Original Research

The Impact of Disaster Preparedness Training on Disaster Preparedness and Attitudes Toward Fertility and Childbearing Among Women of Reproductive Age

Ebru Cirban Ekrem [ID], Beyzanur Örenlioğlu and Elif Davulcu

Nursing, Faculty of Health Sciences, Bartin Universitesi, Bartin, Turkey

Abstract

Objectives: Natural disasters are frequent occurrences worldwide and can influence fertility preferences. This study aimed to assess the impact of disaster preparedness training on the disaster readiness levels of women of reproductive age and their fertility and childbearing attitudes.

Methods: The study employed a classic experimental design with a pre-test and post-test control group. The sample consisted of women of reproductive age in Turkey, determined through the G-Power 3.1.9.7 program, with intervention ($n = 88$) and control ($n = 88$) groups totaling 176 participants. Data were collected using a "Preliminary Evaluation Form," "Descriptive Information Form," "Disaster Preparedness Scale (DPS)," and "Attitudes Toward Fertility and Childbearing Scale (AFCS)."

Results: In the intervention group, the post-test scores significantly increased for the DPS and the AFCS sub-scale on the importance of fertility for the future ($P<0.05$).

Conclusions: The study found that disaster preparedness training provided to women of reproductive age improved their disaster readiness levels. Following the training, the women's knowledge about physical protection during disasters, assistance in disasters, and disaster warnings and systems also increased. Additionally, the training enhanced the positive attitudes of these women toward childbearing.

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Climate change has escalated the frequency and intensity of natural disasters, leading to loss of life and property, disruption of daily life, damage to health care facilities, interruption in health care delivery, and significant economic burdens, thereby impacting individuals' physical and psychological well-being.[1] Disasters affect communities broadly but do not impact all community members equally. Factors such as gender, roles and responsibilities, and access to resources affect individuals' levels of being affected by, coping with, and recovering from disasters. Studies show that disasters impact women and men differently.[2–4] Women often face more difficulties than men in accessing emergency support, water, food, medicine, and health care facilities during disasters and are more frequently confronted with sexual and reproductive health issues.[3,5] Despite demonstrating remarkable resilience and survival efforts during disasters, women are more vulnerable to various health risks, such as physical, mental, and emotional stress, due to gender inequality, which also places them at risk of experiencing secondary traumas post-disaster.[3,6] Regular and updated training starting from the disaster preparedness phase is recommended to prevent or mitigate the physical and psychological health issues that can emerge among disaster victims.[1,2] These trainings are particularly advocated for the inclusion of women, who are often in a vulnerable position.[1,3,6]

In societies, the roles of womanhood, fertility, and motherhood are deeply intertwined. Fertility is not only a biological and physiological event but also a significant psychological and behavioral milestone. Due to social and environmental events, individuals may modify their fertility behaviors to increase or decrease their likelihood of conception.[7–9] It is noted that disasters and extraordinary circumstances occurring in an individual's environment can affect fertility preferences, outcomes, and attitudes.[7,10–12] Globally, an increase in the frequency of natural disasters has been associated with a decrease in birth rates.[13] Therefore, the impact on fertility intentions is inevitable in disasters and crises.

In Turkey, various types of disasters frequently occur due to climate, geography, topography, and human activities. The impact and scale of damage caused by these disasters vary depending on disaster policies and the community's level of disaster Preparedness.[14] Disaster preparedness plays a fundamental role in reducing losses and destruction in potential disasters.[15] The loss of life and property encountered in disasters may influence women's attitudes toward childbearing differently.[7,8,10,12] A notable aspect of this research is the absence of studies examining the relationship between disaster preparedness and attitudes toward fertility and childbearing.

In the devastating Turkey-Syria earthquake of 2023, thousands lost their lives or were injured, an event mourned deeply worldwide. The aftermath of this earthquake, which significantly affected 11 provinces in Turkey, was closely monitored through media and communication tools. This exposure may have caused secondary trauma among those who did not experience the earthquake directly but followed the news or visited the affected areas to provide aid. Whether directly experiencing the earthquake or not, individuals' life decisions post-disaster could have been influenced or altered. Based on this premise, this research aims to investigate the impact of disaster preparedness training on the disaster readiness levels of women of reproductive age and their attitudes toward fertility and childbearing.

Research Hypotheses

H0$_a$: There is no difference in disaster readiness levels between the women of reproductive age in the intervention group, who received disaster preparedness training, and those in the control group.

H1$_a$: The disaster readiness levels of women in the intervention group who received disaster preparedness training are higher than those of women in the control group.

H0$_b$: There is no difference in attitudes towards fertility and childbearing between the women of reproductive age in the intervention group, who received disaster preparedness training, and those in the control group.

H1$_b$: The attitudes towards fertility and childbearing of women in the intervention group who received disaster preparedness training are more positive compared to those in the control group.

Methods

Type of Research

The study uses a classical experimental design with a pre-test and post-test control group. A Clinical Trials registration number has been obtained for this research.

Study Population and Sample

The population for this study consists of women of reproductive age (18-49 years) living across Turkey. The sample size was determined using the G-Power 3.1.9.7 program for power analysis, referencing a similar study by Khadivzadeh, Rahmati, and Esmaily (2021) on fertility control (pre-test score of 9.31±2.3, post-test score of 15.4 ±1.4).[16] Accordingly, with an effect size of 0.500 as recommended by the program, a power of 90%, and a type I error rate of 0.05, the sample size for each group was 86 participants. Considering a dropout rate of 1.85%, as indicated in the same study, it was planned to include 88 participants in each group. The study was completed with a total of 176 participants, adhering to inclusion criteria in both the intervention and control groups. Participants were randomized in a 1:1 ratio into the intervention ($n = 88$) and control ($n = 88$) groups.

Inclusion Criteria for Participation

- Being a female.
- Aged between 20-30 years.
- Nulliparous (having never given birth).
- Able to use an Android smartphone or computer.
- Having access to the internet.
- Not currently pregnant.
- Not undergoing treatment for conception.
- Not diagnosed with menopause.
- Not having any physical or mental disability.
- Able to read and understand Turkish.
- Volunteering to participate in the study.

Randomization

Upon agreeing to participate, participants were informed about the study and were assigned a number in the order of their acceptance. Once the target sample size was reached, all participants were randomly assigned to either the intervention or control group by an independent statistician using a simple random numbers table. The CONSORT flow diagram is presented in Figure 1.

Blinding

Due to the necessity for researchers to administer the training to the intervention group, blinding of researchers was not possible. Data was collected by researchers who were aware of which group the participants belonged to; however, the participants did not know their group assignments. Because researchers knew which group participants were in, the study was conducted with single blinding. The statistical analysis was performed by an independent statistician unaware of the group assignments. Statistical analyses were conducted, and the research report was written before the researchers disclosed the codings used for the intervention and control groups, thereby ensuring that the statistician maintained blinding in data coding and reporting during the reporting phase.

Data Collection Instruments

The study utilized several instruments for data collection:

Preliminary evaluation form
A 9-question form developed by the researcher to determine if participants met the inclusion criteria for the study.

Descriptive information form
Created following the literature by researchers, this form collects demographic information such as age, education level, marital status, occupation, income level, and area of residence and consists of 15 questions.[17–19]

Disaster Preparedness Scale (DPS)

Developed by Şentuna and Çakı in 2020, the Disaster Preparedness Scale is a structured tool designed to measure disaster readiness. It consists of 13 items divided across 4 sub-dimensions: Disaster Physical Protection, Disaster Planning, Disaster Aid, and Disaster Warning Systems. The scale employs a 4-point Likert-type format ranging from (1) "strongly disagree" to (4) "strongly agree," with no items scored in reverse. The minimum possible score on the DPS is 13, and the maximum is 52, where higher scores indicate increased levels of disaster preparedness. The scale's reliability, as measured by Cronbach's Alpha, was initially reported as 0.82.[15] In this study, the Cronbach's alpha for the DPS was 0.85 at the pre-test and 0.86 at the post-test, indicating excellent internal consistency.
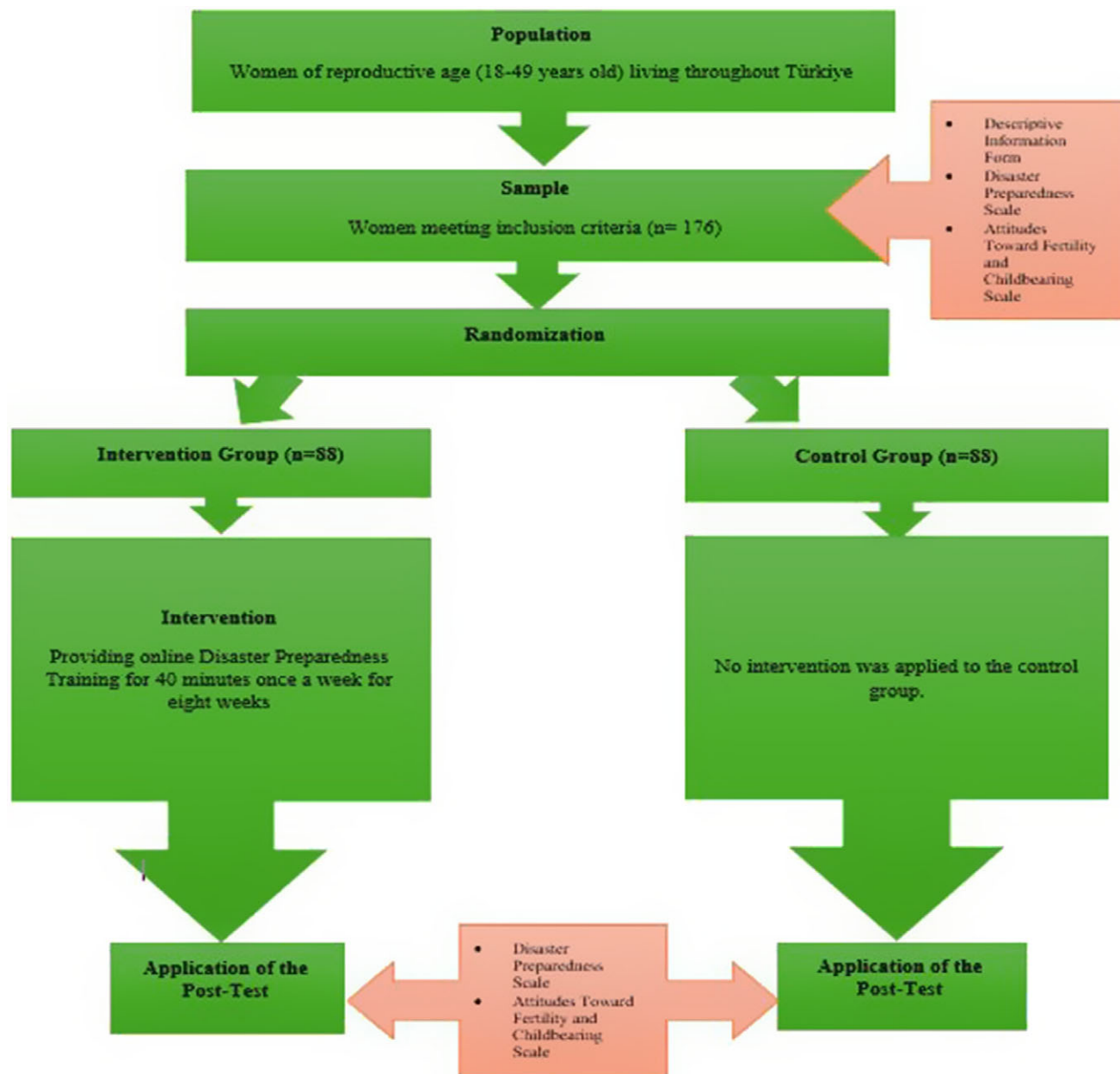
Figure 1. CONSORT flowchart of the research.

Attitudes Toward Fertility and Childbearing Scale (AFCS)

The AFCS was developed by Söderberg et al. in 2013 to assess the attitudes of nulliparous women aged 20-30 toward fertility and childbearing. Aşçı and Gökdemir conducted the Turkish validation and reliability of the scale in 2021. This scale consists of 27 questions across 3 sub-dimensions: Importance of Fertility for the Future, Perception of Childbearing as a Barrier, and Expectations and Planning. The AFCS uses a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree") and does not contain reverse-scored items. The Attitudes Toward Fertility and Childbearing Scale (AFCS) is assessed through its sub-dimensions, and the scores for each sub-dimension are calculated by summing the points from the items within that dimension. An increase in scores from the sub-dimensions of the Importance of Fertility for the Future and Expectations and Planning indicates that the woman has positive attitudes towards childbearing. Conversely, an increase in scores

from the sub-dimension of Perception of Childbearing as a Barrier demonstrates that the woman views childbearing as an impediment to her current life.[20]

Sub-dimension of the importance of fertility for the future

This sub-dimension contains 12 items, with the lowest possible score being 12 and the highest 60. A high score in this sub-dimension indicates that fertility and having children are essential for a woman's future. The Cronbach's Alpha value for this sub-dimension is 0.91.[20] In this study, the Cronbach's alpha value for the Importance of Fertility for the Future sub-dimension was 0.92 at both pre-test and post-test.

Sub-dimension of perception of childbearing as a barrier

This sub-dimension includes 10 items, with possible scores ranging from 10-50. An increase in scores within this sub-dimension indicates that a woman perceives childbearing as an obstacle to her life.

The Cronbach's Alpha value for this sub-dimension is 0.90.[20] In this study, the Cronbach's alpha value for the Perception of Child-bearing as a Barrier sub-dimension was 0.93 at the pre-test and 0.92 at the post-test.

Sub-dimension of expectations and planning

This sub-dimension consists of 5 items, with scores ranging from 5-25. An increase in scores in this sub-dimension suggests that a woman has certain expectations and plans that need to be met before having children. The Cronbach's Alpha value for this sub-dimension is 0.60.[20] In this research, the Cronbach's alpha value for the Expectations and Planning sub-dimension was 0.85 at the pre-test and 0.86 at the post-test.

Disaster preparedness training

Disaster Preparedness Training has been developed by researchers following the literature. It is based on the training content of Ministy of Interior Disaster and Emergency Management Presidency and Kızılay, well-known organizations globally that play an active role in disaster situations.[21–23] Expert opinions were obtained from 5 faculty members/specialists in Nursing, Emergency and First Aid, and Emergency and Disaster Management, and the final version of the training was established. The topics covered in the Disaster Preparedness Training are as follows:

- Preparations to be Made Before a Disaster
- Appropriate Behavior During a Disaster
- Initial Moments After a Disaster
- First Aid
- Psychological First Aid
- Sexual Health/Reproductive Health Needs During Disasters
- Nutrition, Shelter, Camp Management, and Hygiene Needs After a Disaster
- Environmental Risks That May Arise After Disasters

Data collection process

The study was conducted online with women living across Turkey from October 2023-April 2024. Throughout October 2023, researchers regularly posted about the study 4 days a week on social media, inviting participation and sharing the Preliminary Evaluation Form. The researchers then contacted women who met the study's inclusion criteria and provided their contact details via the filled Preliminary Evaluation Forms. An initial pre-test was administered to those who agreed to participate. After the pre-test, participants were divided into intervention and control groups. Suitable days and times were arranged with the women in the intervention group. Subsequently, researchers delivered the "Disaster Preparedness Training" online once a week for 40 minutes over 8 weeks. Eight weeks after the pre-test, a post-test was administered to all participants. The study's data were collected through self-reporting methods. After administering the post-test, the control group received the Disaster Preparedness Training in a single online session.

Table 1. Descriptive characteristics of women (N=176)

Variables		Intervention		Control		Total		Test	P
		n	%	n	%	n	%		
Age	X̄ ± SD (min-max)	21.20 ± 1.76 (20–30)		20.67 ± 1.04 (20–25)		20.94 ± 1.47 (20–30)		2.450[t]	**0.016***
Marital status	Single	82	93.2	87	98.9	169	96.0	3.719[k]	0.118
	Married	6	6.8	1	1.1	7	4.0		
Educational status	Associate degree and below	52	59.1	50	56.8	102	58.0	0.093[k]	0.760
	Bachelor's degree and above	36	40.9	38	43.2	74	42.0		
Working status	Yes	8	9.1	5	5.7	13	7.4	0.748[k]	0.387
	No	80	90.9	83	94.3	163	92.6		
Income status	Income is less than expenses	40	45.5	46	52.3	86	48.9	0.819[k]	0.451
	Income equals expenses	48	54.5	42	47.7	90	51.1		
Previous disaster experience	Yes	45	51.1	54	61.4	99	56.3	1.870[k]	0.171
	No	43	48.9	34	38.6	77	43.8		
Losing a relative in a disaster	Yes	8	9.1	12	13.6	20	11.4	0.903[k]	0.342
	No	80	90.9	76	86.4	156	88.6		
Damage in disaster	Yes	22	25.0	26	29.5	48	27.3	0.458[k]	0.498
	No	66	75.0	62	70.5	128	72.7		
Status of receiving disaster training	Yes	54	61.4	59	67.0	113	64.2	0.618[k]	0.432
	No	34	38.6	29	33.0	63	35.8		
Attitude towards having children	Positive	52	59.1	38	43.2	90	51.1	4.457[k]	**0.050***
	Negative	36	40.9	50	56.8	86	48.9		

*k: Chi square test, t: Independent sample t test, *: P<0.05*

Table 2. Examining the differences between groups in terms of DPS and its sub-dimensions

Variables	Intervention X̄ ±SD	Control X̄ ±SD	t^2	P
Disaster Physical Protection subscale (pretest)	11.57±2.34	11.60±2.06	−0.103	0.918
Disaster Physical Protection subscale (posttest)	12.06±2.53	11.98±2.28	0.219	0.827
t^1/p	**−3.445/0.001***	**−2.025/0.046***		
Disaster Planning subscale (pretest)	7.70±2.05	7.45±1.95	0.828	0.409
Disaster Planning subscale (posttest)	7.72±1.99	7.74±1.96	−0.076	0.939
t^1/p	−0.078/0.938	−1.625/0.108		
Disaster Aid subscale (pretest)	8.22±1.56	8.45±1.68	0.977	0.330
Disaster Aid subscale (posttest)	8.58±1.63	8.64±1.58	0.234	0.815
t^1/p	**−3.464/0.001***	−1.458/0.148		
Disaster Warning Systems subscale (pretest)	4.38±1.19	4.42±1.03	−0.272	0.786
Disaster Warning Systems subscale (posttest)	4.82±1.26	4.55±1.15	1.501	0.135
t^1/p	**−4.456/0.000***	−1.211/0.229		
DPS (pretest)	32.10±5.76	31.69±5.14	0.497	0.620
DPS (posttest)	35.23±5.83	31.84±5.56	0.450	**0.020**
t^1/p	**−3.139/0.002***	−2.920/0.055		

t^1: Dependent sample t test, t^2: Independent samples t test, *: P<0.05

Table 3. Examining differences between groups in terms of AFCS sub-dimensions

Variables	Intervention X̄ ±SD	Control X̄ ±SD	t^2	P
Sub-dimension of the Importance of Fertility for the Future (pretest)	40.14±11.84	34.47±11.12	3.276	**0.001***
Sub-dimension of the Importance of Fertility for the Future (posttest)	43.67±11.60	34.72±11.18	2.303	**0.022***
t^1/p	**−0.683/0.007**	−2.780/0.452		
Sub-dimension of Perception of Childbearing as a Barrier (pretest)	36.88±11.19	38.39±10.22	−0.935	0.351
Sub-dimension of Perception of Childbearing as a Barrier (posttest)	38.09±9.94	38.20±9.30	−0.078	0.938
t^1/p	−1.303/0.196	0.316/0.753		
Sub-dimension of Expectations and Planning (pretest)	16.53±3.83	17.11±3.24	−1.084	0.280
Sub-dimension of Expectations and Planning (posttest)	16.92±3.35	16.90±3.43	0.044	0.965
t^1/p	−0.957/0.341	1.313/0.193		

t^1: Dependent sample t test, t^2: Independent samples t test, *: P<0.05

Statistical Analysis

Data were analyzed using IBM SPSS Statistics 23. The analysis included frequency distributions (count, percentage) for categorical variables and descriptive statistics (mean, standard deviation, minimum, maximum) for numerical variables. Differences between the 2 groups were tested using independent samples t tests and chi-square tests, while changes over time within groups were analyzed using paired samples t tests. Cronbach's alpha was used to assess scale reliabilities. A significance level of $P<0.05$ was accepted.

Ethical Approach

Ethical approval for the study was obtained from the Bartın University Social and Humanities Ethics Committee (Protocol Number: 2023-SBB-0411, Approval Date: 17.07.2023). Women were informed about the purpose of the study through an online survey, after which written informed consent confirming their willingness to participate was obtained. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Descriptive characteristics of the women are presented in Table 1. There is a statistically significant difference between the groups in terms of age and attitudes towards childbearing ($P<0.05$). The average age in the intervention group was higher than in the control group, and the rate of positive attitudes towards having children was also higher in the intervention group compared to the control

group. Other descriptive characteristics of the women in both the intervention and control groups were found to be similar (*P*>0.05) (Table 1).

Table 2 presents the analysis of differences between the groups regarding the DPS and its sub-dimensions. In the intervention group, there was a statistically significant increase in the post-test scores for the Disaster Physical Protection sub-dimension, Disaster Aid sub-dimension, Disaster Warning Systems sub-dimension, and the total DPS score, while in the control group, there was a statistically significant increase in the Disaster Physical Protection sub-dimension score (*P*<0.05). There was a statistically significant difference between the groups in terms of the pre-test and post-test total DPS scores (*P*<0.05) (Table 2).

In the intervention group, the Importance of Fertility for the Future sub-dimension score showed a statistically significant increase at the post-test (*P*<0.05). A statistically significant difference exists between the groups' pre-test and post-test scores for the Importance of Fertility for the Future sub-dimension (*P*<0.05). There were no statistically significant differences between the groups in the pre-test and post-test scores for the Perception of Childbearing as a Barrier and Expectations and Planning sub-dimensions (*P*>0.05) (Table 3).

Discussion

This research aimed to examine the effect of disaster preparedness training on the disaster readiness levels and fertility and childbearing attitudes of women of reproductive age. It emphasizes the need to increase disaster preparedness levels to minimize the damage women suffer from disasters and to enhance knowledge about physical and psychosocial protection, disaster aid, and intervention during disasters.[2] After the disaster preparedness training, an increase in disaster readiness levels was observed among women in the intervention group. Their knowledge about physical protection in disasters, disaster aid, and disaster warnings and systems also increased. There are varying findings in the literature related to this result. Similar to our findings, a community-based study in Nepal aimed at reducing disaster risk reported that women's knowledge and skills significantly increased following the training programs provided.[24] In Iran, disaster preparedness training for women was found to increase their awareness, sensitivity, self-efficacy, and disaster preparedness levels.[25] A systematic review and meta-analysis of 17 randomized controlled trials found that disaster preparedness training positively influenced individuals' disaster readiness behaviors.[26] Watanabe (2020) also confirmed the effectiveness of a disaster preparedness training program for pregnant Women.[27] In Japan, disaster education provided through virtual reality was found to be effective, increasing participants' interest, attention, and satisfaction.[28] Contrary to our findings, a study in Indonesia found that an intervention program aimed at disaster preparedness did not increase women's preparedness levels.[3] The difference between our findings and this study may be attributed to differences in the sociocultural and geographic characteristics of the women involved.

Environmental changes impact women's attitudes toward Childbearing.[9,29] The study found that disaster preparedness training increased the importance of fertility for the future among women in the intervention group, suggesting a positive shift in their attitudes towards having children post-disaster. The literature presents varying results on this finding. In line with our results, after the tsunami disaster in Indonesia, it was determined that as the

damage from the tsunami increased, so did the number of children individuals had.[11] Another study in Indonesia reported an increase in fertility rates following a tsunami.[30] Following a flood disaster in Bangladesh, victims emphasized their desire to have more children.[31] However, there are studies that have shown different results. A systematic review of 50 studies examining changes in live birth numbers after disasters showed that disasters typically negatively affect fertility, depending on the type of Disaster.[29] A study conducted in Bangladesh in 2 different regions prone to severe hurricanes and severe floods found that while floods tended to increase fertility attitudes, hurricanes had a limiting effect on Fertility.[32] The challenges experienced during the COVID-19 pandemic, described as an extraordinary situation, have also negatively affected women's fertility attitudes.[33,34] It is thought that the discrepancies in findings in the literature may stem from the type of disaster and the sociocultural attitudes of women.

Limitations

As far as we know, no study has been found examining the effectiveness of disaster preparedness training given to women of reproductive age in Turkey. Therefore, it is believed that the data from this research will provide significant and current contributions to the literature. However, there are some limitations to the study. Although the study population consists of all women of reproductive age living in Turkey, only women aged 20-30 who are nulliparous were included due to the validity and reliability of the AFCS being established for this group. Future research could be recommended to include different groups of women. Although the study covered women across Turkey, the participation may have been limited to individuals accessible through the researchers' networks. Therefore, using different sampling methods in future research could be beneficial.

Conclusion

The disaster preparedness training provided to women of reproductive age has increased their levels of disaster readiness. Additionally, the training has improved their knowledge of physical protection in disasters, disaster aid, and disaster warning and systems. Furthermore, it has been determined that disaster preparedness training has positively influenced the attitudes of these women toward having children. Turkey is a country frequently affected by disasters; therefore, like all countries, disaster education should be routinely integrated into the educational curriculum from basic levels, updated regularly, and provided to individuals of all ages. It is also believed that providing training on disaster protection, first aid, and various other topics in health institutions would be beneficial. In this context, disaster preparedness and the effects of disasters should be incorporated into main plans and policies, and the public should be informed through public service announcements. Research examining different variables in this context is thought to contribute to the literature.

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