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The Effect of a Health Belief Model-Based Education and Counseling Program on Coronary Heart Disease Risk

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ABSTRACT

Background: Coronary heart disease remains a leading cause of premature mortality worldwide. Although many risk factors are modifiable, insufficient knowledge and low risk perception limit engagement in preventive behaviors. The Health Belief Model provides a theoretical framework to improve risk awareness and support health behavior change; however, evidence regarding nurse-led interventions in outpatient settings is limited. ***Purpose*****:** The aim of this study was to assess the effectiveness of a nursing-led, Health Belief Model-based education and counseling program in improving knowledge of coronary heart disease risk factors, enhancing risk perception, and reducing estimated 10-year coronary heart disease risk among at-risk adults. ***Methods*****:** A randomized controlled pretest-posttest study was conducted in a cardiology outpatient clinic in Turkey between August 2022 and July 2023. A total of 130 participants were randomly assigned to an intervention group or a control group. The intervention included a face-to-face education session lasting 35 to 45 minutes, supported by a structured printed booklet and two follow-up telephone calls at two-month intervals. ***Results*****:** At six months, the intervention group showed significant improvements in knowledge of risk factors, overall and sub-dimension risk perception, and several cardiovascular risk indicators. A significant reduction in estimated ten-year risk was also observed. No significant changes were found in the control group. ***Conclusion*****:** A theory-based, nurse-led education and counseling program improved knowledge and risk perception and reduced cardiovascular risk. ***Implications for Nursing*****:** Integrating theory-based education with structured follow-up may strengthen preventive care and support nurses in promoting cardiovascular health in outpatient settings.

Keywords: Health belief model, Patient education, Counseling, Coronary disease, Risk perception, Framingham Risk Score.

What does this paper add?

1. It demonstrates that a nurse-led, Health Belief Model-based education and counseling program significantly improves coronary heart disease risk knowledge and risk perception in outpatient clinical settings.
2. It provides evidence that integrating structured follow-up (reinforcement telephone calls) with theory-based education can contribute to a measurable reduction in estimated ten-year coronary heart disease risk.
3. It highlights the effectiveness of applying a behavioral theory framework in routine nursing practice to strengthen cardiovascular disease prevention strategies.

Introduction

Coronary heart disease (CHD) remains one of the leading causes of mortality and morbidity worldwide, representing a major public health challenge despite substantial advances in preventive cardiology and clinical management. According to the World Health Organization, cardiovascular diseases account for approximately one-third of all global deaths, with CHD constituting a substantial proportion of this burden (WHO, 2024). Global epidemiological data indicates that although age-adjusted mortality rates have declined in some regions, the absolute number of individuals living with or at risk for CHD continues to rise due to population ageing and the persistence of modifiable risk factors, such as hypertension, dyslipidemia, smoking, physical inactivity, unhealthy diet, and impaired glucose metabolism (Virani et al., 2020).

In response to this growing burden, international guidelines increasingly emphasize the importance of preventive strategies that extend beyond pharmacological treatment and incorporate patient education and behavioral counseling as core components of cardiovascular risk management (WHO, 2024). Patient education and counseling interventions aim to support individuals in understanding their cardiovascular risk and adopting sustainable lifestyle changes. However, evidence suggests that educational approaches focusing solely on information provision often yield limited and short-term effects, particularly when they fail to address the cognitive and emotional determinants underlying health behavior (Tod et al., 2001).

Behavioral theories provide a structured framework for designing education and counseling interventions that target these determinants. Among these, the Health Belief Model (HBM) has been widely used to explain preventive health behaviors across diverse populations and health conditions. The HBM proposes that individuals' engagement in health-promoting behaviors is influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Champion & Skinner, 2008). In the context of CHD prevention, HBM-based interventions have demonstrated effectiveness in improving knowledge, enhancing perceived risk, and promoting lifestyle modification, particularly when delivered through structured education and counseling programs (Brewer et al., 2019; Cicolini et al., 2014). Evidence from chronic disease populations suggests that information, motivation, and behavioral skills are significantly associated with preventive health behaviors (Suyanto et al., 2026).

Risk perception represents a central construct within the HBM and plays a critical role in motivating preventive behavior. Studies have consistently shown that individuals who underestimate their personal cardiovascular risk are less likely to engage in recommended preventive behaviors, even when they possess adequate factual knowledge (Williams et al., 2007; Guo et al., 2023). Conversely, interventions that enhance accurate risk perception—while simultaneously strengthening self-efficacy and addressing perceived barriers—appear more successful in facilitating behavioral change (Brewer et al., 2019; Toptaner & Yıldız, 2016).

In recent years, there has been growing interest in examining whether theory-based education and counseling interventions can influence not only psychosocial outcomes, but also objective indicators of cardiovascular risk. Composite risk estimation tools, such as the Framingham Risk Score (FRS), integrate multiple behavioral and biological risk factors to estimate an individual's 10-year risk of developing CHD and are widely used in preventive cardiology (Berry et al., 2007; García-Ortiz et al., 2010). Demonstrating changes in such risk scores following patient education and counseling interventions may provide compelling evidence for the clinical relevance of theory-driven, non-pharmacological approaches to cardiovascular disease prevention.

The aim of this study was to evaluate the effectiveness of a nursing-led, HBM-based education and counseling program in improving knowledge of coronary heart disease risk factors, enhancing risk perception, and reducing estimated 10-year coronary heart disease risk among at-risk adults.

Materials and Methods

Study Design

This study was designed as a randomized controlled, pretest-posttest experimental trial with two parallel groups: an intervention group receiving a nursing-led education and counseling program based on the HBM and a control group receiving usual care. The study was conducted and reported in accordance with the Consolidated Standards of Reporting Trials

(CONSORT) guidelines for randomized controlled trials (CONSORT Group, 2024).

Setting and Study Period

The study was conducted at the Cardiology Outpatient Clinic of Van Yüzüncü Yıl University Dursun Odabaş Medical Center, Turkey, which is a tertiary-level university hospital providing specialized cardiovascular care. This clinic routinely serves adult patients referred from primary and secondary healthcare facilities as well as self-referred individuals, and provides cardiovascular risk assessment, diagnosis, treatment, and follow-up services for patients with known or suspected cardiovascular diseases and related risk factors.

Participants

The study population consisted of adults aged 18-65 years who were identified as being at risk for coronary heart disease based on the presence of at least one established cardiovascular risk factor,, such as hypertension, diabetes mellitus, hyperlipidemia, smoking, obesity, or a positive family history of cardiovascular disease, during routine cardiology outpatient visits.

Inclusion Criteria

- Age 18-65 years.
- Ability to communicate verbally and provide informed consent.
- Normal cognitive functioning.
- Absence of diagnosed psychiatric disorders that could interfere with participation.

Exclusion Criteria

- History of diagnosed CHD..
- Severe comorbid conditions limiting participation in educational sessions
- Participation in another structured cardiovascular education program within the past year.

Randomization, Blinding, and Sample Size Determination

Participants were randomly assigned to either the intervention or control group using a computer-generated random number sequence. Randomization was performed by an independent researcher who was not involved in participant recruitment, intervention delivery, or outcome assessment. Allocation concealment was ensured using sealed, opaque, sequentially numbered envelopes, which were opened only after baseline data collection was completed (Figure 1).

Due to the nature of the educational intervention, blinding of participants and the intervention provider was not feasible. However, outcome assessments and data entry were conducted by researchers who were blinded to group allocation to minimize assessment bias.

Sample size was determined as a minimum of 130 participants (65 per group) to ensure adequate group sizes for statistical comparisons. Eligible participants were recruited consecutively and enrolled until the target sample size was reached.

Data Collection Instruments

Descriptive Characteristics Form

A researcher-developed form consisting of 17 items was used to collect socio-demographic and clinical data, including age, gender, educational level, marital status, employment status, smoking status, presence of chronic disease, medication use, blood pressure values, lipid profile results and fasting blood glucose levels.

Cardiovascular Disease Risk Factors Knowledge Level Scale (CARRF-KL)

The CARRF-KL, developed by Arıkan et al. (2009), was used to assess participants' knowledge regarding cardiovascular disease risk factors and preventive behaviors. The scale consists of 28 items presented as true/false statements with the response options "Yes," "No," and "I don't know." Correct responses are scored as 1 point, whereas incorrect or "I don't know" responses are scored as 0. Six items are reverse scored. Total scores range from 0 to 28, with higher scores indicating greater knowledge of cardiovascular disease risk factors.

The scale includes items assessing general characteristics of cardiovascular disease, modifiable and non-modifiable risk factors, and outcomes associated with changes in health-related risk behaviors. Specifically, some items evaluate direct knowledge of cardiovascular risk factors, while others assess awareness of the potential benefits and consequences of lifestyle modifications.

The original scale was developed and validated in Turkish. Arıkan et al. reported acceptable validity and reliability findings for the scale, including internal

consistency and test-retest reliability. In the present study, the Cronbach's alpha coefficient was 0.762, indicating acceptable internal consistency.

No established cut-off points are available for categorizing knowledge levels as poor, moderate, or good. Therefore, higher total scores were interpreted as reflecting higher levels of knowledge.

Perception of Risk of Heart Disease Scale (PRHDS)

The PRHDS was originally developed by Ammouri and Neuberger (2008) and adapted into Turkish by Toptaner (2013). The scale consists of 20 items rated on a 4-point Likert scale and evaluates individuals' perceptions regarding heart disease risk across three sub-dimensions: perceived risk, fear of risk, and unknown risk.

The perceived risk dimension assesses individuals' beliefs regarding their susceptibility to heart disease, whereas the fear of risk dimension reflects emotional concerns related to the severity and potentially harmful consequences of heart disease. The unknown risk dimension evaluates perceptions related to uncertainty, lack of knowledge, and difficulty recognizing cardiovascular risk. Higher total scores indicate greater perceived heart disease risk.

Previous studies reported acceptable validity and reliability findings for the Turkish version of the scale, with a Cronbach's alpha coefficient of 0.80. In the present study, Cronbach's alpha for the total scale was 0.770.

Framingham Risk Score (FRS)

The FRS was used as a separate outcome measure to estimate participants' 10-year risk of developing CHD based on age, gender, systolic blood pressure, LDL and HDL cholesterol levels, smoking status, and diabetes status. Blood samples were collected and analyzed in the hospital laboratory. Blood pressure measurements were obtained manually using calibrated sphygmomanometers in accordance with standard clinical procedures.

FRS results were interpreted according to standard risk categories: scores indicating a 10-year CHD risk of less than 10% were classified as low risk, scores between 10% and 20% as moderate risk, and scores greater than 20% as high risk (Wilson et al., 1998).

Intervention

The intervention was delivered in the cardiology outpatient clinic of a tertiary university hospital. Participants in the intervention group received a structured, nursing-led education and counseling program based on the core constructs of the HBM. The intervention consisted of a single face-to-face educational session lasting approximately 35-45 minutes, delivered individually by the researchers, who had received prior training in health education and behavioral counseling.

The content of the intervention was standardized and evidence-based, developed in line with recommendations from the World Health Organization, national cardiology guidelines, and relevant literature. The educational session addressed:

- Definition and epidemiology of CHD.
- Modifiable and non-modifiable CHD risk factors.
- Perceived susceptibility and severity of CHD.
- Perceived benefits of preventive behaviors.
- Common barriers to lifestyle modification and strategies to overcome them.
- Enhancement of self-efficacy related to behavior change.
- Recommendations regarding diet, physical activity, and smoking cessation.

All participants in the intervention group received a printed educational booklet containing the same standardized content. The printed educational booklet was developed by academic experts and reviewed for content validity by specialists in cardiovascular nursing and public health before implementation. The educational session was delivered using a combination of brief lecture, interactive discussion, and individualized counseling techniques to enhance participant engagement and understanding.

To reinforce learning and support behavior change, two structured follow-up telephone counseling sessions were conducted at the 2nd and 4th months after the initial face-to-face education.

Intervention fidelity was ensured by delivering the same educational content, duration, and materials to all participants in the intervention group using a standardized intervention protocol.

Participants in the control group received routine standard care, including regular medical follow-up and physician consultations in the cardiology outpatient clinic, without any additional structured education or counseling intervention. No specific behavioral counseling or educational program was provided to this

group during the study period. Following completion of the posttest assessments, participants in the control group were provided with the educational booklet for ethical reasons.

Data Collection Procedure

Baseline (pretest) data was collected from both groups using face-to-face interviews conducted by trained research assistants who were not involved in the intervention and were blinded to group allocation. Data collection took place in a private consultation room within the cardiology outpatient clinic to ensure privacy and minimize external influence.

Follow-up (posttest) assessments were conducted six months after the intervention using the same standardized data collection instruments.

To ensure consistency, all data collectors received training on the study protocol, interview procedures, and standardized administration of the measurement tools prior to data collection. In addition, all interviews were conducted under similar environmental conditions for both groups.

Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics software (version 25.0). Descriptive statistics (mean, standard deviation, frequency, and percentage) were used to summarize participant characteristics. Baseline comparability between groups was assessed using chi-square tests for categorical variables and independent sample t-tests for continuous variables. Within-group changes from pretest to posttest were analyzed using paired-sample t-tests, while between-group differences were examined using independent sample t-tests. Statistical significance was set at $p<0.05$.

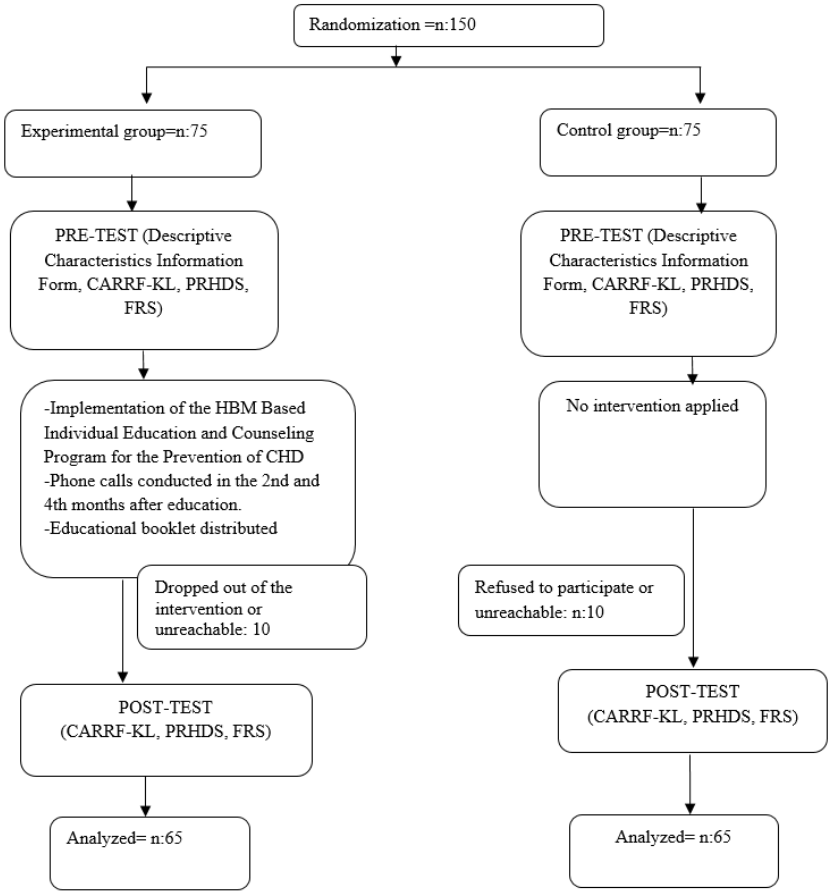

Figure 1. Research ımplementation plan

Ethical Considerations

Ethical approval was obtained from the Inönü University Health Sciences Clinical Research Ethics Committee (Approval No: 09.02.2022-2022/03, 182158). Institutional permission was granted by Van Yüzüncü Yıl University Dursun Odabaş Medical

Center (Approval No:30.12.2021/E-54355720-622.03-146692). Written informed consent was obtained from all participants prior to data collection. The study was registered at ClinicalTrials.gov (27.06.2025-NCT07047950).

Participant confidentiality, voluntariness, and the right to withdraw from the study at any time were strictly respected. Information about participants has been kept confidential. Written informed consent was obtained from all participants prior to data collection. In accordance with the protection of individual rights, the principles of the Declaration of Helsinki were followed throughout the research process.

Results

This study evaluated the effectiveness of a nursing-led, HBM-based education and counseling program in improving knowledge of coronary heart disease risk factors, enhancing risk perception, and reducing estimated 10-year coronary heart disease risk among at-risk adults.

This section presents the results of the randomized controlled trial, focusing on baseline group comparability and the effects of the HBM-based education and counseling intervention on Framingham Risk Score, and knowledge of CHD risk factors, as well as CHD risk perception.

Table 1. Comparison of demographic characteristics of the control and experimental groups

Caracteristics		Experimental Group		Control Group	
		n	%	n	%
Age	22-44 years	33	50.8	33	50.8
	45-61 years	32	49.2	32	49.2
Gender	Male	29	44.6	32	49.2
	Female	36	55.4	33	50.8
Educational Level	Literate	11	16.9	11	16.9
	Primary education	21	32.3	23	35.4
	High School	26	40.0	24	36.9
	Undergraduate/Postgrad	7	10.8	7	10.8
Marital Status	Married	35	53.8	35	53.8
	Single	12	18.5	11	16.9
	Divorced/Widowed	18	27.7	19	29.2
Employment Status	Yes	35	53.8	34	52.3
	No	30	46.2	31	47.7
Presence of Chronic Disease	Yes	23	35.4	27	41.5
	No	42	64.6	38	58.5
Medication Use	Yes	31	47.7	27	41.5
	No	34	52.3	38	58.5
Receiving Information About CARRF-KL	Yes	21	32.3	17	26.2
	No	44	67.7	48	73.8
Receiving Information About Preventing CARRF-KL	Yes	21	32.3	17	26.2
	No	44	67.7	48	73.8
Family History of CARRF-KL	Yes	32	49.2	29	44.6
	No	33	50.8	36	55.4
Smoking Status	Yes	25	38.5	31	47.7
	No	40	61.5	34	52.3

When comparing the distribution of participants in the control and experimental groups according to age, gender, marital status, educational status, employment status, chronic disease status, medication use, disease knowledge, smoking, first-degree relatives with CHD, and level of knowledge about chronic disease prevention, no significant differences were found between the groups in terms of these variables ($p>0.05$). The groups were similar and homogeneous in terms of descriptive characteristics (Table 1).

Table 2. Comparison of pre-test and post-test blood pressure measurements in the control and experimental groups

Blood Pressure		Pre-Test (Mean±SD)	Post-Test (Mean±SD)	t	p
Systolic Blood Pressure	Control Group	128.25±19.66	126.25±15.72	1.221	.536
	Experimental Group	126.13±20.15	119.63±15.65	6.570	**0.01**
		t*=1.230	t*=7.145		
		p=0.521	**p=0.01**		
Diastolic Blood Pressure	Control Group	78.52±10.13	78.15±10.48	.433	.666
	Experimental Group	79.47±11,39	77.21±10.00	1.017	.311
		t*=0.171	t*=0.798		
		p=0.865	p=0.426		

SD: Standard Deviation, **t**: t-value (test statistic), **p**: p-value (significance level), **Mean**: Arithmetic Mean (average).

Table 2 shows the comparison of mean systolic blood pressure between the control and experimental groups. No significant difference was found between the pre-test and post-test means in the control group ($p > 0.05$). However, a statistically significant decrease in mean systolic blood pressure was observed in the experimental group at post-test ($p < 0.05$). When comparing the average diastolic blood pressure between the control and experimental groups, no statistically significant difference was found between the pre-test and post-test averages for either group ($p > 0.05$) (Table 2).

Table 3. Comparison of pre-test and post-test blood and Framingham risk score parameters in the control and experimental groups

Blood Parameters		Pre-Test (Mean±SD)	Post-Test (Mean±SD)	t	p
Total Cholesterol	Control Group	203.14±39.06	205.25±35.72	-	.420
	Experimental Group	227.13±36.15	208.63±25.65	1.621	**.001**
		t*=3.983	t*=0.621	8.546	
		p=0.01	p=0.536		
HDL Cholesterol	Control Group	48.52±14.13	50.015±13.40	2.017	.466
	Experimental Group	47.47±13.39	54,215±11.00	10.83	**.001**
		t*=-0.433	t*=1.017	0	
		p=0.666	p=0.311		
LDL Cholesterol	Control Group	113.46±22.97	114.35±21.79	-.573	.569
	Experimental Group	122.81±21.80	110.36±15.62	10.54	**.001**
		t*=2.379	t*=-1.198	2	
		p=0.019	p=0.233		
Fasting Blood Glucose	Control Group	94.64±23.98	96.72±25.48	-	.360
	Experimental Group	102.40±25.40	94.80±24.99	2.137	**.001**
		t*=6.667	t*=-0.434	6.955	
		p=0.001	p=0.665		
Framingham Risk Score	Control Group	11.43±7.31	11.01±7.48	0.433	0.666
	Experimental Group	10.02±6.39	7.21±4.35	4.517	
		t*=0.876	t*=4.434		**0.011**
		p=0.750	**p=0.001**		

SD: Standard Deviation, **t**: t-value (test statistic from the paired samples t-test), **p**: p-value (indicates statistical significance), **Mean**: Arithmetic Mean (average).

Table 3 compares the pre-test and post-test averages of blood parameters for the control and experimental groups. In the control group, post-test averages for total cholesterol increased, but this increase was not statistically significant ($p > 0.05$). In the experimental group, a statistically significant decrease in post-test mean total cholesterol was observed ($p < 0.05$). For HDL cholesterol, the control group showed an increase in post-test averages, but this increase was not statistically significant ($p > 0.05$). In the experimental

group, HDL cholesterol post-test averages showed a statistically significant increase ($p < 0.05$). For LDL cholesterol, the control group showed an increase in post-test averages, but this increase was not statistically significant ($p > 0.05$). In the experimental group, LDL cholesterol post-test averages showed a statistically significant decrease ($p < 0.05$). For fasting blood glucose, the control group showed an increase in post-test averages, but this increase was not statistically significant ($p > 0.05$). In the experimental group, post-test averages for fasting blood glucose showed a statistically significant decrease ($p < 0.05$). The Framingham risk scores for the control and experimental groups were also analyzed. In the control group, no statistically significant difference was observed ($p > 0.05$). In the experimental group, the risk scores decreased significantly ($p < 0.05$) (Table 3). These results indicate that the education and counseling program based on the HBM was effective in reducing cardiovascular risk.

Table 4. Comparison of pre-test and post-test mean scores for the PRHDS and ıts sub-scales/ CARRF-KL

PRHDS and sub-scales		Pre-Test (Mean±SD)	Post-Test (Mean±SD)	t	p
Fear of Risk	Control Group	17.70±5.62	17.63±5.59	.567	.573
	Experimental Group	17.26±5.55	18.93±6.82	-5.276	**.001**
		t*=-0.452	t*=1.195		
		p=0.652	p=0.234		
Unknown Risk	Control Group	17.30±1,94	17.21±2,09	.630	.531
	Experimental Group	17.35±1,97	17.80±2,54	-1.672	.099
		t*=0.134	t*=1.430		
		p=0.894	p=0.155		
Risk	Control Group	14.56±3.89	14.73±3.98	-1.557	.124
	Experimental Group	14.76±3.75	15.00±4.09	-.938	.352
		t*=0.298	t*=0.369		
		p=0.766	p=0.713		
Total Score	Control Group	49.56±3.84	49.58±3.86	.290	.772
	Experimental Group	49.37±4.02	51.73±5.53	-4.239	**.001**
		t*=-0.290	t*=2.552		
		p=0.772	**p=0.012**		
CARRF-KL	Control Group	14.18±4.26	15.69±4.48	.021	.984
	Experimental Group	14.16±5.15	22.63±3.65	8.182	**.001**
		t*=0.212	t*=9.408		
		p=0.892	**p=0.001**		

SD: Standard Deviation, **t**: t-value (test statistic from the paired samples t-test), **p**: p-value (indicates statistical significance), **Mean**: Arithmetic Mean (average).

Table 4 compares the pre-test and post-test mean scores for the PRHDS sub-scales and total score in the control and experimental groups. When comparing the mean scores for the Unknown Risk and Risk sub-scales, no statistically significant differences were observed between the pre-test and post-test scores for either the control or experimental group ($p > 0.05$). However, when comparing the total PRHDS scores and the Fear of Risk sub-scale scores, a statistically significant increase was observed in the post-test scores of the experimental group compared to pre-test scores ($p < 0.05$). This indicates that the experimental group showed a significant improvement in risk perception, as measured by the total PRHDS and the Fear of Risk sub-scale, following the intervention. The scores on the CARRF-KLwere compared between the control and experimental groups. In the control group, the mean pre-test score and the mean post-test score show no statistically significant difference ($p > 0.05$). In the experimental group, the mean pre-test score ($p > 0.05$), while the mean post-test score increased significantly ($p < 0.05$) (Table 4). These results show that the education and counseling program based on the HBM significantly improved individuals' knowledge of cardiovascular disease risk factors.

Overall, the intervention group demonstrated significant improvements in knowledge of coronary heart disease risk factors, risk perception, and estimated 10-year cardiovascular risk, whereas the control group showed no meaningful changes during the study period.

Discussion

This randomized controlled study evaluated the effects of a nursing-led education and counseling program based on the HBM on CHD risk-related knowledge, risk perception, and estimated cardiovascular risk among adults at risk for CHD. Overall, the findings demonstrate that the HBM-based intervention produced meaningful improvements across both psychosocial and clinical outcomes, supporting the value of theory-driven patient education in cardiovascular disease prevention (Daniati et al., 2021; Fatahian et al., 2024; Saffari et al., 2024; Sasanfar et al., 2022; Wondmu et al., 2022; Zhou et al., 2025).

The observed reductions in systolic blood pressure and improvements in lipid profile and fasting blood glucose levels are consistent with previous studies showing that structured education and counseling interventions can positively influence cardiovascular risk parameters (Cicolini et al., 2014; Fatahian et al., 2024; Park et al., 2025; Saffari et al., 2024; Villablanca et al., 2010). Importantly, the magnitude of these changes suggests not only statistical significance, but also potential clinical relevance. Reductions in systolic blood pressure of approximately 5-10 mmHg have been associated with meaningful decreases in cardiovascular morbidity and mortality in population-based studies (Virani et al., 2020). One of the most notable findings of this study was the significant reduction in Framingham Risk Score (FRS) observed in the intervention group. The FRS integrates multiple behavioral and biological risk factors to estimate 10-year CHD risk and is widely used in preventive cardiology (Berry et al., 2007). The approximately 28% reduction in FRS observed over the six-month follow-up period suggests that improvements in individual risk parameters following the HBM-based intervention translated into a meaningful overall reduction in estimated cardiovascular risk. Similar reductions in composite cardiovascular risk scores following educational or counseling interventions have been reported in previous nurse-led and lifestyle-focused studies (Brewer et al., 2019; García-Ortiz et al., 2010; Komaç & Duru, 2024; Rautio et al., 2015).

Consistent with the theoretical assumptions of the HBM, participants in the intervention group demonstrated a substantial increase in knowledge of CHD risk factors, with a large effect size observed following the intervention. Knowledge enhancement is a fundamental prerequisite for informed health-related decision-making and behavior change, and previous research has shown that patient education interventions can effectively improve cardiovascular risk-related knowledge (Cahyani, 2025; Carleton et al., 1995; Daniati et al., 2021; Fatahian et al., 2024; Komaç & Duru, 2024; Sasanfar et al., 2022; Wondmu et al., 2022; Zhou et al., 2025). The structured and standardized nature of the educational content, together with reinforcement through follow-up telephone counseling, may explain the magnitude of the observed knowledge gains.

Changes in CHD risk perception following the intervention were more complex. While significant improvements were observed in the “fear of risk” sub-scale and overall risk perception scores, no significant changes were detected in the “unknown risk” or “perceived risk” sub-scales. This finding aligns with previous studies suggesting that emotional components of risk perception may be more responsive to educational interventions than cognitive assessments of personal susceptibility or uncertainty (Guo et al., 2023; Toptaner & Yıldız, 2016; Williams et al., 2007). Risk perception is a multi-dimensional construct, and modifying deeply rooted beliefs about personal risk may require longer-term or more intensive interventions than those applied in the present study (Tawfik et al., 2024; Tod et al., 2001).

From a nursing and patient education perspective, the findings highlight the important role of nurse-led, theory-based education and counseling programs in cardiovascular disease prevention. Nurses are uniquely positioned to deliver individualized education, address perceived barriers, reinforce self-efficacy, and provide continuity of care in outpatient settings. Previous studies have demonstrated that nurse-led interventions can lead to improvements in cardiovascular risk factors and patient outcomes, supporting the integration of such approaches into routine preventive care (Cicolini et al., 2014; Daly et al., 2017; Fatahian et al., 2024; Lidin et al., 2018; Lönnberg et al., 2020).

Future research should examine the long-term impact of HBM-based education and counseling interventions on cardiovascular outcomes and explore whether repeated or extended interventions can further enhance risk perception dimensions that were less responsive in the present study. Incorporating digital or group-based reinforcement strategies may also improve the sustainability of behavior change, as suggested by

emerging evidence in patient education research (Brewer et al., 2019).

Limitations

This study has some limitations. The single-center design may limit generalizability, and the six-month follow-up period does not allow assessment of long-term sustainability of the observed effects.

Similar limitations have been noted in prior educational intervention studies in cardiovascular prevention (Brewer et al., 2019; Thorndike et al., 2011).

Implications for Nursing

This study shows that nurses can play an effective role in improving patients' awareness of CHD risk and promoting preventive behaviors through structured, HBM-based education in outpatient settings. The findings suggest that theory-guided patient education can be integrated into routine nursing care without requiring complex or costly resources. In addition, simple reinforcement strategies, such as follow-up telephone calls, may help maintain the effects of education over time and support gradual improvements in cardiovascular risk management.

Conclusion

In conclusion, this study provides evidence that a nursing-led education and counseling program grounded in the HBM can improve knowledge of CHD risk factors, enhance aspects of risk perception, and contribute to meaningful reductions in estimated cardiovascular risk. These findings support the incorporation of theory-driven patient education and counseling into preventive cardiovascular care and reinforce the central role of nurses in promoting cardiovascular health.

Acknowledgements

All the participants and hospital staff who contributed to the study are acknowledged for their cooperation during the data collection.

Data Availability

Data is available from the authors upon a reasonable request.

Ethical Considerations

Ethical approval was obtained from the İnönü University Health Sciences Clinical Research Ethics Committee (Approval No: 09.02.2022-2022/03 182158). Institutional permission was granted by Van Yüzüncü Yıl University Dursun Odabaş Medical Center (Approval No: 30.12.2021/E-54355720-622.03-146692). Written informed consent was obtained from all participants prior to data collection. The study was registered at ClinicalTrials.gov (27.06.2025-NCT07047950).

Conflict of Interests

The authors declare that they have no conflict of interests.

Funding or Sources of Financial Support

The authors received no extramural funding for the study.

Trial Registration

ClinicalTrials.gov, https://clinicaltrials.gov, 27.06.2025-NCT07047950.

Authors' Contributions

Study Design: **MFY, BE**. Data Collection: **MFY**. Data Analysis: **MFY**. Study Supervision: **MFY, BE**. Manuscript Writing: **MFY, BE**. Critical Revision of the Manuscript for Important Intellectual Content: **MFY, BE**.

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