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Improving Control of High Blood Pressure among Middle-aged Turkish Women of Low Socio-economic Status through Public Health Training

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Aim. To assess the effects of health training course aimed at educating middle-aged women of low socio-economic status in Turkey how to better control high blood pressure.

Methods. The intervention study included 400 randomly selected women aged (mean ± standard deviation) 34.1 ± 8.6 years. After their body size and blood pressure were measured, the women were randomly divided into two groups. The intervention group underwent public health training on high blood pressure control and obesity reduction, whereas control group had no training at all. After six months, blood pressure and body size of women in both groups were measured again.

Results. Overall, the initial high blood pressure and obesity ratio in the intervention and control group were 20.0% and 31.7%, respectively. After 6 months of the intervention program, the number of women within the optimal weight range significantly increased in the intervention group compared with control group ($p = 0.009$). After the intervention program, the number of women with normal weight and normal blood pressure in the intervention group significantly increased (weight: 130 women before vs 150 after, $p = 0.001$; blood pressure: 160 women before vs 173 after, $p < 0.001$). After the intervention, the percentage of meals consisting of fried food in the intervention group was lower by 31.9%, and by 5.0% in the control group. After the intervention the percentage of boiled food increased by 15.7% in the intervention group, compared with no change in the control group. The consumption of food high in salt decreased by 5.5% in the control and by 72.2% in the intervention group. Similarly, the percentage of women who exercised almost doubled in the intervention group, whereas there was no change in the control group.

Conclusion. The changes in the lifestyle significantly reduced hypertension and obesity ratio among women. The public health center can provide initial health training support as a part of the broader public health management program, aimed at helping people tackle health problems.

Key words: *blood pressure; health training support; obesity; women*

Hypertension is one of the major public health problems and its prevalence has been increasing worldwide, especially in the developing countries (1). Hypertension sometimes represents a significant health problem for women of reproductive age, e.g., as one of the major causes of the most commonly encountered complications of pregnancy (2,3).

All overweight and obese adults with a body mass index (BMI) of > 25 are considered at risk of developing hypertension, high blood cholesterol, type 2 diabetes, coronary heart disease, and other diseases (4). Recent reports have shown that increased body weight is an important determinant of mortality among middle-aged women (5). Obesity is especially evident in some minority groups, as well as in those with lower incomes and lower education (4).

In Turkey, systolic blood pressure has been the most prominent risk factor for coronary heart disease mortality, with the coronary death rates relatively high among women (6) and rapidly increasing among Turkish population aged 35-64 years (7).

Lifestyle modifications are effective in lowering blood pressure and can reduce other cardiovascular risk factors at little cost and minimum risk (8). However, such lifestyle modifications, consisting of balanced and optimal nutrition, physical exercise, and healthy living, can be difficult to introduce, especially for women of low socio-economic status and educational level. These women usually live in the suburbs in generally poor and unfavorable social conditions, which make them susceptible to many health risks. There are also other factors limiting the desirable changes in the lifestyle within this social group, such

as traditional customs and community intolerance against social activities of women (e.g., outdoors exercise or even walking). Most women in this group are home-makers and dependent not only culturally, but also economically on the core members of the family (the husband, mother, or father-in-law). The factors restricting the change in the lifestyle of women may vary from country to country, depending on social, cultural, and economic differences. In Croatia, for example, there is a relatively low participation of women below 50 years of age in sports and working activities (9).

Interventions aiming at modifying lifestyle may serve as a cost-effective control of the cardiovascular risk factors (10). However, the benefits and significance of health intervention programs often disappear over time, as it has happened in Turkey, where such intervention programs for the improving public health have not been successfully implemented so far. The present study aimed to educate a group of middle-aged women on the prevention of hypertension and obesity by reducing the possible risks associated with these diseases through introducing the necessary modifications in the lifestyle. The women in this age group may play an important role in the implementation of modifications into lifestyle of members of their families, ie, the wider community, especially with respect to nutrition.

Participants and Methods

This intervention study was carried out in poor outskirts of the city of Isparta, the so-called Yenice region. Isparta is located in the lake district of West-Southern Turkey and socio-demographically considered as a developing region. Yenice region has a population of 5,279 people, with 1,017 of them being women aged 20-50 years. The prevalence of hypertension in Isparta province as well as its impact on the health of population remains unknown due to the lack of epidemiological studies.

Participants

There were 400 women participating in the study. The mean (± standard deviation) age of all women in both groups was 34.1±8.6 years; 85.4% were married, 66.5% graduated from a primary school, and 85% were housewives. The mean monthly family income was US$ 145±86, and the mean number of family members was 4.3±1.4. The mean age of women at the first pregnancy was 20.2±2.9 years. The mean number of their living children was 2.2±1.0. More than 65% of women used some form of contraception, whereas 6.5% had already entered menopause. None of the studied women were alcoholics, and only a small proportion smoked cigarettes (0.5%).

Since the overall prevalence of hypertension in Turkish adult population is estimated to be 20% (11), we decided to randomly choose 430 women aged between 20 and 50 years from the total of 1,017 women living in Yenice. The inclusion criteria were age between 20 and 50 years and permanent residence in the region for at least the previous 3 years. The names and addresses of 1,017 women were obtained from the local administration office. Women were randomized into two groups: 214 women belonged to the intervention group and 216 to the control group (Fig. 1). Physicians and female nurses from our health centre contacted women included in the study and asked them to visit the health center to undergo measurements of blood pressure and body size. No information on the health training program was provided. Thus, the women of both groups could be considered as partly blinded participants at the beginning of the study. The investigators and assessors were different independent persons, and the staff participating in the study were not the residents of Yenice and not related to the subjects.

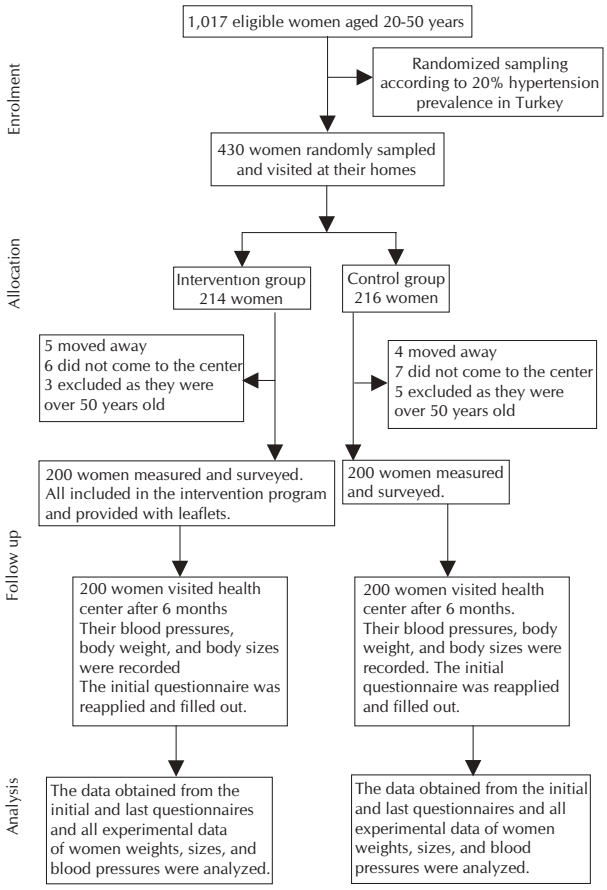

Figure 1. Scheme of experimental protocol and intervention program.

To ensure high level of participation, socially active leaders (*muhtars*, responsible for governing the smallest urban regions, and *imams*) were asked to visit each woman and emphasize the importance of their visit to the public health center. Five women in the intervention group and 4 women in the control group moved away, 6 women in the intervention group and 7 women in the control group did not visit the center, and 3 women in the intervention group and 5 women in the control group were excluded from the participation because they were actually above the age of 50 (their parents had them officially registered a few years after they were born). This left 200 women in the intervention and 200 women in the control group.

Training Protocol

The study protocol consisted of two steps. At step 1, a health care professional from the center measured the blood pressure (12), weight, and body size of each woman, using the same devices. The person performing the measurements was not provided with any information on the subjects and did not know to which group they belonged. This was secured by an assisting person responsible for recording the data. The step 1 was carried out between August 13 and September 19, 2001. At that occasion, a face-to-face interview using a 58-item questionnaire was carried out with each woman. The questionnaire inquired on the general socio-demographic properties (age, fertility, family planning, education, occupation, accommodation, family members, and family income), addictive habits (smoking or alcohol), body exercise, nutritional behavior (including tea, coffee, and salt), and level of knowledge on hypertension, stress, current diseases, and other disorders.

All women in the intervention group received health training support from an expert, as well as a leaflet explaining health impact of the above issues and the issues orally presented during

the intervention. The control group of women did not receive any training or information leaflets.

At step 2, six months after step 1, all 400 women were called to visit the health center and the same study protocol was carried out once again during January and February 2002 (Fig. 1). The women with high blood pressure were immediately referred to a clinical specialist.

Application of Health Education Training

The women in the intervention group were taken in groups of 5 from the room where their blood pressure and body sizes were measured to a different room where health education took place. During the intervention program, they were given necessary information on the intervention program. Each woman was encouraged to actively participate in the ongoing education program. The duration of each intervention program applied to a group of 5 women was not recorded and was not limited. However, we conducted only 1 to 3 intervention programs per day. The total duration of the intervention program lasted 25 days.

Intervention Program

The sixth report of the Joint National Committee (12) and national literature on the recommendations and prevention of hypertension, obesity, and lifestyle modifications were examined in detail. The most pronounced factors associated with these issues and the important factors specific for the region were emphasized, while some others were briefly explained during the intervention program.

The definition of blood pressure, negative health impacts of hypertension, and hypertension risk factors were explained to the women in the intervention group. The greatest emphasis was put on obesity and importance of physical exercise. The significance of balanced nutrition and diverse assortment of food were explained in a simple language. Most importantly, inappropriateness of fasting to lose weight was emphasized while the attention was drawn to the advantages of having regular daily meals and importance of prolonging chewing. Among the healthy cooking methods, boiling was suggested as better than frying, without reducing the use of vegetables. Reducing total amount of fat and oil was advised, particularly the replacement of margarine and butter with olive oil and other vegetable oils. Additionally, the negative health impact of exceeded use of salt on hypertension, the salt contents of some preserved local foods (pickle, salted, or dried meat), and the significance of milk products, legumes, and fish were explained. Daily and regular exercising, hiking, walking, or jogging were advised as having good health impact and reducing stress, obesity, hypertension, and osteoporosis in women.

However, to reduce the intensity of intervention program and improve the efficiency of training program, some of the issues, such as smoking and alcohol addiction, were not much emphasized even though they were included in the questionnaire. Smoking and alcohol consumption were not common among the women since these habits were not socially and culturally allowed.

Outcome Measures

The lower limits of hypertension are 140 mm Hg for systolic and 90 mm Hg for diastolic blood pressure, as defined by the Joint National Committee guidelines (12,14) and the recommendations of the World Health Organization's International Society of Hypertension (13). The Joint National Committee classification of hypertension is based on the average of two or more properly measured seated blood pressure readings on each of two or more office visits (14).

In our study, the measurements were made twice a day and were not repeated on subsequent days. The mean value of measurements above 140/90 mm Hg of either the systolic, diastolic, or both measurements was considered high blood pressure, but not hypertension.

The individuals were classified as obese or overweight on the basis of body mass index (BMI). Thus, BMI <25 kg/m^2 was considered normal, 25-29.9 kg/m^2 was considered overweight, and 30 kg/m^2 and over indicated obesity (4,15).

Statistical Analysis

Statistical analysis was performed by using SPSS statistical package (Version 9.0, SPSS Inc., Chicago, IL, USA) for Windows. Chi-square and t-tests were used to determine the differences between the groups, whereas McNemar test was used to determine the differences within the group (before and after the intervention). The level of statistical significance was set at $p<0.05$.

Results

In the pre-intervention stage, there were no significant differences in the socio-demographic features and risk factors for high blood pressure between the intervention and control group.

Table 1. Changes in nutritional habits of the women in control (n = 200) and intervention groups (n = 200) before and after the intervention

		Before intervention (%)			After intervention (%)		
Nutritional habits		control group	intervention group	p	control group	intervention group	p
Daily number of meals	one	1.0	1.5	0.455*	0.5	1.0	0.853*
	two	20.0	14.5		21.0	20.5	
	three	72.0	75.5		74.0	74.5	
	four	6.5	8.5		4.0	4.0	
	other	0.5	–		0.5	–	
Meals containing salt	low salt	23.5	18.5	0.533*	21.5	22.0	0.010*
	normal	65.5	69.0		68.5	70.0	
	high salt	9.0	9.0		8.5	2.5	
	no salt	2.0	3.5		1.5	5.5	
Daily amount of tea consumed (cup)	none	5.0	5.5	0.095*	4.5	5.0	0.740*
	1-4	63.5	60.5		59.5	58.5	
	5-10	24.0	19.0		28.0	25.5	
	11 and over	7.5	15.0		8.0	11.0	
Way of eating	slow	35.0	30.5	0.078*	33.5	28.0	0.170*
	normal	49.5	45.0		50.5	49.0	
	fast	15.5	24.5		16.0	23.0	
Cooking times per month (mean ± SD)	frying	11.9 ± 8.3	11.6 ± 8.1	0.714†	11.3 ± 6.9	7.9 ± 6.2	<0.001†
	boiling	11.9 ± 7.4	12.7 ± 7.7	0.290†	11.9 ± 6.6	14.7 ± 6.0	<0.001†
	grilling	1.6 ± 1.6	1.9 ± 2.4	0.141†	1.2 ± 1.4	1.4 ± 1.7	0.199†
	baking	3.0 ± 2.4	3.1 ± 2.6	0.689†	3.4 ± 2.0	3.4 ± 2.0	1.000†
Oil consumption (kg/month, mean ± SD)	olive oil	2.0 ± 2.7	2.02 ± 2.4	0.937†	1.8 ± 2.2	2.3 ± 1.9	0.015†
	sunflower oil	4.0 ± 2.5	3.6 ± 2.3	0.098†	3.9 ± 2.2	3.1 ± 2.1	<0.001†
	margarine	3.3 ± 2.8	3.0 ± 2.9	0.293†	3.0 ± 2.4	1.7 ± 1.7	<0.001†
	butter	2.3 ± 2.9	2.2 ± 3.0	0.734†	2.2 ± 2.6	0.9 ± 1.7	<0.001†
	other	0.0 ± 0.1	0.0 ± 0.1	1.000†	0.0 ± 0.1	0.0 ± 0.0	1.000†

*Chi-square test.
†Student t-test.

After the intervention, the women in the intervention group reduced the use of salt, oils, and fats in their cooking, especially margarine and butter. Also, after the intervention most women from the intervention group preferred boiling and baking over frying, with a 31.9% decrease in frying and 15.74% increase in boiling; the difference was significant in comparison with the control group (Table 1). One of the significant lifestyle changes, resulting from a training support after the intervention, was increased body exercise (Table 2).

At the beginning of the study, the ratio of obesity (≥30.0 kg/m^2) was found to be 29.0% in the control group, and 34.5% in the intervention group. The corresponding values after the intervention were 34.5% and 24.5%, respectively (Table 3).

A significant difference was found in BMI distribution between the intervention and control group after the intervention ($p = 0.014$). Similarly, the number of women with normal BMI in the intervention group was significantly higher than the number of women with normal BMI in the control group (86 vs 60, respectively) after the intervention program ($p = 0.009$). Additionally, the number of women with normal BMI significantly increased after the intervention ($p = 0.001$).

When asked how much they knew about hypertension, 52% of women in the control group and 44% in the intervention group replied they had no knowledge of the disease. After the intervention, the percentage of women without any knowledge on hypertension decreased to 46.0% and 14.5%, respectively, although the control group received no intervention. However, the differences before and after the intervention were found significant only within the intervention group ($p < 0.001$) and between the control and intervention group ($p < 0.001$). The difference was not significant within the control group.

Before the intervention, the overall ratio of high blood pressure was 20% in both groups of women (Table 4). After the intervention, the high blood pressure ratio was 15.5% in the control group and 13.5% in the intervention group, but the difference between the groups was not significant. On the other hand, significant difference was found in the distribution of blood pressure before and after the intervention in the intervention group ($p = 0.035$), whereas no significant difference was found in the control group. After the intervention, the number of women with optimal blood pressure in the intervention group significantly increased compared with their number before the intervention ($p < 0.001$).

Table 2. Body exercise among women in the control (n = 200) and intervention (n = 200) groups before and after the intervention

	Before intervention (%)			After intervention (%)		
Body exercise	control group	intervention group	p*	control group	intervention group	p*
Yes	17.0	23.5	0.135	17.0	46.5	<0.001
Type:						
walking	85.3	93.6	0.426	76.5	72.0	0.637
jogging	2.9	2.1		–	2.2	
cycling	–	–		2.9	7.5	
swimming	–	–		–	–	
other	11.8	4.3		20.6	18.3	
Frequency:						
regularly	35.3	42.5	0.650	44.1	47.3	0.603
occasionally	52.9	42.6		41.2	44.1	
in spare time	11.8	14.9		14.7	8.6	
Daily duration:						
0.5 h	41.7	55.0	0.324	46.7	47.7	0.894
>1 h	58.3	45.0		53.3	52.3	

*Chi-square test.

Table 3. Distribution of women according to their body mass index (BMI) in the control (n = 200) and intervention (n = 200) groups before and after the intervention

	Before intervention (%)			After intervention (%)		
BMI (kg/m^2)	control group	intervention group	p*	control group	intervention group	p*
Normal (18.5-24.9)	33.0	32.0	0.166	30.0	43.0	0.014
Overweight (25.0-29.9)	38.0	33.5		34.5	32.5	
Obese (30.0-39.9)	25.0	33.0		30.5	23.0	
Extremely obese (>40.0)	4.0	1.5		5.0	1.5	

*Chi-square test.

Table 4. Blood pressures of the women in control (n = 200) and intervention (n = 200) groups before and after the intervention

	Before intervention (%)			After intervention (%)		
Blood pressure (mm Hg)*	control group	intervention group	p†	control group	intervention group	p†
Optimum (<120/<80)	49.5	48.5	0.964	50.0	54.0	0.310
Normal (120-129/80-84)	19.5	20.0		21.5	24.5	
High normal (130-139/85-89)	11.0	11.5		13.0	8.0	
Mild (140-159/90-99)	13.5	11.0		9.5	11.0	
Moderate (160-179/100-109)	3.0	4.5		1.5	0.5	
Severe (≥180/≥110)	1.5	2.0		1.0	–	
Isolated systolic (≥140/<90)	2.0	2.5		3.5	2.0	

*When a subject's systolic and diastolic blood pressures fall into different categories, the higher category was used.
†Chi-square test.

Discussion

We found that public health intervention program on hypertension control and prevention caused significant changes in the lifestyle of women participating in the study. Boiling became a preferred cooking method, high salt consumption was significantly reduced (almost by 72.2%), and the percentage of women who exercised greatly increased (by almost 98%). The reduction of high blood pressure by the intervention program was insignificant, but there was a significant reduction in the proportion of obese women in the intervention group after the intervention.

Changing daily lifestyle of women (eating behavior, cooking methods, and daily exercise) was reported to reduce the prevalence of both obesity and hypertension (16,17). One can question the reasons behind the beneficial effects of such additional health training support to tackle with public health problems. Increased level of education of women in Croatia led to their increased engagement in sport activities (9). Hengstler et al (18) also indicated the importance of cost-effective preventive interventions as beneficial for the health of the entire population.

The women in our study who had mildly and moderately increased blood pressure had normal blood pressures after receiving a proper health education support, and the high blood pressure prevalence was reduced by 6.5% within the intervention group. The significant difference in blood pressure values before and after the intervention could be attributed to the effect of health training support. Significant reduction in obesity prevalence might reduce high blood pressure prevalence, but also the composition of blood triglycerides might have changed due to healthier cooking methods, with increased use of unsaturated oil, and perhaps increased daily exercise. All these may be possible causes of significantly reduced high blood pressure prevalence. The amount of oil and fat used for daily cooking decreased because frying was replaced by boiling and baking.

The reduction in the daily sodium intake by approximately 50% may significantly contribute to decrease in high blood pressure and prevalence of hypertension (19). Moreover, the effects of intervention programs aiming at nutritional habits of a population are especially efficient if they suggest eating more fruit and vegetables (20) and more fish (21), engaging in aerobic exercise on a regular basis, such as walking, jogging, or swimming for 30-45 minutes three to four times a week (22), and reducing the intake of saturated fat and cholesterol.

In the control group, there was a slight increase in the number of women with normal blood pressure. This beneficial effect could be attributed to many factors: the campaign was so effective that it reached all the women in the local area by involving the socially active leaders (*muhtars* and *imams*). Also, the women in both groups might have been under an increased stress because some of them visited the health center for the measurement of blood pressure for first time in their lives. This stress may have been overcome on their second visit. Furthermore, we advised the women with high blood pressure to seek proper health control for their blood pressure. Although all the above factors could naturally be effective for both groups, there were no significant differences in the blood pressure in the control group before and after the intervention, but the differences were significant in the intervention group.

Since there were no such limiting factors for obesity, the number of women with a normal BMI in the control group did not increase. The number of women with normal BMI in the intervention group significantly increased after the intervention program. The ratio of obese women in the control group increased from the 25% to 30.5%, while the percentage of obese women in the intervention group reduced from 33% to 23%. This finding indicated that the women in the control group may have benefited from the campaign for lowering their blood pressure, but not for controlling the obesity since the control of obesity needs a proper educational intervention causing important modifications in the lifestyle as it did in the intervention group. The increase in the percentage of obese women in the control group was only 5.5%, which may be due to the effect of winter, not an agricultural working season in the region, as most of these women are unpaid family workers. The group of women in our study could conform to the recommendations for overcoming obesity because it consisted of middle-aged women, who were generally home-makers and unpaid family field workers. Also, the women of both groups had low income, lower education, no social security, and no socio-economic independence. The National Institute of Health recognizes obesity as an especially evident problem in some minority groups and groups with lower incomes and less education (4). However, we reduced the prevalence of obesity in women – who are a typical low-income, low-education, minority group – by the intervention program. Maybe this type of program could be used for effective education of other similar population groups.

Our results indicated that there were greater or lesser effects of the changes in lifestyle on obesity and even in high blood pressure due to health training support. Our intervention program was shown to be a cost-effective intervention method to reduce the prevalence of high blood pressure and obesity among the women, especially those from less educated and poor social groups.

In conclusion, irregular and unhealthy lifestyle is an important factor affecting high blood pressure and obesity among women aged 20-50 years, particularly those of low socio-economic status. The educational intervention was found to be beneficial in controlling blood pressure and obesity in general population. Health education can be used as a fast and efficient way to increase public awareness of the importance of prevention of common health problems, such as hypertension. The intervention method we tested can be used as a cost-effective method for the maintenance of public health. Public health practitioners should occasionally offer such programs to tackle the health problems commonly encountered in a general population. Hopefully, the results of our study will

help the public health policy makers to reinforce the implementation of similar interventions.

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