IJBMC
International Journal of Body, Mind and Culture

Volume 12, Issue 2, pp 112-120
DOI: 10.61838/ijbmc.v12i2.843

Article type:
Original Research

Climate Change and Emotions: A Comparative Study across Affected and Non-Affected Provinces in Iran

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Article history:

Received 3 Nov 2024
Revised 29 Dec 2024
Accepted 24 Jan 2025
Published online 26 Feb 2025

How to cite this article:
Sohrabi, F., Kolivand, P. H., Alishvandi, R., Ahmadi, H., Asadi, M., Motavali, Y., & Mamsharifi, P. (2025). Climate Change and Emotions: A Comparative Study across Affected and Non-Affected Provinces in Iran. International Journal of Body, Mind and Culture, 12(2), 112-120.

ABSTRACT

Objective: This study aims to compare climate-related emotions in provinces with higher and lower climate change impacts.

Methods and Materials: The statistical population included residents from 10 provinces (5 with higher and 5 with lower climate change impacts) in 2024. A total of 1,379 valid questionnaires were collected using the climate change emotions questionnaire (Marczak, Wierzba, Zaremba & et al., 2023). Data were analyzed with descriptive and inferential statistics, including Student's t-test.

Findings: Significant differences were found in the emotional responses of anger, passion, anxiety, and sorrow between the provinces with higher and lower climate change impacts ($p<0.001$). In other words, people in provinces with lower climate change impacts reported higher emotional scores.

Conclusion: The findings suggest that emotional responses to climate change are more pronounced in provinces with lower climate change impacts. This underscores the mental health implications of climate change and the need for targeted interventions in different regions.

Keywords: Climate change, emotions, Climate-change engagement, Comparative Study.

Introduction

Climate change refers to long-term shifts in weather patterns, including variations in temperature, precipitation, wind, and other atmospheric conditions on Earth (Jones et al., 2019). While climate change can be driven by both natural phenomena, such as solar activity and volcanic eruptions, as well as human activities, including the burning of fossil fuels and deforestation, its effects are becoming increasingly evident and widespread. Notably, Iran is particularly vulnerable to climate change, facing challenges such as frequent droughts, extreme heat, and water scarcity (Aryasadr et al., 2024). These issues not only threaten the country's natural resources but also intensify social and psychological stress for its population. Iran has experienced rising temperatures and prolonged dry periods, resulting in diminished water resources, reduced agricultural productivity, and the displacement of communities. These factors make Iran a critical region for investigating the emotional and mental health impacts of climate change (Asghari, 2024). For this study, the provinces were selected based on their varying levels of exposure to the effects of climate change. Provinces identified as experiencing "higher climate change impacts" were chosen due to the frequent occurrence of extreme weather events such as droughts, heat waves, and reduced water availability. In contrast, provinces with "lower climate change impacts" were selected for their relatively stable climate conditions. These regional distinctions offer a valuable framework for exploring how climate-related emotions differ according to varying degrees of environmental stress. Climate change exerts profound effects on both physical and mental health (Pihkala, 2024). Extreme weather events, such as storms, floods, and droughts, directly threaten physical safety and security, while also contributing to heightened feelings of insecurity, anxiety, and helplessness (Arias et al., 2021).

Furthermore, shifting weather patterns and rising temperatures can lead to resource depletion, forced migrations, and breakdowns in social structures, all of which can contribute to rising levels of stress and depression (Gianfredi et al., 2024). Research suggests that climate change can alter emotional states, particularly in vulnerable populations (Charlson, Ali, Benmarhnia & et al., 2021). Emotions are fundamental to human behavior, guiding decision-making processes and influencing how individuals react to perceived threats. They shape individual and collective actions, helping people anticipate or avoid potential risks (Gianfredi et al., 2024). Emotions also play a critical role in cognitive decision-making and performance (van Kleef & Côté, 2022). Climate-related events, such as floods and droughts, often evoke negative emotions like fear, anxiety, and despair. These emotions arise as individuals feel vulnerable and insecure about their environment (Harth, 2021). In turn, these feelings can influence decision-making, behaviors, and social interactions, leading to reduced engagement with others and heightened social tensions (Garfin et al., 2024). In addition, communities in climate-affected regions may experience frustration and helplessness, especially when they feel powerless to mitigate the changes occurring in their environment (Ramadan et al., 2023). The rising phenomenon of eco-anxiety and depression, especially among younger generations, highlights the growing mental health burden linked to climate change. Reports indicate that approximately 45% of young people in ten countries experience emotions such as sadness, fear, and anger related to climate change, which negatively affect their daily lives. These climate-related emotions can be acute or long-term, reflecting individuals' attachments to the people, places, and ecological systems that sustain life (Pellitier et al., 2023)

Given the emotional impacts associated with climate change, it is imperative to explore climate-related emotions, particularly in countries such as Iran, which are highly vulnerable to the severe effects of climate change. A comprehensive understanding of the emotional and psychological responses to climate change is crucial for designing targeted interventions and policies that effectively address the mental health needs of affected populations. This research has the potential to contribute to the development of educational programs and coping strategies, thereby enhancing both social and individual resilience to climate change. By focusing on these emotional responses, it is possible not only to improve mental health outcomes but also to foster greater public engagement with climate policies, thus promoting more sustainable solutions to environmental crises. Consequently, the present study seeks to compare climate-related emotions across different provinces of

Iran, each exposed to varying levels of climate change, to shed light on the psychological challenges faced by vulnerable populations.

Methods and Materials

This study employs a causal-comparative (post facto) research design, a method commonly used to examine the relationships between independent and dependent variables by investigating cause-and-effect relationships in retrospect. This design enables the identification of the consequences or causes of existing differences among various groups. For the theoretical framework and background, library sources were utilized, and data were gathered through a survey and field study conducted in 10 provinces. The statistical population consisted of residents from these provinces, with five provinces experiencing significant climate change impacts and five provinces with relatively stable climatic conditions, all sampled in 2024. The provinces were selected based on a range of climatic data, including rainfall, drought frequency, migration patterns, and other climate-related indicators sourced from the Iranian Red Crescent and the Iran Meteorological Organization. Specifically, the criteria used to assess climate change impacts included average temperature increases, the frequency of extreme weather events (such as droughts, heat waves, and storms), and water scarcity. These data allowed for a classification of provinces into those most affected by climate change and those with more stable environmental conditions.

The sampling method employed in this study was convenience sampling. While a more robust technique, such as stratified random sampling, could have improved representativeness, limitations in study design and available resources necessitated this approach. A total of five cities were selected from each province. The sample size was determined using G-Power software to ensure adequate statistical power for analyzing the eight emotional responses to climate change. A minimum of 200 participants from each province was selected to mitigate participant dropout and ensure the analysis remained statistically valid. This sample size was calculated based on a power analysis, which took into account expected effect sizes and the required power level. Measures were implemented to ensure data quality, including safeguards to prevent duplicate responses.

Climate Change Emotions Questionnaire was used to collect data. The Climate Change Emotions Questionnaire was developed by Marczak, Wierzba, Zaremba & et al (2023). This questionnaire contains 32 items, which can be answered on a 5-point Likert scale ranging from one (strongly disagree) to five (strongly agree). It includes 8 subscales: anger, dissatisfaction, enthusiasm, helplessness, guilt, isolation, anxiety, and sadness, with each subscale comprising 4 questions, along with a total score. The questionnaire asks: “What feelings do you have regarding climate change?” You may have heard that the Earth is currently experiencing climate change. This questionnaire aims to explore your feelings in this regard. Please rate the extent to which the following statements apply to you. This questionnaire is not designed to assess your knowledge, so there are no right or wrong answers. Please select the response that best describes your feelings. The raw score is calculated by summing the responses to the four items within each scale. For each scale, the raw score ranges from 4 to 20. A higher score indicates a stronger experience of the given climate emotions. The reliability of this tool was established by Marczak, Wierzba, Zaremba & et al (2023) for all subscales using Cronbach's alpha, yielding values between 0.81 to 0.94 (Marczak, Wierzba, et al., 2023). This questionnaire has not yet been standardized in Iran, and this research aims to perform this standardization. Additionally, the questionnaire was translated into Persian and culturally adapted for the Iranian population. A pilot study was conducted to ensure that the items were understood as intended and culturally relevant. No significant issues were found during this process, confirming that the items were interpreted consistently by the Iranian respondents. In the present study, the reliability of this tool, as measured by Cronbach's alpha, was found to be 0.91 for the climate change group and 0.92 for the normal group.

Findings and Results

In Table 1, demographic characteristics are listed. 1017 participants (% 73/7) were female and 362 were male (% 26/3).

Table 1

Demographic variables

Variables		Groups	Frequency
Age (year)	Under 18	higher climate change impacts	76
		lower climate change impacts	70
	18 to 34	higher climate change impacts	440
		lower climate change impacts	443
	35 to 54	higher climate change impacts	165
		lower climate change impacts	154
	55 and higher	higher climate change impacts	14
		lower climate change impacts	17
Education state	Diploma	higher climate change impacts	225
		lower climate change impacts	298
	Bachelor of Art	higher climate change impacts	224
		lower climate change impacts	260
	Master of Art	higher climate change impacts	157
		lower climate change impacts	162
	PhD	higher climate change impacts	31
		lower climate change impacts	22

Based on the information in Table 2 and regarding the distribution of scores of participants in the climate change emotions questionnaire, different descriptive indices and the results of the K-S normality test showed that the distribution of scores in both groups in the measured variables tended to the normal distribution. Based on the calculated Student's t-test, the results of Table 3 show that in the variables of anger (F= 1/493, df=1377, Sig= 0/222), enthusiasm (F= 0/147, df=1377, Sig= 0/702), anxiety (F= 0/552, df=1373, Sig= 0/458), sorrow (F= 1/896, df=1374, Sig= 0/169), and the total score of climate change emotions (F= 2/867, df=1371, Sig= 0/091), there is a significant difference in the mean scores between the two groups of provinces with climate change and the normal group. Therefore, in the provinces less involved in climate change, such as West Azerbaijan, Kurdistan, Lorestan, Mazandaran, and Gilan, people's scores in emotions related to climate change are higher than the other group.

Table 2

Descriptive statistics of climate change emotions variables by groups

Variables	Groups	Min-Max	Mean ± SD	K-S	P-Value	effect sizes*
Climate anger	higher climate change impacts	10-20	15/48 ± 2/76	0/121	0/120	0/051
	lower climate change impacts	10-20	16/93 ± 2/69	0/152	0/124	
Climate enthusiasm	higher climate change impacts	8-20	13/98 ± 2/81	0/165	0/171	0/033
	lower climate change impacts	8-20	14/78 ± 3/34	0/225	0/164	
Climate discontent	higher climate change impacts	8-20	15/33 ± 2/90	0/265	0/131	0/014
	lower climate change impacts	8-20	16/54 ± 2/87	0/241	0/119	
Climate powerlessness	higher climate change impacts	8-20	13/95 ± 2/59	0/351	0/133	0/022
	lower climate change impacts	8-20	14/87 ± 3/03	0/340	0/142	
Climate guilt	higher climate change impacts	4-20	13/39 ± 3/46	0/265	0/125	0/011
	lower climate change impacts	4-20	14/28 ± 4/10	0/198	0/127	
Climate isolation	higher climate change impacts	8-20	13/74 ± 2/77	0/178	0/137	0/020
	lower climate change impacts	8-20	14/68 ± 3/10	0/422	0/188	

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E-ISSN: 2345-5802

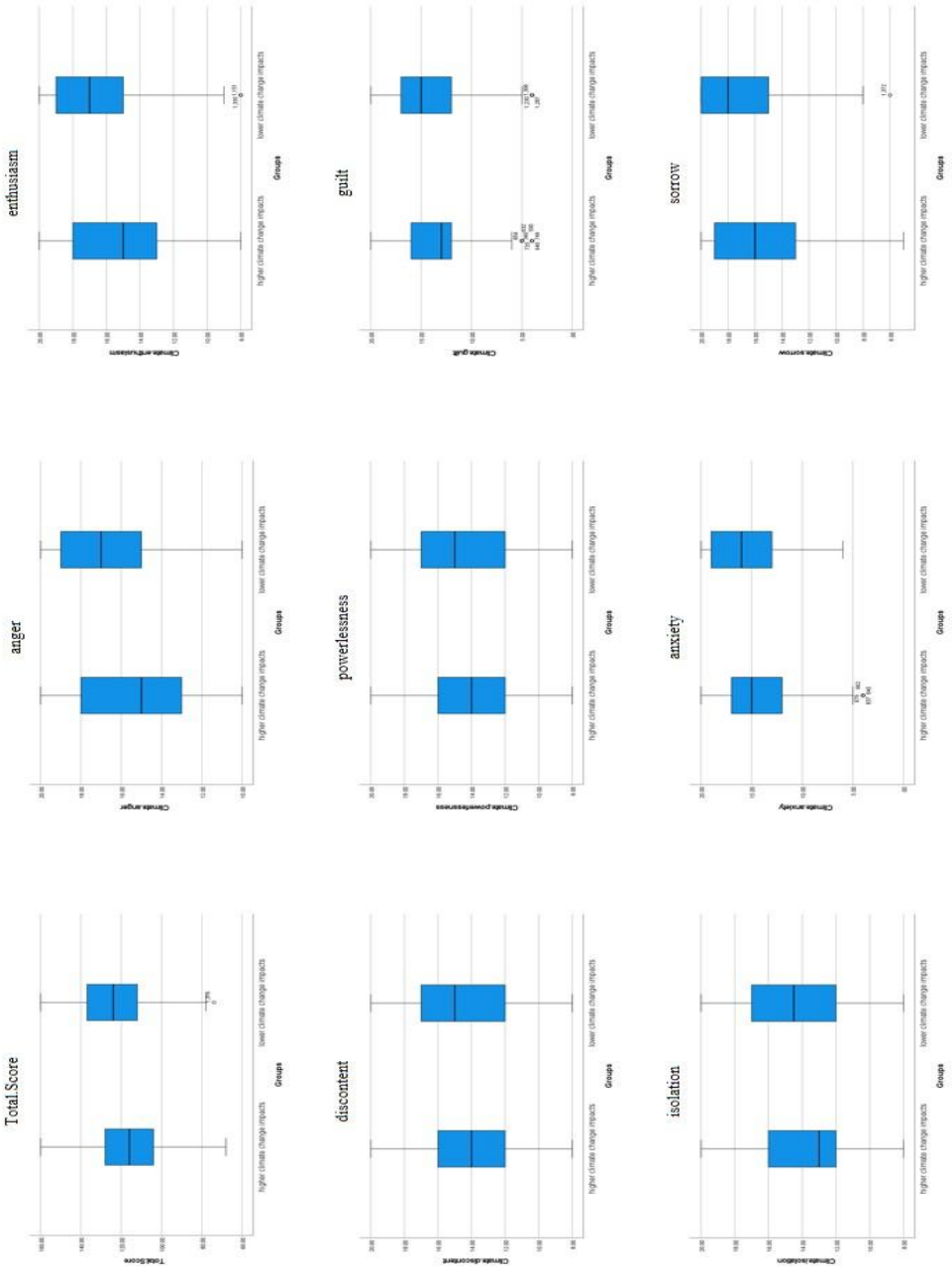
Climate anxiety	higher climate change impacts	4-20	14/74 ± 3/21	0/094	0/123	0/022
	lower climate change impacts	6-20	15/83 ± 3/22	0/147	0/107	
Climate sorrow	higher climate change impacts	5-20	15/83 ± 3/09	0/255	0/197	0/025
	lower climate change impacts	6-20	16/94 ±2/99	0/211	0/162	
Total score	higher climate change impacts	68-160	116/47 ± 16/29	0/201	0/192	0/045
	lower climate change impacts	74-160	124/72 ± 17/72	0/193	0/142	

* η^2: small (~0.01), medium (~0.06), and large (~0.14).

Figure 1 shows the box plot of emotions related to climate change in two groups:

Figure 1

The box plot of emotions related to climate change in two groups



The findings presented in Table 3 reveal significant differences in the emotions of anger, enthusiasm, anxiety, and sorrow, as well as in the overall emotional response to climate change. Specifically, provinces experiencing less pronounced climate change reported higher emotional scores. However, certain variables did not exhibit significant differences. Potential explanations for these non-significant results include factors such as sample size, variability in responses, and the inherent characteristics of the emotions being investigated. These elements may have diminished the statistical power of the analysis, thereby influencing the outcomes.

Table 3

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig.(2-tailed)	MD	SD	95% Confidence Interval of the Difference	
									Lower	Upper
anger	E.V.A *	1.493	.222	-8.59	1377	.000	-1.44	0.16	-1.78	-1.11
	E.V. not A **			-8.69	637.963	.000	-1.44	0.16	-1.77	-1.12
enthusiasm	E.V.A	.147	.702	-6.84	1377	.000	-1.21	0.17	-1.56	-.86
	E.V. not A			-6.87	629.908	.000	-1.21	0.17	-1.56	-.86
discontent	E.V.A	21.663	.000	-4.39	1377	.000	-0.79	0.18	-1.15	-.44
	E.V. not A			-4.04	544.206	.000	-0.79	0.19	-1.18	-.41
powerlessness	E.V.A	17.143	.000	-5.55	1377	.000	-0.92	0.16	-1.25	-.59
	E.V. not A			-5.15	551.953	.000	-0.92	0.17	-1.27	-.57
guilt	E.V.A	20.759	.000	-3.97	1377	.000	-0.89	0.22	-1.32	-.45
	E.V. not A			-3.66	545.753	.000	-0.89	0.24	-1.36	-.41
isolation	E.V.A	11.409	.001	-5.35	1377	.000	-0.94	0.17	-1.28	-.59
	E.V. not A			-5.07	568.253	.000	-0.94	0.18	-1.30	-.57
anxiety	E.V.A	.552	.458	-5.50	1373	.000	-1.08	0.19	-1.47	-.70
	E.V. not A			-5.48	614.942	.000	-1.08	0.19	-1.47	-.69
sorrow	E.V.A	1.896	.169	-5.87	1374	.000	-1.10	0.18	-1.47	-.73
	E.V. not A			-5.97	640.981	.000	-1.10	0.18	-1.47	-.74
Total score	E.V.A	2.867	.091	-8.02	1371	.000	-8.24	1.02	-10.26	-6.23
	E.V. not A			-7.70	575.908	.000	-8.24	1.07	-10.35	-6.14

* Equal variances assumed / ** Equal variances not assumed

Discussion and Conclusion

This research aimed to compare the emotional responses to climate change among provinces with higher and lower climate change impacts. The findings of this study are consistent with previous research on climate change emotions (Doherty & Clayton, 2011; Harth, 2021; Myers et al., 2012; Schneider et al., 2021). One potential hypothesis is that it can be acknowledged that higher climate change emotion scores among people in provinces less affected by climate change, compared to those in provinces that have been grappling with this challenge for years, could be attributed to several main reasons. People in provinces where the effects of climate change are not strongly felt may lack a complete understanding of the depth of the issue due to the absence of direct experiences with the serious consequences of this crisis (Gregersen et al., 2023). This lack of understanding may lead to feelings of anger, as they cannot comprehend the depth of others' problems, and they perceive fears and anxieties about climate change as exaggerated (Stanley et al., 2021). Those living in regions that are relatively normal in terms of climate change might experience a sense of guilt, meaning they feel their comfortable lives contrast with the serious challenges faced by others. This feeling leads to anger toward the systems and social institutions that have rendered them more vulnerable to this crisis (Marczak, Wierzba, et al., 2023; Marczak, Winkowska, et al., 2023). On the other hand, people in regions less affected by climate change may exhibit greater enthusiasm for solving this problem compared to residents of areas that have been dealing with climate change for years (Pandit, 2014). Individuals living in less affected cities might feel a responsibility to prevent future crises. This sense of responsibility can encourage them to engage in activities

and efforts to address environmental issues, even if they are not currently experiencing severe problems (Zurich & Association, 2017). Residents of areas consistently facing climate-related challenges may become accustomed to their conditions and deem efforts for change futile. In contrast, people in cities experiencing less climate change are still unfamiliar with some challenges, and this unfamiliarity can lead to a heightened eagerness for action. Those who have not yet faced the serious consequences of climate change are likely more inclined to think about solutions and seek innovative answers. This hope and confidence in their ability to solve problems encourage them to take action (Ojala, 2023).

Additionally, in areas where the effects of climate change are not distinctly felt, people may be more concerned about their future. They are likely anxious about the consequences of climate change and its impacts on urban life, the economy, and community health in the future (Clayton & Karazsia, 2020). Their anxiety stems from a lack of knowledge about when and how these changes might affect their lives. Media and social networks continuously circulate news related to climate change and the crises resulting from it. In cities that have experienced less climate change, individuals may be confronted with alarming information that increases their anxiety (Clayton, 2020). This information can create feelings of inefficacy and worry rather than comfort. Individuals in less affected cities may feel they have no control over the upcoming situation. This sense of powerlessness can lead to anxiety, as they do not know what actions to take to prevent the negative effects of climate change or to remain insulated from its consequences (Soutar & Wand, 2022). Moreover, individuals living in cities less impacted by climate change may criticize themselves for their relatively comfortable lives. They might feel that they are unaware of the experiences and challenges faced by others, and this lack of connection can lead to sorrow (Hamilton, 2022). Those living in relatively normal regions might worry about the future consequences of climate change on their lives and environment. This fear of the unknown and the potential for crises can exacerbate feelings of sorrow, as they do not know when and how these crises may impact them (Pihkala, 2024). Due to the lack of direct contact with climate change, people may feel unable to leverage their power to prevent this crisis. This feeling of powerlessness can result in deep sorrow and grief. Individuals living in climate-affected areas often confront harsh realities and serious challenges, which can foster a greater sense of empathy in them. While people in cities with less change may feel that they have no tangible problems, this may lead to a sense of isolation and sadness, as they might find it difficult to relate to the real issues faced by others (Holthaus, 2023).

Future research should further test these hypotheses, particularly by exploring the roles of empathy and perceived responsibility. These factors could offer deeper insights into why individuals in less affected regions report higher levels of certain emotions. Additionally, it is crucial to examine the emotions that did not show significant differences between groups. A more nuanced analysis could suggest that other factors, such as age, education, or exposure to climate change media, might help explain this result. By incorporating these variables, future studies could provide a more comprehensive understanding of the emotional responses involved. Moreover, further exploration of contextual factors—such as regional variations in economic development, education levels, or media consumption—could yield valuable insights. These elements may significantly influence people's emotional reactions to climate change, thus broadening the scope of the findings and offering a deeper understanding of emotional responses. One of the key policy implications of our findings is that climate adaptation strategies should not only address physical and environmental challenges but also integrate mental health support for vulnerable populations. Educating individuals in provinces less impacted by climate change about its severity could foster greater empathy for those living in more affected areas. Educational programs aimed at raising awareness could help bridge the emotional divide between these groups, promoting more informed and compassionate responses to climate change. In this context, the Iranian Red Crescent can tailor its programs to the specific needs of provinces with varying levels of climate change impact, ensuring that interventions are responsive to regional conditions.

Additionally, it is important to acknowledge the limitations of convenience sampling, which may affect the generalizability of the findings. Future research should consider employing more robust sampling methods, such as stratified random sampling, to enhance

the representativeness of the sample. Additionally, it is crucial to acknowledge that variables such as media exposure, personal experiences with climate-related disasters, and socioeconomic status may serve as potential confounders in the results. Subsequent studies should aim to control for these factors to improve the accuracy and validity of the findings. Moreover, it is recommended that future investigations explore the relationship between emotional responses to climate change and subsequent behavioral outcomes. Gaining a deeper understanding of how climate change emotions translate into concrete actions could provide valuable insights into how individuals in different regions respond to the crisis and participate in mitigation and adaptation strategies.

The results of this study reveal notable emotional differences between individuals residing in regions directly impacted by climate change and those in areas less affected. In regions where climate change has been a persistent issue, residents tend to exhibit greater emotional resilience, likely due to years of adaptation to these changing conditions. In contrast, individuals in regions that have not yet experienced the full scope of climate change appear to be more emotionally reactive, which may be attributed to their heightened awareness and concern about potential future risks. These findings underscore the importance of addressing climate-related emotions, particularly within vulnerable communities. However, beyond acknowledging these emotional disparities, it is imperative to offer practical recommendations for policymakers, mental health professionals, and environmental organizations. Interventions aimed at increasing awareness and understanding of climate change in less affected regions could be instrumental in helping communities better prepare for future challenges. Such interventions might include educational programs, public awareness campaigns, and psychological support services, all designed to enhance resilience and promote effective coping strategies. Moreover, the emotional impacts of climate change are not restricted to specific regions but are emerging as a growing global concern. Consequently, addressing these emotional burdens necessitates coordinated, international efforts. Collaborative actions involving governments, mental health professionals, and environmental organizations are crucial to mitigating both the physical and emotional consequences of climate change. While this study focuses on specific regions, it contributes to the broader global discourse on the mental health implications of climate change and highlights the pressing need for collective action to address its widespread effects.

Acknowledgments

We thank all the participants in the 10 provinces of Iran who participated in this research. We are also grateful to the Deputy of education, research, and technology for his cooperation in conducting this research.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. This research was conducted under the supervision of the Iranian Red Crescent Society, and ethical approval was granted under code IR.RCS.REC.1403.032. Participants were approached through local centers, and informed consent was obtained from all participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

Authors' Contributions

All authors equally contributed to this study.

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