^2$  ( $p = 0.033$ ). 44.4% of patients were overweight (BMI, 25-29.9) and 44.4% were obese (BMI,  $\geq 30$ ). It was noted total cholesterol did not change ( $p = 0.687$ ) after intervention when compared to the baseline. Triglycerides decreased ( $p = 0.005$ ). However, LDL-cholesterol increased ( $p = 0.017$ ) and HDL-cholesterol decreased ( $p = 0.013$ ) (table 1).

### DISCUSSION

A six month follow-up program including multiple nursing interventions such as patient-centred education, assessment, counselling, regular follow-up and referrals to the other disciplines was applied to 45 patients diagnosed with hypertension.

Results of this program showed a significant decrease in the mean systolic and diastolic BP and decrease in BMI, however, only triglycerides decreased in lipid values. There was no significant difference in total cholesterol; surprisingly, LDL-cholesterol increased but HDL-cholesterol decreased.

The means of systolic and diastolic BP had decreased. The proportion of patients with controlled BP  $< 140/90$  mmHg had increased significantly. Besides focusing on complying with lifestyle changes and drug therapy, patients who were unable to reach the target BP levels were referred to their physician for medication adjustments directed at further reducing blood pressure. The benefits of multifactorial intervention to control BP were convincingly demonstrated in studies with (Mohammadi et al 2006; New et al 2003) and without a control group (Drevenhorn et al 2007; Woodward et al 2006; Clark et al 2000).

Controlled hypertension reduces total mortality, cardiovascular mortality, stroke, and heart failure events (Chobanian et al 2003).

The BMI of the patients decreased significantly in contrast to Woodward et al (2006) and Jehn et al (2006) whose studies indicated no significant changes in BMI. The decrease in BMI can be explained by follow-up with patients within a shorter interval of one month. But patients should be monitored and followed up continuously in order to maintain weight loss. The weight loss led to a decrease in BP since there was a positive relation between body weight and BP (Chobanian et al 2003).

There was a meaningful decrease in triglycerides. There was no significant difference in total cholesterol. Surprisingly, LDL-cholesterol increased and HDL-cholesterol decreased. The association of hypertension with low HDL cholesterol and increased LDL cholesterol, hypertriglyceridaemia, has been shown by Stern et al (2000). The studies conducted by Drevenhorn et al (2007) and Mohammadi et al (2006) showed cholesterol; HDL-cholesterol and LDL-cholesterol were not significantly improved. At the baseline, 37.7% of the patients' LDL-cholesterol was  $\geq 130$ mg/dl and 15.5% was  $\geq 160$  mg/dl. However, only 7.1% of patients were using lipid-lowering medication. This may have contributed to the unimproved blood lipids because dietary adjustments alone could not lower LDL-cholesterol levels to less than 130mg/DL in many individuals (Denke and Grundy 1990). Lipid-lowering drugs usually decrease LDL and total cholesterol levels more effectively than does diet (Garber et al 1996). Another possibility to be considered was serum cholesterol which has been reported to be higher in winter than in summer (Burtis and Ashwood 1998). Moreover there may be seasonal changes in nutritional habits. Generally, in the city of Mugla food preparation habits use a great deal of olive oil in the cooking of vegetables, but the foods which are high in cholesterol and saturated fat such as red meat and sausage are usually roasted and eaten more often in winter time. In examining the food diaries of the patients, it was noted that the consumption of vegetables, fruits and legumes

increased. But it was also note worthy that intake of foods such as red meat had increased, so patients were advised to limit certain meat products.

It has been reported a large proportion of patients with high BP have a significant plasma cholesterol abnormality in that 67.9% of the hypertensive patients without coronary artery disease and 88.4% of the hypertensive patients with coronary artery disease had hypercholesterolaemia (Stern et al 2000). Especially in patients with hypercholesterolaemia, cholesterol levels should be decreased (Kastarinen et al 2000). More effective ways to manage hypercholesterolemia in hypertensive patients by non-pharmacological means are needed. Furthermore, for patients with the highest level of risk, improvements in their treatment using pharmacological means are also needed (Kastarinen et al 2000).

#### **Limitations**

The use of a control group design and the lack of a control group is the limitation of this study.

#### **CONCLUSION**

Subsequent to a follow-up program there were meaningful changes in the mean readings for systolic and diastolic BP. Concerning cardiovascular risk factors, the BMI had significantly decreased. There was no expected improvement in lipid values except triglycerides.

The main goals in the treatment of hypertensive patients should be to reduce the cardiovascular risk, which is especially high in patients who also have lipid abnormalities, and to bring the hypertension under control. Nurses can play a very important role in hypertension management and cardiovascular risk reduction, and this role needs to be further developed and recognised. To manage hypertension and reduce the cardiovascular risk factors, a program is needed and should be implemented to include antihypertensive treatment options, lifestyle changes and lipid-lowering drug therapy. In addition, further research is needed to determine the long-term effects of such a program.

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