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The Effect of Health Belief Model-Based Education on Disaster Preparedness Belief and Disaster Literacy in Women: A Quasi-Experimental Study

Sağlık İnanç Modeli Temelli Eğitimin Kadınlarda Afet Hazırlık İnancı ve Afet Okuryazarlığına Etkisi: Bir Yarı Deneysel Çalışma

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ABSTRACT

The aim of the study was to determine the effect of Health Belief Model-Based Education (HBMBE) on disaster preparedness belief and disaster literacy among women. This one-group pretest-posttest quasi-experimental research was conducted between March and May 2024 in the Women's Studies Unit of Social Support Services Directorate affiliated with a municipality in Istanbul. The HBMBE was delivered to 45 women aged 18-60. Data were collected twice, before and after the education. The Descriptive Information Form, General Disaster Preparedness Belief Scale, and Disaster Literacy Scale were used as data collection tools. The mean age of the women was 44.64±15.03 years, 63.3% were married, 36% were primary school graduates, and 81.6% were unprepared for disasters. The mean General Disaster Preparedness Belief Scale score was 107.04±13.88 before the education and 115.37±12.48 after the education. The mean Disaster Literacy score was 28.31±9.58 before the education and 39.92±3.31 after the education. A statistically significant difference was found between the pre-test and post-test scores of both the General Disaster Preparedness Belief Scale and the Disaster Literacy scores ($p<0.05$). The findings indicated that HBMBE improved disaster preparedness beliefs and disaster literacy among women. Future studies should focus on randomized controlled trials aiming to enhance disaster preparedness beliefs and disaster literacy among women living in geographically high-risk areas for disasters.

Keywords: Disaster Preparedness Belief, Disaster Literacy, Women, Health Belief Model

ÖZ

Çalışmanın amacı, Sağlık İnanç Modeli Temelli Eğitimin (SİMTE) kadınlarda afet hazırlık inancı ve afet okuryazarlığına etkisini belirlemektir. Ön test-son test tek gruplu yarı deneysel nitelikte olan bu çalışma, Mart-Mayıs 2024 tarihleri arasında İstanbul'da bir belediye ait Sosyal Destek Hizmetleri kadın çalışmaları biriminde gerçekleştirilmiştir. Çalışmada, 18-60 yaş arası 45 kadına SİMTE uygulanmıştır. Veriler, eğitim öncesi ve sonrası olmak üzere iki kez toplanmıştır. Tanımlayıcı Bilgi Formu, Genel Afet Hazırlık İnancı Ölçeği ve Afet Okuryazarlığı Ölçeği veri toplama aracı olarak kullanılmıştır. Kadınların yaş ortalamasının 44,64±15,03 yıl olduğu, %63,3'ünün evli, %36'sının ilkokul mezunu ve %81,6'sının afetlere hazırlıklı olmadığı belirlendi. Kadınların eğitim öncesi Genel Afet Hazırlık İnancı Ölçeği puan ortalaması 107,04±13,88 ve eğitim sonrası 115,37±12,48 olduğu saptandı. Afet Okuryazarlığı Ölçeği puan ortalaması eğitim öncesi 28,31±9,58 ve eğitim sonrası 39,92±3,31 olarak belirlendi. Ön test ve son test Genel Afet Hazırlık İnancı Ölçeği ve Afet Okuryazarlığı Ölçeği puanları arasında istatistiksel olarak anlamlı bir farklılık bulundu ($p<0,05$). Kadınlarda SİMTE sonrası afet hazırlık inancı ve afet okuryazarlığının arttığı sonucuna ulaşıldı. Gelecek çalışmalarda, afet riski yüksek farklı coğrafi bölgelerde yaşayan kadınların afet hazırlık inancını ve afet okuryazarlığını geliştirecek randomize kontrollü çalışmalar yapılması önerilmektedir.

Anahtar Kelimeler: Afet Hazırlık İnancı, Afet Okuryazarlığı, Kadınlar, Sağlık İnanç Modeli

Highlights of journal articles

* Women's General Disaster Preparedness Belief Scale scores significantly improved after Health Belief Model-Based Education.
* Women's Disaster Literacy Scale scores significantly improved after Health Belief Model-Based Education.
* Women's disaster literacy was initially inadequate but improved to an adequate level after Health Belief Model-Based Education.

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INTRODUCTION

Over the past decade, disasters such as earthquakes, tsunamis, landslides, heat waves, floods, and severe cold have adversely affected more than two billion people worldwide.[1] Disasters frequently occur in Türkiye due to its geological, topographical, and climatic features. Based on an analysis of the major earthquakes that have occurred worldwide since 1900, Türkiye is ranked fourth. Disasters such as floods and avalanches are also frequently experienced due to seasonal characteristics.[2]

Disasters, whether natural or man-made, affect individuals and societies physically, socially, psychologically, and economically, requiring large-scale interventions such as emergency management, recovery, and reconstruction.[3,4] At this point, the Sendai Framework for Disaster Risk Reduction (2015–2030) was adopted following intergovernmental negotiations at the Third United Nations World Conference held in Sendai, Japan, in 2015. The Sendai Framework emphasizes empowering communities and individuals to cope with the social, economic, and psychological impacts of disasters.[5,6] A study conducted by the Disaster and Emergency Management Presidency (AFAD) in Türkiye revealed that more than half of the society is unprepared for disasters.[7] Therefore, ensuring individuals' preparedness at the personal level is crucial for effective disaster management, as it helps protect health and safety.[5,6]

According to reports from the United Nations and UNICEF, women are among the groups most vulnerable to threats such as natural disasters, climate change, and COVID-19. Globally, more than half of disaster-related fatalities are reported to be women.[8] Due to biological, physiological, and social differences between genders, women's recovery processes tend to take longer after disasters.[9] Women face disadvantages in accessing basic needs such as shelter, healthcare, safety, job security, and nutrition.[10,8] In this context, it is crucial to ensure the active participation of women in strategies to reduce disaster risk and increase resilience.[6] Empowering women in disaster preparedness and response plays a vital role in ensuring the safety of families and communities, identifying the specific needs of women and children, and advocating for their rights.[11,8]

A key component of health promotion strategies is enabling individuals to participate in health-related decision-making, where personal perceptions and beliefs play a crucial role.[12] The Health Belief Model is used as a guide to identify motivating and inhibiting factors for individuals to perform positive health behaviors. A study conducted in Japan found that post-disaster ecosystem-based disaster risk reduction awareness and environmentally friendly behaviors were associated with the perceived barriers and perceived benefits components of the Health Belief Model.[13] Similarly, Health Belief Model-based interventions applied to a community in Malaysia were found to be effective in enhancing individuals' preparedness for floods.[14]

Disaster literacy is the ability of individuals to obtain correct information about disaster prevention, preparedness, and recovery procedures, to comprehend and assess information, and to convert information into action.[15] Studies conducted in various countries such as China and the Netherlands have found that societies have low levels of disaster literacy.[16,17] A study conducted in Türkiye among individuals aged 18 to 60 found that more than half had low disaster literacy, highlighting the need for initiatives aimed at increasing awareness and preparedness for disasters.[18] In this context, improving women's disaster literacy is particularly important in enabling them to take proactive measures to reduce disaster risks and mitigate potential damages.[15-17]

This study aimed to determine the effect of Health Belief Model-Based Education (HBMBE) on disaster preparedness belief and disaster literacy among women.

The hypotheses of the study are as follows:

$H0_1$: There is no significant difference in women's disaster preparedness beliefs before and after the HBMBE.

H1: There is a significant difference in women's disaster preparedness beliefs before and after the HBMBE.

$H0_2$: There is no significant difference in women's disaster literacy before and after the HBMBE.

H2: There is a significant difference women's disaster literacy before and after HBMBE.

MATERIALS AND METHODS

Design

This study is a one-group pretest-posttest design. Figure 1 presents the study flow.

Setting and Sample

The study was conducted between March and May 2024 at the Women's Studies Unit of the Şişli Municipality Social Support Services Directorate. The sample size was determined using G*Power 3.0.10. A minimum of 45 women were required, considering a power value of 0.95, a Type I error rate of 0.05, and an effect size of 0.50. The inclusion criteria consisted of women aged 18–60 who could read and write in Turkish. Exclusion criteria included individuals who did not volunteer to participate, had previously received disaster-related training, or had hearing or visual impairments. A total of 45 women participated in the study and were included in the final analysis.

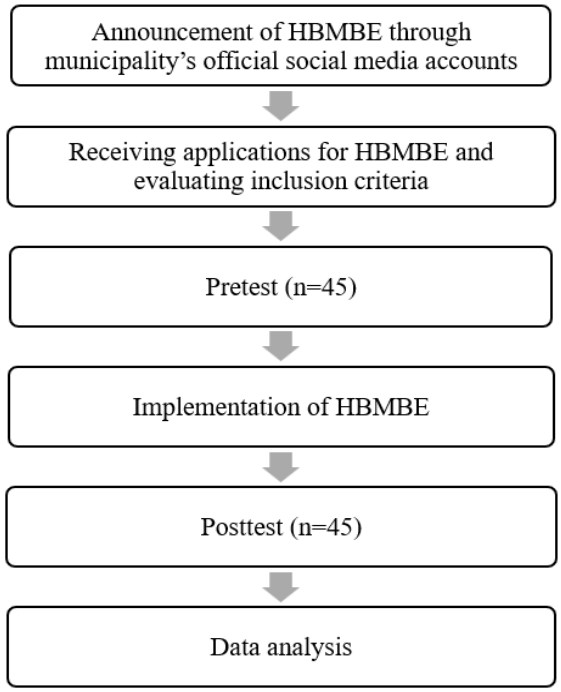

Figure 1. Study Flow

Data Collection Tools

Descriptive Characteristics Form

This form was created by the researchers, including 11 questions related to age, marital status, educational status, place of residence, income status, having children, having experienced a disaster before, and disaster preparedness.[7,14,16,18]

General Disaster Preparedness Belief Scale (GDPBS)

GDPBS was developed by Inal et al. (2018) to assess individuals' disaster preparedness beliefs based on the Health Belief Model. The scale consists of 31 items. It uses a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The dimensions of the GDPBS include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy. The total score on the scale ranges from a minimum of 31 to a maximum of 155 points. The Cronbach's alpha coefficient of the scale was reported as 0.93.[19] In this study, Cronbach's alpha value of the scale was determined as 0.89.

Disaster Literacy Scale (DLS)

The DLS was developed by Çalışkan and Üner (2022) to measure the level of disaster literacy. The scale consists of 61 items across four dimensions: mitigation, preparedness, response, and recovery. Each statement on the scale is rated on a 5-point scale: "1 = Very Difficult," "2 = Difficult," "3 = Undecided," "4 = Easy," and "5 = Very Easy." The total score is calculated using the formula: Index = (Arithmetic Mean - 1) × (50/4). The score obtained is interpreted as follows: inadequate (0-30), limited (30-36), adequate (36-42), and excellent (42-50). The Cronbach's alpha

coefficient of the scale was reported as 0.95.[20] In this study, Cronbach's alpha value of the scale was determined as 0.97.

Health Belief Model-Based Education (HBMBE)

The Health Belief Model was used as a guide for the educational content in this study.[21] The components of the model are as follows:

Perceived susceptibility: It is a belief about the likelihood of experiencing a health problem or adverse event.

Perceived severity: It is a belief about the seriousness of the health problem or event.

Perceived benefits: It is a belief about the potential positive aspects of the recommended health behaviors.

Perceived barriers: It is a belief about the potential negative aspects of health behaviors.

Cues to action: There are external or internal events or reminders that prompt an individual to take action toward a recommended health behavior. Cues to Action may include reminders via media campaigns, public awareness activities, or even direct personal experiences with natural disasters, such as witnessing or hearing about the impacts of recent events.

Self-efficacy: It refers to an individual's confidence in their ability to take the necessary actions to prevent or manage a health issue.[21]

HBMBE, which is based on the components of the Health Belief Model, consists of three sessions, each lasting 45 minutes for one day. The content of the first session includes disaster risk, definition and types of disasters, benefits of disaster preparedness, factors preventing and facilitating disaster preparedness. The content of the second session includes the importance of disaster literacy, the effects of low disaster literacy, the benefits of accessing and using accurate information about disasters, and the factors preventing and facilitating access to accurate information. The first two sessions of the education were presented by the researchers. In this context, the researchers attended AFAD's Disaster Awareness Training before starting the study. The content of the third session was what to do before, during and after the disaster. This session was conducted by a UMKE (National Medical Rescue Teams) volunteer nurse.

Data Collection

The data collection process commenced after obtaining ethics committee and institutional permissions. Through the municipality's official social media accounts, the authorized person disseminated an announcement that included details about the target group, content of the education, and the researchers' contact information. Women who volunteered to participate in the study then contacted the researchers. Verbal explanations were provided regarding the research topic, the data collection process, voluntary participation, the confidentiality of the information, and the assurance that data would not be shared with anyone. For HBMBE, two separate days were scheduled for the women who volunteered to participate. The education was therefore held on two different days in the seminar room of the Women's Studies Unit of Social Support Services Directorate. Data were collected through self-report on two occasions, before and after the HBMBE. Upon completion of the HBMBE, participants were awarded certificates of participation.

Ethical Consideration

Institutional permission was obtained from the Şişli Municipality Social Support Services Directorate for this study (Date: 08.01.2024). Ethics committee approval was obtained from Istanbul University-Cerrahpaşa Social and Human Sciences Research Ethics Committee (Decision no: 2024/49, Date: 06.02.2024). Permission to use the data collection tools was obtained from the relevant researchers. The women were informed verbally and in writing about the purpose and content of the study, the voluntary nature of their participation, their right to withdraw at any time, and the assurance that their information would be kept confidential and used solely for scientific

purposes. Written informed consent was obtained from the participants.

Data Analysis

SPSS 22.0 (Statistical Package for the Social Sciences) was used for the data analysis. The scales' reliability was assessed using Cronbach's alpha. The normality of the data distribution was assessed using the Shapiro-Wilk test and graphical examinations. Descriptive statistical analyses included mean, standard deviation, minimum, maximum, and percentage values. The dependent samples t-test was used to compare the pre-test and post-test data, as the data met the assumption of normality. The significance level was accepted as $p<0.05$.

RESULTS

The mean age of the women was 44.64±15.03 years (min=18, max=60). Among them, 63.3% were married, 57.1% had children, and 36.7% were primary school graduates. The majority of the women were unemployed, and half reported having a middle income level (Table 1).

The disaster-related characteristics of the women are also presented in Table 1. It was found that 63.3% had encountered a disaster situation before, and half had experienced the Marmara earthquake. The majority of the women reported that they were unprepared for a disaster and did not have a survival kit.

Table 1. Sociodemographic and Disaster-Related Characteristics of Participants (n=45)

Variables		n	%
Marital status	Married	31	63.3
	Single	14	28.6
Having a child	Yes	28	57.1
	No	17	34.7
Education status	Primary school	18	36.7
	Secondary school	3	6.1
	Higher school	9	18.4
	University and above	15	30.6
Employment status	Yes	5	10.2
	No	38	77.6
Income level	Low	4	8.1
	Middle	26	53.1
	High	15	30.6
Disaster experience	Yes	31	63.3
	No	14	28.6
Experience of the Marmara Earthquake	Yes	25	51.0
	No	20	40.8
Disaster preparedness	Yes	5	10.2
	No	40	81.6
Survival kit possession	Yes	7	14.3
	No	34	69.4

Table 2 presents the comparison of women's GDPBS scores before and after HBMBE. The mean total GDPBS score before HBMBE was 107.04±13.88, with mean sub-dimension scores of 22.37±4.70 for perceived susceptibility, 11.08±2.68 for perceived severity, 12.06±2.83 for perceived benefits, 35.71±6.70 for perceived barriers, and 25.80±4.15 for self-efficacy. After HBMBE, the mean total GDPBS score increased to 115.37±12.48, with sub-dimension scores of 24.00±4.12 for perceived susceptibility, 11.54±2.43 for perceived severity, 12.46±2.49 for perceived benefits, 39.35±5.32 for perceived barriers, and 29.01±4.40 for self-efficacy. A statistically significant difference was observed between pre-test and post-test GDPBS scores ($t = -4.62$; $p<0.001$). These findings indicate that women's general disaster preparedness beliefs significantly improved following HBMBE ($p<0.001$).

Table 2. Comparison of GDPBS Pretest and Posttest Scores (n=45)

GDPBS	Pretest $\bar{X}$ ±SD	Posttest $\bar{X}$ ±SD	*t*	*p*
Perceived Susceptibility	22.37±4.70	24.00±4.12	-3.34	0.02***
Perceived Severity	11.08±2.68	11.54±2.43	-1.02	0.310
Perceived Benefit	12.06±2.83	12.46±2.49	-1.44	0.155
Perceived Barrier	35.71±6.70	39.35±5.32	-3.50	0.001*
Self-efficacy	25.80±4.15	29.01±4.40	-3.21	0.002**
GDPBS Total	107.04±13.88	115.37±12.48	-4.62	<0.001*

*$\bar{X}$: Mean, SD: Standard Deviation, t: Dependent Sample t test, *p <0.001, **p <0.01 ***p <0.05*

The findings comparing women's DLS scores before and after HBMBE are presented in Table 3. The mean total DLS score before HBMBE was 28.31±9.58, with mean sub-dimension scores of 55.71±14.75 for mitigation, 53.68±13.01 for preparedness, 43.88±10.72 for response, and 45.86±13.63 for recovery. After HBMBE, the mean total DLS score increased to 39.92±3.31, with sub-dimension scores of 68.20±6.44 for mitigation, 68.04±5.35 for preparedness, 55.93±4.34 for response, and 63.66±4.54 for recovery. The mean DLS score was found to be significantly higher after the education (Table 3).

Table 3. Comparison of DLS Pretest and Posttest Scores (n=45)

DLS	Pretest $\bar{X}$ ±SD	Posttest $\bar{X}$ ±SD	*t*	p
Mitigation	55.71±14.75	68.20±6.44	-5.20	<0.001*
Preparedness	53.68±13.01	68.04±5.35	-7.32	<0.001*
Response	43.88±10.72	55.93±4.34	-7.05	<0.001*
Recovery	45.86±13.63	63.66±4.54	-8.21	<0.001*
DLS total	28.31±9.58	39.92±3.31	-7.89	<0.001*

*$\bar{X}$: Mean, SD: Standard Deviation, t: Dependent Sample t test, *p <0.001*

DISCUSSION

Certain groups are more vulnerable to disasters due to factors such as age, gender, race, culture, disability, socioeconomic status, and geographical location.[22] Women are particularly vulnerable in disasters due to biological, physiological, and social differences.[8,10] Notably, most women participating in this study indicated a lack of disaster preparedness, which is consistent with broader research suggesting that women possess lower knowledge of disaster risks compared to men.[8,10,23] Consequently, addressing and empowering women within disaster risk management strategies is of paramount importance.[8,9] The present study evaluated the effect of health belief model-based training on women's disaster preparedness beliefs and disaster literacy.

The findings of this study indicate that women's disaster preparedness beliefs significantly improved following the HBMBE. Similar results were reported in a study conducted in Iran, where Health Belief Model-based training was implemented to enhance earthquake preparedness among women.[24] The findings of a study in Thailand examining the effect of Health Belief Model-based intervention on the belief of preparedness against floods are also similar.[14] In addition, the Health Belief Model-based training program was found to be effective in increasing the belief of preparedness of individuals living in rural areas against epidemics, which is a type of biological disaster.[25] Disaster preparedness is the activities that include reducing the negative effects caused by disasters. Disaster preparedness is also considered as a health behavior.[19] According to the Health Belief Model, which serves as a framework for promoting health behaviors, positive behavioral change is influenced by individuals' perceptions of the severity of a

given risk and the perceived benefits of preventive actions.[21] In this study, the use of the Health Belief Model as a guiding framework for the education program is thought to have contributed to the enhancement of disaster preparedness behaviors among women.

The perceived severity and perceived benefit dimensions of the General Disaster Preparedness Belief Scale did not change significantly following the intervention. Perceived severity and perceived benefit represent individuals' beliefs regarding the seriousness of disaster outcomes and the usefulness of preparedness behaviors, respectively. This finding may be explained by the fact that participants had already experienced major disasters, such as the Marmara earthquake, which may have contributed to relatively high baseline perceptions of disaster severity. Previous studies indicate that prior disaster experience may influence these risk-related perceptions.[26-28] For instance, Cui and Han reported that individuals with prior earthquake experience demonstrated significantly higher perceptions of earthquake risk than those without such experience.[28] Accordingly, HBMBE appears to be particularly effective in strengthening actionable components of preparedness, such as self-efficacy and perceived barriers, rather than substantially altering already established perceptions of disaster severity.

Disaster literacy is a critical concept in disaster management, and the ability to access and use accurate information is essential, particularly for vulnerable groups.[29] Several studies show that disaster literacy is limited in Turkish community.[30,31] In the literature, experimental studies aiming to improve individuals' disaster literacy are also very limited.[32,33] In this context, disaster literacy emerges as a concept that needs to be developed in vulnerable groups in disasters.[34] The findings of our study showed that the pre-education disaster literacy level of women, who are among the groups at risk in disasters, was inadequate and that their disaster literacy increased to an adequate level after HBMBE. Similarly, a study conducted among teachers demonstrated that disaster education effectively increased disaster literacy.[33] Another study found that a disaster risk communication workshop significantly enhanced individuals' disaster risk reduction literacy.[35] Additionally, in Indonesia—one of the countries frequently affected by natural disasters—an electronic book development initiative was undertaken to improve the disaster literacy of school-age children, another vulnerable group in disasters.[32] These findings suggest that educational interventions tailored to vulnerable populations play a crucial role in improving disaster literacy.[32,35] The education in our study was grounded in the Health Belief Model, which posits that individuals' perceptions of susceptibility, severity, benefits, and barriers influence their likelihood of engaging in protective behaviors.[21] Accordingly, the observed improvement in disaster literacy may be attributed to the structured educational content of HBMBE, which supports not only knowledge acquisition but also the translation of knowledge into preparedness actions. Thus, improving disaster literacy among women—who are among the groups at risk in disasters—may enhance their understanding of disaster risks and facilitate proactive preparedness behaviors.

CONCLUSION AND RECOMMENDATIONS

In this one-group pretest-posttest quasi-experimental design study, women received one-day education based on the Health Belief Model, and their disaster preparedness beliefs and literacy were evaluated. The pre-education findings indicated that women's disaster literacy was inadequate. However, post-education assessments revealed a significant improvement, with disaster literacy reaching an adequate level. Additionally, the findings indicated a significant increase in women's disaster preparedness beliefs following the education. These findings highlight the potential of

Health Belief Model-based education programs as a strategy to enhance disaster preparedness and literacy among women. Similar programs could be integrated into community health initiatives or women's support programs to build resilience against disasters. Future research should employ randomized controlled trials to further investigate the long-term effects of HBMBE and to compare its effectiveness against other educational approaches. Given the low baseline disaster literacy observed in this study, there is a need for continued efforts to develop and disseminate accessible and culturally relevant disaster education materials for women. Moreover, it is recommended that future studies examine the impact of HBMBE across diverse geographical areas to better understand its effectiveness in varying disaster-prone contexts.

Limitations

As the study was conducted in a municipality-affiliated center in Istanbul, the results can only be generalized to this specific sample group. The use of a one-group pretest-posttest quasi-experimental design is the second limitation. Future research should include randomized controlled trials to strengthen the findings.

Declaration of Interest

The authors declare no conflict of interest.

Authors' Contributions

MG; research, conceptualization, formal analysis, methodology, writing – review, editing, supervision, project management. **EY;** research, data collection, formal analysis, writing – review, editing. **MAY**; conceptualization, formal analysis, methodology, writing – review, editing

All authors have read and approved the published version of the article.

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Data and Material Accessibility

The data sets used and/or analyzed during the current study can be obtained from the corresponding author upon reasonable request.

Ethics Approval and Informed Consent

This study was conducted in accordance with the guidelines outlined in the Helsinki Declaration, and all procedures involving research participants were approved by the Istanbul University-Cerrahpaşa Social and Human Sciences Research Ethics Committee (Decision no: 2024/49, Date: 06.02.2024). Written consent was obtained from all participants.

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