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The Effect of Training Structured According to the Health Belief Model on Women's Obesity Management and Health Beliefs About Obesity: A Randomized Controlled Trial

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Abstract

Background: The goal of obesity management is to enhance health. Like in all chronic diseases, a long-term, multimodal approach is required in obesity management, considering the treatment goals of each individual and the benefits and risks of different therapies. The Health Belief Model is thought to be effective in obesity management.

Aim: The present research was carried out to investigate the effects of the training provided to women with obesity based on the Health Belief Model (HBM) on women's health beliefs about obesity and obesity management.

Methods: This randomized controlled trial was conducted in a family health center in Türkiye between 2017 and 2018. The sample included 128 women with obesity (64 in the control group and 64 in the intervention group) determined by power analysis. The intervention and control groups were determined by simple random sampling. Data were collected using the Descriptive Information Form, Health Belief Model Scale in Obesity (HBMSO), and Anthropometric Measurement Form. The intervention group received 7 weeks of training based on the Health Belief Model. A six-month follow-up was performed after the training. Data were assessed by the chi-squared test, independent samples t-test, repeated measures Analysis of Variance (ANOVA) test, Friedman test, Mann-Whitney U test, Kruskal-Wallis test, and Wilcoxon signed-ranks test. Cohen's d was utilized in effect size calculation.

Results: After the training, women in the intervention group had higher mean scores on all subscales except perceived disability. The mean perceived disability score was significantly lower, showing that the training was effective ($P < 0.001$). The impact size of the intervention was large ($d = 1.86$, $d = 3.81$, $d = 1.14$, $d = 2.16$, $d = 2.02$, respectively). The mean body weight values of the women in the intervention group (pre-test 86.90 ± 12.23, post-test 76.26 ± 12.34) decreased after the training based on the Health Belief Model ($P < 0.001$), with a small effect size ($d = 0.20$). In the control group, the mean body weight values (pre-test 82.53 ± 9.80, post-test 83.73 ± 9.50) increased, with no statistically significant change detected ($P = 0.370$). Body Mass Index (BMI) values (pre-test 35.72 ± 6.33, post-test 30.82 ± 4.27) decreased after the training in the intervention group ($P < 0.001$), with a medium effect size (0.36). Conversely, the values for the control group (pre-test 33.26 ± 2.99, post-test 35.39 ± 9.95) increased ($P < 0.001$), with a large effect size ($d = 1.12$). Waist circumference values decreased after the training in the intervention group (pre-test 102.85 ± 10.44, post-test 96.37 ± 10.67) ($P < 0.001$), with a medium effect size ($d = 0.25$). Waist circumference values also decreased in the control group (pre-test 93.06 ± 10.34, post-test 92.29 ± 14.38); however, the change was not statistically significant ($P < 0.001$).

Conclusion: The HBM-based training provided to women with obesity positively affected women's beliefs about obesity.

Keywords: Health belief model, obesity management, obesity, women's health

Introduction

Obesity, now defined as a chronic disease, is one of the most significant health problems in both developed and developing countries, with its prevalence gradually increasing. More than one billion people worldwide are obese, including 650 million adults, 340 million adolescents, and 39 million children, and these numbers continue to rise. According to the World Health Organization (WHO) estimates, approximately 167 million people, including adults and children, will be adversely affected by overweight or obesity by 2025.[1] According to the predictions of the World Obesity Atlas 2022, published by the World Obesity Federation, one billion people worldwide, including 1 in 5 women

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and 1 in 7 men, will be living with obesity by 2030.[2] According to the results regarding the prevalence of non-communicable diseases and risk factors in Türkiye,[3] 21.6% of men, 35.9% of women, and 28.8% of people in total are obese.

Obesity, a common disease, increases death rates by causing other severe diseases, including cardiovascular diseases, some types of cancer, and diabetes.[4,5] Obesity also causes mental and social problems. Obese individuals are exposed to negative behaviors, such as being blamed and labeled with social prejudices in areas such as employment, education, and personal relationships.[6,7] This situation leads to psychological problems such as decreased self-esteem and depression.[7,8] When all these are evaluated together, it is seen that obesity adversely affects the quality and duration of life by disrupting physical and mental health.[9,10]

All these data on obesity, disease risks, and the burden this situation imposes on the health system indicate a public health problem. Many factors cause obesity. The most common factors are sociodemographic, behavioral, and genetic characteristics, and living in an obesogenic environment.[11] Excessive nutrition and lack of physical activity are the most important modifiable causes. Therefore, it is important to change the nutrition and activity habits of individuals with obesity to ensure that they acquire healthy lifestyle behaviors.[12]

It would be a better approach to prevent or manage obesity by providing a holistic approach rather than giving advice without forming a habit. Obesity management should aim to prevent more weight gain in individuals who cannot lose weight and to reduce the possible health risks due to obesity.[13] While managing obesity, it is necessary first to change behavior and implement this for at least six months. Medical treatment methods should be used in case of failure.[14] Using models in training to ensure behavior change makes the training systematic. Models guide the development and testing of initiatives to be implemented and enable the scientific results of these initiatives to be presented.[15] Different models, such as behavioral treatment strategies,[16] the transtheoretical model,[17] and the Information-Motivation-Behavioral Skills (IMB) model,[18] have been used in obesity management. In this context, structuring the training to fight obesity according to the Health Belief Model (HBM) can yield significant results in developing positive health behaviors.[19]

The HBM is an effective guide that explains and measures the conditions that motivate or prevent individuals' adherence to treatment in numerous health problems and behaviors that protect and enhance health, which are used in attempts to change negative health behaviors.[20] The HBM has been employed to investigate the causes of health behaviors in breast, cervical, testicular, and prostate cancer screenings and diabetes control, and a measurement tool based on the HBM has been developed for many health problems.[21,22] The HBM argues that individuals' beliefs, values, and attitudes impact their health behaviors.[20] If these beliefs and attitudes toward obesity are determined, health training structured according to the HBM can be prepared in line with an individual's needs and will contribute to positive health behaviors.[23] Studies conducted on different groups have found that training programs for obesity structured according to the HBM are effective,[23] and the HBM is effective on modifiable factors to manage obesity effectively.[24,25]

Previous studies have not used measurement tools with proven validity and reliability. No previous study has planned to conduct special training for patients with obesity, and no joint measurement tools have been used in previous research. The training discussed in most studies in the literature to date has been provided only on cognition. The present study on HBM-based training used HBM-based measurement tools for obesity and planned to include the affective domain to contribute to evidence-based practices. This training is an alternative method that increases the effectiveness of standard obesity treatment and accelerates weight loss. It is thought that HBM-based training, which includes the domain of affective learning (such as case sample stories) and uses HBM-based measurement tools developed for obesity, will contribute to evidence-based practices. HBM-based training aims to change the beliefs of obese women about obesity and provide obesity management, such as physical activity and nutrition planning. The research was conducted to determine the effect of the training provided to women with obesity according to the Health Belief Model on women's beliefs, attitudes, and health behaviors, and its contribution to obesity management.

The research hypotheses are as follows:

H_1: The HBM-based training provided to women with obesity positively affects obesity-related levels and components of the Health Belief Model.

H_2: The HBM-based training provided to obese women enables them to manage obesity by changing their attitudes and behaviors (going to the gym regularly to exercise, consulting a dietitian to maintain the diet).

H_3: The HBM-based training provided to women with obesity ensures a reduction in women's anthropometric measurements (body weight, Body Mass Index (BMI), and waist circumference).

Materials and Methods

Design and Participants

This study was a pre-test post-test control group randomized controlled trial. There was an intervention group (IG) and a control group (CG) in the study. The present study was registered at the ClinicalTrials.gov Protocol Registration and Results System (ClinicalTrials.gov ID: NCT04983147).

Study Setting and Sample

This study was carried out in a family health center in Türkiye between 2017 and 2018. The study population comprised women with obesity aged 18-65 years (BMI ≥ 30). The sample size was determined using power analysis, calculated according to the mean and effect size values determined. The power of the study sample was calculated using the G*Power-3.1.9.2 program at a 95% confidence interval, a 0.05 level of significance, and a margin of error of 0.05.[26] The power analysis, using Cohen's standard effect sizes, determined that 128 people, 64 in each group (64 women for the intervention group and 64 for the control group), should be reached to achieve 80% power with an effect size of 0.5%, a margin of error level of 0.05%, and a confidence interval of 95%.[26] The study was finished with 64 women.

Inclusion Criteria

Women meeting the following criteria were included in the sample group:

- being over the age of 18 and under the age of 65
- being at least a primary school graduate
- having a BMI ≥ 30
- having a waist circumference ≥ 88 cm
- having received no previous training on obesity
- having no chronic diseases or mental or psychological disabilities limiting activities of daily living
- not performing any regular physical activity before the study and not having consulted a dietician.

Randomization and Blinding

Randomization

All women who met the inclusion criteria for randomization were included in the study, and simple randomization was performed. Women included in the study were randomly assigned to a control and an intervention group. The intervention and control were labeled as "I" and "C" respectively, on the right side of each line in the table created. The names of the women who agreed to participate in the research were added in order. The first experiment was designated as the intervention and the subsequent one as the control. According to the statistical findings, a homogeneous distribution was achieved ($P > 0.05$) (Table 1). Therefore, women in both the intervention and control groups were homogeneously distributed. The present study conforms to the checklist of information to include when reporting a randomized trial (Consolidated Standards of Reporting Trials (CONSORT) list: extensions of CONSORT statements). The researcher performed this application (Figure 1).

Blinding

Due to the nature of the study, blinding could not be performed. The researcher was not blind because he planned the randomization and implemented the training. Participants also knew they were in the intervention group because they attended the training for which their consent was obtained.

Data Collection Instruments

The data collection tools included the Descriptive Information Form, Health Belief Model Scale in Obesity (HBMSO), and Anthropometric Measurements Form.

Descriptive Information Form

The participants filled out a descriptive information form prepared by the researcher based on the relevant literatüre.[23-25] It included 15 questions about age, marital status, family type, education status, social security, profession, income, having children, previous exercise habits, reasons for quitting exercising, consulting a dietician and following a prescribed diet, and if so, the reasons for quitting the diet.

Health Belief Model Scale in Obesity

Dedeli and Fadiloglu[27] developed the Health Belief Model Scale in Obesity (HBMSO) by evaluating an individual's beliefs about weight loss. Cronbach's alpha value of the 32-item scale was 0.80. The HBMSO has five subscales that can be used independently: health value, perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. The total scale score

Table 1. Training Plan Implemented According to Health Belief Model (HBM)

	Educaton Subject	Training Methods	Materials
Week 1	Perception of Susceptibility to Obesity Definition of obesity Causes of obesity The importance of preventing obesity Obesity management and its importance	Lecture Q&A Discussion	PowerPoint presentation
Week 2	Perception of Seriousness Towards Obesity Harms of obesity to our health Physiological diseases caused by obesity Mental illnesses caused by obesity	Lecture Q&A Discussion	PowerPoint presentation, Chalkboard
Week 3	Benefit Perception Regarding Obesity Management Obesity management and the benefits of weight loss for our health Benefits of diet in obesity management Benefits of physical activity in obesity management	Lecture Q&A Discussion	PowerPoint presentation Training Manual
Week 4	Barriers to Obesity Management Obstacles you may encounter in obesity management Listening to the group's weight loss experiences	Lecture Q&A Discussion Case report	PowerPoint presentation Chalkboard
Week 5	Barriers to Obesity Management Obstacles you may encounter in obesity management	Case report	Weight loss stories of women with obesity
Week 6	Barriers to Obesity Management Obstacles you may encounter in diet and solution suggestions Evaluation of the group's nutritional behaviors	Lecture Q&A Discussion	PowerPoint presentation Chalkboard
Week 7	Barriers to Obesity Management Obstacles you may encounter in physical activity and solutions Evaluation of the group's behaviors towards physical activity	Lecture Q&A Discussion Demonstration	PowerPoint presentation Chalkboard Video Show

Training subjects, durations, methods and materials applied to obese women according to HBM

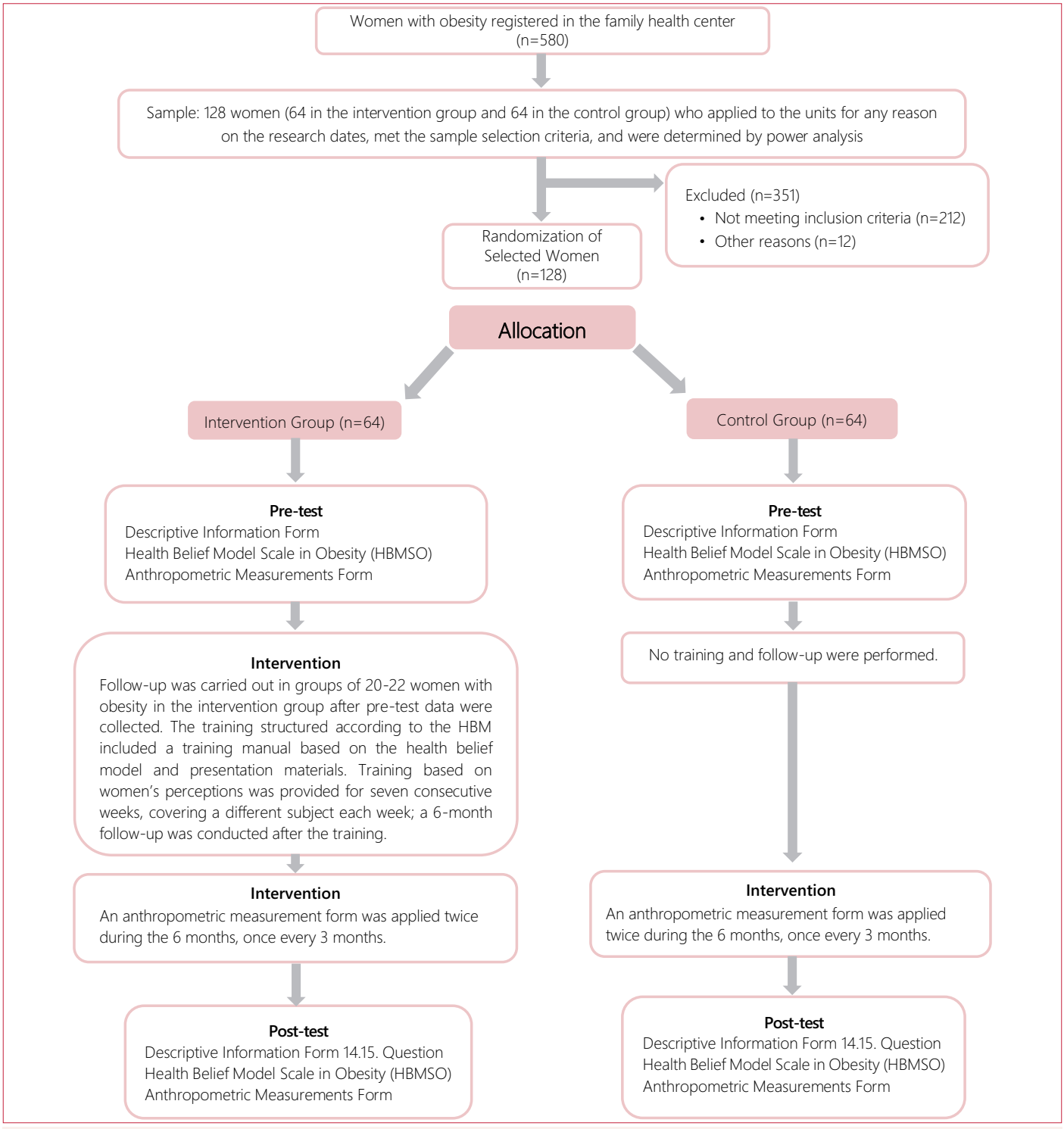

Figure 1. Research Plan.

average of HBMSO is not calculated. It is calculated by summing the scores of the items belonging to each subscale of the scale (when the inverted item is reverse-coded (item 16) and dividing by the number of items in each subscale. There is no cut point value. In the present study, Cronbach's alpha coefficient of the HBMSO was found to be 0.86.

Anthropometric Measurements Form

This form recorded the participant's height, weight, BMI, and waist circumference.

The following tools were used while filling out the anthropometric measurements form:

Height Meter: A height measuring bar with a capacity of 20 - 207 cm and 1 mm precision (WHO waist circumference).

Scale: A wide and non-slip platform, large liquid crystal display (LCD) number display scale with a 200 kg capacity and 100 g precision (WHO waist circumference).

Body Diameter Measuring Tape: A measuring tape with a 0-205 cm capacity and 1 mm precision (WHO waist circumference).

Rules Applied During Measurements

- The weight of women was measured by placing the scale on a flat surface without a slope, with their thick clothes and shoes removed, and without moving (WHO waist circumference).
- The height of women was measured with feet together and the head in the Frankfurt plane (the angle between the head and the neck is 90 degrees) (WHO waist circumference).
- The waist circumference of women was measured on a flat surface, holding the tape loosely and with women standing in an upright position without applying excessive pressure, with their hands and arms at both sides, feet close to each other (12-15 cm apart), and weight evenly distributed on both feet, from the level of the navel measured (WHO waist circumference).

Training Content

The training intervention was conducted as a program structured around obesity management according to the HBM. The content of the training was created based on the results of the importance of health, sensitivity, seriousness, disability, and benefit perception, which are the sub-dimensions of the women's health belief model after the pre-test.

Health Value

The definition and epidemiology of obesity were explained.

Perceived Susceptibility

After evaluating women's consideration of obesity as a disease, the training content included the definition of obesity, how it is evaluated, and why it is a significant health problem.

Perceived Severity

After evaluating women's consideration of obesity as a serious health issue, the training content included health issues such as physical and mental disorders that can result from obesity.

Perceived Benefits

After evaluating the health benefits of proper obesity management for women, the training content included the health benefits of managing obesity, proper nourishment, and physical activity.

Perceived Barriers

After evaluating perceived barriers to women's obesity management, barriers encountered in obesity management were discussed with the group, strategies to overcome these barriers were listed, and a training program was created for each woman so that she could manage obesity in a way suitable for her.

Training Tools

Training tools included a training manual, slide show, videos, and case sample stories.

Training Manual

The researcher prepared a training manual titled "Do Not Stay Silent Toward Obesity" to guide women in obesity management by positively impacting their beliefs about obesity.

Slide Show

The presentation prepared according to the HBM was utilized in group training.

Video

Using tools such as video is more effective than verbal expression and reading, facilitating learning through hearing and seeing. Therefore, the researcher prepared videos that would raise awareness of the subject and used them in the training. The video featured designed characters and had a duration of 2 minutes and 30 seconds. It illustrated the experiences of a woman with obesity and her weight loss story. The video was not available online.

Case Sample Stories

Real-life stories of individuals who had successfully managed obesity and found themselves healthier compared to their previous condition were shared with the group. Individuals who had previously had obesity and managed to lose weight were invited to the training, which was provided in the affective domain.

Study Implementation

For the intervention group, follow-up was carried out in groups of 20-22 women with obesity after pre-test data were collected. The training hours were determined according to the availability of the women, with intervals of 10-12 hours, 13-15 hours, and 15-17 hours. The specific group timing was determined according to the preferences of the women. The training program, based on women's perceptions, was provided for seven successive weeks, covering a different subject each week, and a 6-month follow-up was conducted after the training.[14] The training, structured in accordance with the HBM, included a training manual based on the health belief model and presentation materials. The materials, prepared within the scope of literature[1-3] and in consultation with five experts, were delivered once per week for seven weeks as 30-40-minute sessions when all women in the intervention group were available.[14,23,28] The training utilized educational methods such as verbal lectures, brainstorming, discussion and demonstration, PowerPoint presentations, a whiteboard, and videos. No training was provided to women in the control group. After pre-test data were collected, the control group was put on hold. The anthropometric measurements form was applied to both the intervention and control groups twice over six months, once every three months.[14]

After the training, women underwent follow-up through phone calls every 15 days to increase their motivation and ensure they answered questions about obesity management. During the 6-month follow-up, women were asked about engaging in regular physical activity by regularly going to the gym to exercise and consulting a dietitian to maintain the diet.

Statistical Analysis

The data were analyzed using the IBM Statistical Package for the Social Sciences Statistics Version 20.0 (SPSS 20.0) software package (IBM, New York, USA). Continuous variables are presented as

mean ± standard deviation and median (minimum-maximum), and categorical variables are presented as numbers and percentages. The research data were assessed by the chi-squared test, independent samples t-test, repeated measures Analysis of Variance (ANOVA) test, Friedman test, Mann-Whitney U test, Kruskal-Wallis test, and Wilcoxon signed-ranks test. Cohen's d was utilized in effect size calculation (Comprehensive Meta-Analysis Version 3). As stated by Cohen, if the d value is 0.2, it is considered a small effect; if it is 0.5, the effect is medium; if it is > 0.8, it is defined as a large effect.

Ethical Considerations

The researcher collected data from a family health center. Permission was received from Atatürk University Faculty of Health Sciences Ethics Committee (Approval Number: 2016/03/10, Date: 18.03.2016), and written consent was obtained from the institution where the research was conducted. Permission to use the "HBMSO" was obtained from the authors. In addition, consent was obtained from the participants after the study's goals were explained to them. This study was conducted following the principles of the Helsinki Declaration of Human Rights (Cassese, A. 1980).

Results

Women in both groups were not dieting during the study. Women in the intervention and control groups were homogeneously distributed, and no significant difference was found between the groups in terms of control variables (P > 0.05) (Table 2).

Table 3 shows no significant difference in the pre-test measurements of women in the intervention and control groups regarding the health value, perceived susceptibility, perceived benefits, perceived severity, and perceived barriers subscales (P > 0.05). In the post-test measurements, women in the intervention group had higher mean scores in all subscales, except for perceived barriers. The mean perceived barriers score was significantly lower, indicating that the training was effective (P < 0.001). The effect size was large in the subscales (d = 1.86, d = 3.81, d = 1.14, d = 2.16, d = 2.02, respectively).

The post-test measurements of women in the control group showed that the mean scores on the health value, perceived benefits, perceived susceptibility, and perceived severity subscales on the HBMSO were significantly lower (P = 0.002, P < 0.001, P < 0.001, P < 0.001, respectively). The scores on the perceived severity and perceived barriers subscales increased, but not statistically significantly (P = 0.057).

As seen in Table 4, the mean body weight of women in the intervention group (86.90 ± 12.23) was higher than that of women in the control group (82.53 ± 9.80), and there was a statistically significant difference between the groups (P = 0.028). The effect size was small (d = 0.39). According to the interim measurement after the training, the mean body weight of women in the intervention group (80.31 ± 14.69) was lower than their mean body weight before the training. The mean body weight of women in the control group (83.16 ± 9.70) was higher than during the first measurement. No statistically significant difference was identified between the groups (P = 0.198). In the last measurement after the training, the mean body weight of women in the intervention group (76.26 ± 12.34) was lower than their mean body weight during the intermediate measurement. The mean body weight of women in the control group (83.73 ± 9.50) was similar to the body weight during the intermediate measurement.

Table 2. Comparison of Descriptive Characteristics of Women in the Intervention and Control Groups

Descriptive Characteristics	Intervention Group (n = 64)		Control Group (n = 64)		Test*
	S	%	S	%	
Age (In years)	$X_I \pm SD_I = 41.92 \pm 8.24$		$X_C \pm SD_C = 41.64 \pm 9.53$		
30 and below	5	7.8	9	14.0	$X^2 = 2.344$ P = 0.504
31–40	23	35.9	22	34.4	
41–50	27	42.2	21	32.8	
51 and over	9	14.1	12	18.8	
Education					$X^2 = 5.509$ P = 0.064
Primary school	41	64.1	28	43.8	
Middle school	9	14.0	12	18.7	
High school	14	21.9	24	37.5	
Marital Status					
Married	54	84.4	57	89.1	$X^2 = 610$ P = 0.435
Single	10	15.6	7	10.9	
Children					
None	11	17.2	7	10.9	$X^2 = 6.393$ P = 0.172
1	8	12.5	11	17.2	
2	16	25.0	23	35.9	
3	24	37.5	14	21.9	
4 and more	5	7.8	9	14.1	
Family Type					
Nuclear	48	75.0	44	68.8	$X^2 = 0.618$ P = 0.432
Extended	16	25.0	20	31.2	
Social Security					
Yes	57	89.1	58	90.6	$X^2 = 0.086$ P = 0.770
No	7	10.9	6	9.4	
Income Status					
Income<Expenditure	18	28.1	13	20.3	$X^2 = 1.064$ P = 0.302
Income=Expenditure	46	71.9	51	79.7	
Exercising Regularly Previously					
Yes	15	23.4	16	25.0	$X^2 = 0.043$ P = 0.837
No	49	76.6	48	75.0	
Reasons for Quitting Exercising (n_I=49, n_C=48)					
Family issues	16	32.7	10	20.8	$X^2 = 4.036$ P = 0.133
Inability to allocate time	24	49.0	21	43.8	
Financial constraints	9	18.3	17	35.4	

(*Continued*)

Table 2. Comparison of Descriptive Characteristics of Women in the İntervention and Control Groups (Continued)

Descriptive Characteristics	Intervention Group (n = 64) S	%	Control Group (n = 64) S	%	Test*
Consulting a Dietician Previously					
Yes	31	48.4	24	37.5	X^2=1.772 P = 0.183
No	32	51.6	40	62.5	
Attempting to diet previously					
Yes	37	57.8	32	50.0	X^2=0.786 P = 0.375
No	27	42.2	32	50.0	
Reason for Quitting Dieting					
Failure to practice	24	64.9	20	62.5	X^2=6.590 P = 0.086
Feeling sick	4	10.8	1	3.1	
Weakness of will	8	21.6	5	15.6	
Being bored	1	2.7	6	18.8	
Going to Sports After Training					
Yes	64	100.0	0	0	
No	0	0	64	100	
Consulting a Dietician After Training					
Yes	64	100.0	0	0	
No	0	0	64	100	
Total	64	100.0	64	100.0	

X^2 = Chi-squared test

A statistically significant difference was revealed between the groups (P < 0.001). The effect size was medium (d = 0.68). The difference between the pre-test and post-test mean body weight in the intervention group was statistically significant (P < 0.001). The effect size was small (d = 0.20), and there was no statistically significant difference between the pre-test and post-test mean body weight in the control group (P = 0.370).

Table 5 shows that the mean BMI of women in the intervention group (35.72 ± 6.33) was higher than that of women in the control group (33.26 ± 2.99), and a statistically significant difference was identified between the groups (P = 0.006). The effect size was medium (d = 0.50). According to the interim measurement after the training, the mean BMI of women in the intervention group (33.63 ± 6.36) was lower than their mean BMI before the training. The mean BMI (34.38 ± 8.62) of women in the control group was higher than during the first measurement. No statistically significant difference was found between the groups (P = 0.575). In the post-training measurement, the mean BMI (30.82 ± 4.27) of women in the intervention group was lower than the mean BMI during the intermediate measurement. The mean BMI (35.39 ± 9.95) of women in the control group was higher than their mean BMI during the intermediate measurement. A statistically significant difference was revealed between the groups (P < 0.001). The effect size was medium (d = 0.60). The difference between the pre-test mean BMI (35.72 ± 6.33) and the post-test mean BMI (30.82

Table 3. Intragroup and İntergroup Comparison of Pre-Test And Post-Test Health Belief Model Scale in Obesity (HBMSO) Subscale Scores of the Women in the Intervention and Control Groups

HBMSO Subscales	Intervention Group (n = 64) X ± SD	Control Group (n = 64) X ± SD	Test*	Cohen's d (95% CI)
Health Value				
Pre-test	3.16 ± 0.75	3.18 ± 0.69	U = 2004.000 P = 0.833	
Post-test	4.20 ± 0.50	3.09 ± 0.68	U = 350.000 **P < 0.001**	1.86
Test**	Z=-6.631 **P < 0.001**	Z=-3.136 **P = 0.002**		
Cohen's d (95% CI)	1.57	1.13		
Perceived Susceptibility				
Pre-test	3.43 ± 0.65	3.58 ± 0.59	U = 1818.500 P = 0.265	
Post-test	4.64 ± 0.44	3.02 ± 0.41	U = 37.000 **P < 0.001**	3.81
Test**	Z=-6.699 **P < 0.001**	Z=-6.378 **P < 0.001**		
Cohen's d (95% CI)	2.11	1.07		
Perceived Severity				
Pre-test	4.10 ± 1.02	4.12 ± 0.96	U = 2024.000 P = 0.907	
Post-test	4.86 ± 0.31	4.07 ± 0.93	U = 702.500 **P < 0.001**	1.14
Test**	Z=-5.354 **P < 0.001**	Z=-1.901 P = 0.057		
Cohen's d (95% CI)	0.84			
Perceived Benefits				
Pre-test	4.20 ± 0.87	4.20 ± 0.86	U = 2041.000 P = 0.973	
Post-test	4.88 ± 0.25	3.70 ± 0.73	U = 115.500 **P < 0.001**	2.16
Test**	Z=-5.285 **P < 0.001**	Z=-6.026 **P < 0.001**		
Cohen's d (95% CI)	0.88	0.62		
Perceived Barriers				
Pre-test	2.48 ± 0.79	2.40 ± 0.80	U = 1925.000 P = 0.556	
Post-test	1.86 ± 0.75	3.21 ± 0.57	U = 355.500 **P < 0.001**	2.02

(*Continued*)

Table 3. Intragroup and İntergroup Comparison of Pre-Test And Post-Test Health Belief Model Scale in Obesity (HBMSO) Subscale Scores of the Women in the Intervention and Control Groups (Continued)

HBMSO Subscales	Intervention Group (n = 64) X ± SD	Control Group (n = 64) X ± SD	Test*	Cohen's d (95% CI)
Test**	Z=-3.690 **P < 0.001**	Z=-6.327 **P < 0.001**		
Cohen's D (95% CI)	0.80	1.14		

**Mann-Whitney U Test*
Cohen's d: < 0.2 small, 0.5 medium, > 0.8 large
***Wilcoxon Signed-Ranks Test*

± 4.27) was statistically significant (P < 0.001). The effect size was medium (d = 0.36). Additionally, the difference between the pre-test (33.26 ± 2.99) and post-test mean BMI (35.39 ± 9.95) in the control group was statistically significant (P < 0.001), and the effect size was large (d = 1.12).

According to Table 6, the mean waist circumference of women in the intervention group (102.85 ± 10.44) was larger compared to that of women in the control group (93.06 ± 10.34). A statistically significant difference was identified between the groups (P < 0.001). The effect size was large (d = 0.94). According to the interim measurement after the training, the mean waist circumference of women in the intervention group (100.07 ± 10.47) was smaller than the measurement before the training. Women in the control group had a similar mean waist circumference (93.43 ± 10.28). There was a statistically significant difference between the groups (P < 0.001), and the effect size was medium (d = 0.64). In the post-training measurement, the mean waist circumference of

Table 4. Intragroup and İntergroup Comparison of Pre-Test, Intermediary, And Post-Test Body Weight Values of the Women in the Intervention and Control Groups

Body Weight Measurement	Intervention Group (n = 64) X ± SD	Control Group (n = 64) X ± SD	Test*	Cohen's d (95% CI)
Pre-test	86.90 ± 12.23[a]	82.53 ± 9.80	t = 2.226 **P = 0.028**	0.39 (0.484- 8.240)
Intermediary Test	80.31 ± 14.69[b]	83.16 ± 9.70	t=-1.294 P = 0.198	
Post-test	76.26 ± 12.34[c]	83.73 ± 9.50	t=-3.834 **P < 0.001**	0.68 (-11.319- -3.612)
Test**	F=117.755 **P < 0.001**	F=45.361 P = 0.370		
Cohen's d (95% CI)	0.20			

**Independent samples t-test was applied.*
Cohen's d: <0.2 small, 0.5 medium, > 0.8 large.
***Friedman test was applied.*
****a,b,c superscripts indicate within-group differences; measurements with the same letter are similar.*

Table 5. Intragroup and Intergroup Comparison of Pre-Test, Intermediary, and Post-Test Body Mass Index (BMI) Values of the Women in the Intervention and Control Groups

BMI Measurement	Intervention Group (n = 64) X ± SD	Control Group (n = 64) X ± SD	Test*	Cohen's d (95% CI)
Pre-test	35.72 ± 6.33[a]	33.26 ± 2.99[a]	t = 2.811 **P = 0.006**	0.50 (0.728-4.195)
Intermediary Test	33.63 ± 6.36[b]	34.38 ± 8.62[b]	t=-0.562 P = 0.575	
Post-test	30.82 ± 4.27[c]	35.39 ± 9.95[c]	t=-3.381 **P = 0.001**	0.60 (-7.259--1.898)
Test**	X^2=99.969 **P < 0.001**	X^2=65.718 **P < 0.001**		
Cohen's d (95% CI)	0.36	1.12		

**Independent samples t-test was applied.*
Cohen's d: <0.2 small, 0.5 medium, > 0.8 large.
***Friedman test was applied.*
****a,b,c superscripts indicate within-group differences; measurements with the same letter are similar.*

Table 6. Intragroup and Intergroup Comparison of the Pre-Test and Post-Test Waist Circumference Values of the Women in the Intervention and Control Groups

Waist Circumference Measurement	Intervention Group (n_i=64)	Control Group (n_c=64)		
	X ± SD	X ± SD	Test*	Cohen's d (95% CI)
Pre-test	102.85 ± 10.44[a]	93.06 ± 10.34	t=5.3331 **P < 0.001**	0.94 (6.160-13.433)
Intermediary test	100.07 ± 10.47[b]	93.43 ± 10.28	t=3.619 **P < 0.001**	0.64 (-11.319--3.612)
Post-test	96.37 ± 10.67[c]	92.29 ± 14.38	t=1.821 P=0.071	
Test**	F=103.684 **P < 0.001**	F=15.347 P=0.521		
Cohen's d (95% CI)	0.25			

**Independent samples t-test was applied.*
Cohen's d: <0.2 small, 0.5 medium, > 0.8 large
***Repeated measures Analysis of Variance (ANOVA) test was applied.*
****a,b,c superscripts indicate within-group differences; measurements with the same letter are similar.*

women in the intervention group (96.37 ± 10.67) was smaller than during the intermediate measurement. The mean waist circumference of women in the control group (35.39 ± 9.95) was also smaller than during the intermediate measurement. There was no statistically significant difference between the groups (P=0.071). However, the difference between the pre-test (102.85 ± 10.44) and post-test (96.37 ± 10.67) waist circumference measurements was statistically significant (P < 0.001), and the effect size was medium (d=0.25). The difference between the pre-test (93.06 ± 10.34) and post-test (92.29 ± 14.38) mean waist circumference measurements in the control group was not statistically significant (P < 0.001).

Discussion

In this study, it was determined that the mean scores on the Health Belief Model Scale in Obesity health value, perceived susceptibility, and perceived severity subscales increased, while the perceived disability subscale mean score decreased in the post-test after the HBM-based training in the intervention group. This result indicates that the health beliefs of the experimental group towards obesity differ positively. This result supports Hypothesis 1, which states "The HBM-based training provided to women with obesity positively affects obesity-related levels and components of the Health Belief Model." The literature reports improvements in obesity in groups to which HBM-based training was applied.[23,28] In the present study, although patients without chronic diseases were included in the intervention group, perceived severity was high after the training. This may be due to an increase in chronic diseases worldwide and the fact that 41 million (74%) people die each year due to chronic diseases, which highlights the importance of health threats under the subscale of perceived severity.[29] This result is a strong aspect of the study. A study on pregnant women found that after two weeks of HBM-based training, the mean scores on the subscales of health value, perceived severity, perceived disability, and perceived benefits increased, but there was no change in perceived susceptibility.[30] The affective domain is important for the development of attitudes and beliefs.[31] In this study, considering the affective domain and including it in all perceptions in the HBM-based education plan (e.g., case sample stories) may have been effective in providing appropriate attitudes and beliefs. Additionally, unlike other studies, this study achieved behavioral change in all women after the training; they regularly went to the gym and consulted a dietitian. This result supports Hypothesis 2, which states "The HBM-based training provided to obese women enables them to manage obesity by changing their attitudes and behaviors (going to the gym regularly to exercise, consulting a dietitian to maintain the diet)." Furthermore, the aforementioned result indicated that the 6-month period ensures behavioral change. Weight loss is important in obesity management. Anthropometric measurements were made to determine this. Considering the anthropometric measurements, it was observed that the pre-test measurement values of women in the intervention group decreased after the training. This result shows that education has positively affected women's health beliefs about obesity and enabled them to lose weight. This result supports Hypothesis 3, titled "The HBM-based training provided to women with obesity ensures a reduction in women's anthropometric measurements (body weight, BMI, and waist circumference)." This is consistent with the literatüre.[32,33]

Including HBM-based training in obesity management, which requires a holistic and multidisciplinary approach, regular exercising, and consulting a dietitian, contributed to a decrease in anthropometric measurements (exercising regularly, eating according to the nutrition program, weight, body mass index, and waist circumference).

Limitations and Strengths of the Study

The results of the present study are limited to women registered at a family health center in Türkiye. Each region has physical, social, and cultural differences.[34] Therefore, the results of this study can only be generalized to the studied region.

The study was conducted on women because the WHO reported higher rates of obesity among women than among men. In this case, women can be considered a group at a higher risk for obesity. Obesity is more common among women globally. This shows that the study was conducted on an appropriate sample, which is a strong aspect of the study. Women who did not engage in regular physical activity and did not consult a dietician were included in the study, which was an important factor in determining the impact of the study.

The health belief model is effective in providing behavioral change. Training on obesity has been given in the literature. However, no

study has planned to provide both cognitive and affective training in contingent education, which is done with a measurement tool that evaluates the health belief model in obesity. This reveals the strength of the present study.

Conclusion

Methods that can create behavioral change for obesity, one of the most significant health problems today, are crucial. The model intergrates factors that can influence behavior, viewing it as a whole and identifying paths to achieve the desired goals. The Health Belief Model is a proven framework for changing beliefs, attitudes, and behaviors. The results of this study support the strong impact of the HBM-based educational intervention on improving women's knowledge, beliefs, and behaviors. In this study, the HBM served as the basis, and the training provided was aligned with cognitive and affective domains, enhanced by a holistic and multidisciplinary approach.

The training based on the Health Belief Model resulted in increased obesity-related health belief levels among women. The training given to women with obesity according to the HBM has changed women's attitudes and behaviors by positively affecting their beliefs about obesity, encouraging them to go to the gym and consult a dietitian to maintain eating patterns. This provided effective obesity management, including regular exercise, adherence to nutrition programs, weight loss, and reductions in BMI and waist circumference. It is recommended that in studies about obesity patients, nursing interventions be implemented within the framework of models, focusing the training on cognitive and affective domains and extending it to different groups.

Treatments such as diet programs, physical activity, and surgical procedures for obesity should be supplemented with complementary training interventions that enhance health beliefs. Therefore, the affective domain should be considered in HBM-based training.

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Informed Consent: Written consent was obtained from the institution where the research was conducted.

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