Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Climate Change Anxiety Among Citizens of Mazandaran Province, Iran: A Descriptive-Analytical Study

Hanieh Badakhshanian-Fard
Mazandaran University of Medical Sciences
Atefeh Jabbari
Mazandaran University of Medical Sciences
Kosar Kouhi
Babol University of Medical Sciences
Fathollah Gholami-Borujeni
fa.gholami@mazums.ac.ir

Mazandaran University of Medical Sciences

Research Article

Keywords: Psychological disorders, climate change, global warming, mental health impacts, climate anxiety

Posted Date: June 18th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9672099/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Global warming and extreme weather events increasingly threaten not only the environment but also human mental health; however, the psychological effects of climate change remain underexplored in climate-vulnerable regions such as Mazandaran Province in northern Iran. This descriptive-analytical cross-sectional study aimed to investigate climate change-related psychological effects among citizens of Mazandaran Province in 2024. Data were collected using the validated Clayton Climate Change Anxiety Questionnaire, which measures four dimensions: cognitive-emotional disturbances, functional impairment, personal experience, and behavioral engagement. The questionnaire was distributed online via social networks (WhatsApp, Telegram, Instagram, Eitaa, and Bale), and 250 citizens who had resided in the province for more than ten years completed it. Due to non-normal data distribution (Kolmogorov-Smirnov test), non-parametric tests including Mann-Whitney U and Kruskal-Wallis were used, with a significance level of $p < 0.05$. The mean total score for climate change-related psychological effects was 49.24 (SD = 13.58), reflecting a moderate level of climate anxiety according to the Clayton classification. Subscale scores included cognitive-emotional disturbances (mean = 14.78), behavioral engagement (mean = 19.33), personal experience (mean = 6.90), and functional impairment (mean = 8.21). No statistically significant associations were found between climate anxiety and demographic variables including age, gender, occupation, income, or type of residence ($p \geq 0.05$ for all). However, a significant difference emerged between educational groups: participants with university education reported higher levels of cognitive-emotional disturbances, behavioral engagement, and personal experience compared to those with a high school diploma or less ($p \leq 0.05$), while functional impairment showed no significant difference between the two groups ($p \geq 0.05$). In conclusion, citizens of Mazandaran Province experience a moderate degree of climate change-related anxiety, with university education being associated with greater cognitive, emotional, and behavioral responses. Strengthening social and economic infrastructures, alongside targeted mental health support and awareness programs, can enhance community resilience. Addressing the psychological dimensions of climate change must become an integral part of public health strategies and environmental crisis management.

Highlights

• This is the first study to investigate climate change-related psychological effects among citizens of Mazandaran Province, Iran (n = 250).

• The mean total climate anxiety score was 49.24, reflecting a moderate level of distress according to the Clayton Climate Change Anxiety Questionnaire classification.

• University-educated participants reported significantly higher cognitive-emotional disturbances, personal experience, and behavioral engagement compared to those with lower education ($p \leq 0.05$); functional impairment did not differ significantly.

• No significant relationships were found between climate anxiety and age, gender, income, residence location, or type of residence.

1. Introduction

Global warming and extreme weather events, such as droughts, floods, storms, and heatwaves, have profound impacts on the environment, economic development, and public health at both global and regional levels. These changes not only affect ecosystems but also have adverse effects on human health and mental well-being [1]. For example, natural disasters have indirect effects on physical and social infrastructures, disrupting educational, medical, economic, and transportation systems. This increases the stress burden on individuals and threatens the mental health of vulnerable populations [2]. These effects can include acute and post-traumatic stress disorders, physical ailments, severe depression, and other issues such as substance and alcohol abuse, increased suicide rates, and higher risks of child abuse. Additionally, longer and more intense heatwaves associated with climate change are likely to be linked to increased mortality rates, homicide, suicide, physical assault, and domestic violence [3].

In fact, greenhouse gas emissions due to economic and population growth have significantly increased. In 2018, the global average temperature was recorded to be more than 1 degree Celsius above pre-industrial levels. If current greenhouse gas emission trends continue, it is predicted that the world will reach the threshold of dangerous climate change by the early 2030s[4, 5]. Gradual changes associated with climate change are likely to lead to increased migration and conflicts. People may leave their homes due to various factors such as rising sea levels, melting permafrost, and glaciers, making it impossible or undesirable to stay in their current locations. Migration can be highly stressful, as the process of adapting to a new home is challenging, especially when individuals are not welcomed by local residents. Moreover, migration is often accompanied by economic difficulties. These issues well explain why high levels of mental illness are observed among involuntary migrants [2].

Research on emotions related to climate change is growing, and investigating these emotions is of great importance. These investigations show how much public concern about climate change has increased and may lead to support for policies and coping actions. Additionally, these emotions are linked to individuals' mental health [6]. Climate anxiety, which includes a range of emotions arising from awareness of climate change, has become globally prevalent. This anxiety can act as an adaptive factor, encouraging individuals to respond to environmental threats, but high levels of it can have negative impacts on mental health. Although climate anxiety is not recognized as a mental illness, it can place a greater psychological burden on vulnerable individuals and reduce their mental well-being [7].

Annika Walinski and et all in 2023 in the narrative review summarizes global evidence on the impact of climate change on mental health. A systematic search identified 128 relevant studies examining direct effects of extreme weather events (floods, storms, fires) and chronic stressors (heat, drought), as well as indirect effects like food insecurity and migration. Findings indicate that traumatic events increase risks of affective and anxiety disorders, particularly post-traumatic stress disorder. Heat elevates mental illness morbidity, mortality, and psychiatric emergencies. Persistent stressors related to climate change

also contribute to mental health risks. As global warming advances, mental illness prevalence is expected to rise, highlighting the need to protect vulnerable populations and conduct further research [8].

Susan Clayton and McKenna F. Parnes (2025) discuss the increasing recognition of climate change's effects on mental health and social connections. Experiencing events like wildfires or severe weather, as well as the general awareness of climate threats, can lead to feelings of anxiety, weakened social ties, and interpersonal conflicts such as aggression. On the other hand, this awareness can also inspire people to engage in activism aimed at addressing climate issues. Such activism not only helps protect the environment but also benefits the mental well-being of those involved. Further studies are needed to explore when and how climate anxiety motivates activism and its positive effects, while policies could support those affected to become active in climate efforts [9]. Hayes et al. in 2018 reported that the risks and impacts of climate change on mental health are rapidly increasing. This impact directly, indirectly, and pervasively affects those who are most vulnerable [10]. Studies show that individuals who experience climate anxiety typically score higher on measures of anxiety and depression [11]. Recent research on climate change anxiety (CCA) indicates that this anxiety involves negative cognitive, emotional, and behavioral effects related to climate concerns. A study by Schwartz et al. (2023) on young adults aged 18 to 35 in the United States identified two main dimensions of climate anxiety: cognitive-emotional impairment and functional impairment. The results showed that both dimensions were associated with symptoms of generalized anxiety disorder (GAD), while only functional impairment was linked to symptoms of major depressive disorder (MDD). Furthermore, participation in collective environmental activism, but not individual actions, reduced the association between cognitive-emotional impairment and depression. Qualitative responses revealed participants' deep worries and feelings of the ineffectiveness of individual actions, highlighting the importance of encouraging collective efforts to enhance a sense of agency and improve mental health in the face of climate change [9, 12].

Iran is facing significant challenges due to climate change that affect its environment, economy, and society. Temperatures are rising, with forecasts suggesting an average increase of about 2.6°C by the middle of the century, while rainfall is decreasing considerably [13]. This combination is causing serious water shortages that impact roughly 35% of the population [14]. The country is also dealing with worsening droughts, expanding desert areas, and more frequent floods, all of which threaten farming and food supply. Different regions of Iran, from dry deserts to the cooler northern areas, are vulnerable to various climate-related issues such as extreme heat and natural disasters like landslides [15]. Urban growth is making matters worse by increasing heat and air pollution, which harms public health[16]. Although Iran is one of the largest greenhouse gas emitters in the Middle East, efforts to reduce emissions have been limited, partly due to economic sanctions and dependence on fossil fuels. These environmental problems have also led to social tensions, especially regarding water scarcity, underscoring the urgent need for effective climate policies and adaptation measures in the country [17].

Mazandaran Province in Iran has seen a notable rise in its population recently, driven by its advantageous location, abundant natural resources, and appeal as a tourist destination. This population increase is putting significant strain on the area's natural resources and infrastructure, particularly

concerning water and land use [18]. Meanwhile, the region is facing climate-related challenges such as higher temperatures, decreased rainfall, and more frequent droughts, which threaten water supplies, soil health, and agricultural productivity in this temperate, humid zone near the Caspian Sea. The combined effects of growing population and climate change have made Mazandaran more susceptible to environmental problems, emphasizing the need for sustainable planning and robust climate resilience measures [19].

Therefore, the aim of this study is to investigate the psychological effects of climate change on the citizens of Mazandaran Province (Iran). This study expands our knowledge on this topic, particularly in the context of providing useful information for health planners and policymakers to better adapt to the challenges of climate change.

2. Materials and Methods

2.1. Study Design and Setting

This was a descriptive-analytical cross-sectional study conducted among citizens of Mazandaran Province, Iran, in 2024. Mazandaran, located along the southern coast of the Caspian Sea, is characterized by a temperate, humid climate but has recently experienced rising temperatures, decreased rainfall, and recurrent droughts making it a relevant setting for investigating climate-related psychological responses.

2.2. Study Population and Sampling

The target population included all citizens who had resided in Mazandaran Province for more than ten years. Due to the absence of similar prior studies in Iran and the undefined nature of the target population, the sample size was determined using Morgan's table. Given the population of over three million citizens in the province, a minimum sample of 380 participants was estimated.

Questionnaires were distributed online via social networks (WhatsApp, Telegram, Gmail, Eitaa, Bale, and Instagram). The dissemination was widely conducted in citizen groups, local media, websites, and popular pages. A convenience sampling approach was used to reach individuals with access to the internet and social media. From those who voluntarily accessed the questionnaire link, participants were then selected using simple random sampling to minimize selection bias. Data collection took place between March and June 2024.

Out of 380 distributed questionnaires, 250 were fully completed and included in the final analysis, yielding a response rate of 65.8%. While this response rate is acceptable for online surveys in social sciences, the possibility of non-response bias particularly among older adults or those with limited digital literacy should be acknowledged.

2.3. Measurement Instrument

Data were collected using the Clayton Climate Change Anxiety Questionnaire [19], a validated instrument widely used to assess climate change-related psychological distress. The questionnaire consists of 22 items, each scored on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). It measures four distinct dimensions:

- Cognitive-emotional disturbances (e.g., intrusive thoughts, worry)
- Functional impairment (e.g., difficulty concentrating or functioning in daily life)
- Personal experience of climate change effects (e.g., direct exposure to extreme weather)
- Behavioral engagement (e.g., pro-environmental actions motivated by concern)

The total score ranges from 22 to 110. According to Clayton's classification, scores below 48 indicate no climate change anxiety, scores between 49 and 96 reflect moderate anxiety, and scores above 97 indicate high anxiety.

The validity of the Persian version of the questionnaire was confirmed through content validity by experts. Reliability was assessed using Cronbach's alpha, yielding an overall coefficient of 0.959. Subscale reliabilities were as follows: cognitive-emotional disturbances (0.941), behavioral engagement (0.863), personal experience (0.931), and functional impairment (0.890), all indicating excellent internal consistency.

The questionnaire also included a demographic section collecting information on age, gender, education level (categorized as high school diploma or less vs. university education), type of residence (owner vs. renter), residential location (urban vs. rural), occupation, and monthly income level (low, medium, high).

2.4. Ethical Considerations

The study was approved by the Student Research Committee of Mazandaran University of Medical Sciences (Code: IR.MAZUMS.REC.1404.099). The first page of the online questionnaire included a clear statement of the study's purpose, assurance of confidentiality, and the voluntary nature of participation. Informed consent was obtained electronically before participants could proceed to the questionnaire items. No personal identifying information was collected.

2.5. Statistical Analysis

Data were analyzed using SPSS software (version 26.0, IBM Corp., Armonk, NY, USA). Normality of the data distribution was assessed using the Kolmogorov-Smirnov test. Results indicated that the data were not normally distributed ($p < 0.05$ for all variables); therefore, non-parametric tests were employed for all inferential analyses.

- For comparisons between two independent groups (e.g., education level: university vs. high school diploma or less; gender; type of residence), the Mann-Whitney U test was used.
- For comparisons involving more than two groups (e.g., income levels: low, medium, high), the Kruskal-Wallis H test was applied.

- Correlations between continuous variables (e.g., age and anxiety scores) were examined using Spearman's rank-order correlation.

A p-value of less than 0.05 was considered statistically significant for all tests. Descriptive statistics, including mean, median, mode, standard deviation, minimum, and maximum, were calculated for each subscale and total scores.

2.6. Limitations of the Methodology

Several methodological limitations should be acknowledged. First, the online distribution method may have excluded individuals with limited internet access or lower digital literacy, particularly older adults and those in remote rural areas. Second, the convenience sampling approach, while practical, limits the generalizability of findings to the entire population of Mazandaran Province. Third, the cross-sectional design precludes any causal inferences about the relationship between climate change awareness and psychological effects. Fourth, the sample was predominantly female (79.2%), which, while reflecting the higher voluntary participation of women in online health surveys, may not accurately represent the gender distribution of climate anxiety in the general population. Finally, self-reported data are subject to recall and social desirability biases.

3. Results

3.1. Participants' Demographic Characteristics

A total of 250 participants fully completed the questionnaire and were included in the final analysis. As shown in Table 1, the majority of participants were female (198, 79.2%), while males comprised 52 (20.8%). Regarding education level, nearly half of the participants held a bachelor's degree (113, 45.2%), followed by those with a high school diploma (49, 19.6%), master's degree (39, 15.6%), PhD (24, 9.6%), associate degree (11, 4.4%), middle school (9, 3.6%), primary school (2, 0.8%), and illiterate (3, 1.2%). For analytical purposes, participants were divided into two educational groups: Group 1 (university education: associate degree to PhD) and Group 2 (high school diploma or less). In terms of income, 138 participants (55.2%) reported a medium income level, 80 (32.0%) reported low income, and 32 (12.8%) reported high income. The majority lived in urban areas (193, 77.2%) compared to rural areas (57, 22.8%), and most were homeowners (200, 80.0%) rather than renters (50, 20.0%). The age distribution of participants is presented as a histogram in Fig. 1, with a mean age of 30.92 ± 12.22 years.

Table 1
Demographic Characteristics of Study Participants (n = 250)

Characteristic	Subcategory	Frequency (n)	Percentage (%)
Gender	Male	52	20.8
	Female	198	79.2
Education Level	Illiterate	3	1.2
	Primary school	2	0.8
	Middle school	9	3.6
	High school diploma	49	19.6
	Associate degree	11	4.4
	Bachelor's degree	113	45.2
	Master's degree	39	15.6
	PhD	24	9.6
Income Level	High	32	12.8
	Medium	138	55.2
	Low	80	32.0
Residence Location	Rural	57	22.8
	Urban	193	77.2
Type of Residence	Owner	200	80.0
	Renter	50	20.0

3.2. Normality Assessment

Prior to conducting inferential analyses, the normality of the data distribution was examined using the Kolmogorov-Smirnov test. The results indicated that the data were not normally distributed for any of the study variables ($p < 0.05$ for all). Consequently, non-parametric tests—specifically the Mann-Whitney U test for two-group comparisons and the Kruskal-Wallis H test for comparisons involving more than two groups—were employed for all inferential statistical analyses.

3.3. Descriptive Statistics of Climate Change Anxiety

Table 2 presents the descriptive statistics for the total climate change anxiety score and its four subscales. The mean total score for climate change-related psychological effects among citizens of Mazandaran Province was 49.24 (SD = 13.58). According to Clayton's classification (Table 3), this falls within the range of 49–96, indicating a moderate level of climate change-related anxiety in the studied population.

Among the four subscales, functional impairment had the highest mean score (19.33, SD = 4.73, on a scale with a maximum of 30), followed by cognitive-emotional disturbances (14.78, SD = 5.69, scale maximum 40), behavioral engagement (8.21, SD = 3.78, scale maximum 25), and personal experience (6.90, SD = 3.02, scale maximum 15). It is important to note that direct comparison across subscales should be made with caution, as each subscale has a different possible score range. When interpreted proportionally (i.e., mean score divided by maximum possible score), the data suggest that functional impairment (64.4% of maximum) and cognitive-emotional disturbances (37.0% of maximum) represent the most prominent domains of climate anxiety in this sample.

The wide range of total scores (minimum = 6, maximum = 110) indicates substantial individual variability in climate change-related psychological distress among participants.

Table 2
Descriptive Statistics of Climate Change Anxiety and Subscales (n = 250

Parameter	**Cognitive-Emotional Disturbances**	**Functional Impairment**	**Personal Experience**	**Behavioral Engagement**	**Total Climate Anxiety Score**
Number of participants	250	250	250	250	250
Mean	14.78	19.33	6.90	8.21	49.24
Median	14.00	20.00	6.00	7.00	48.00
Mode	8.00	18.00	3.00	5.00	54.00
Standard deviation	5.69	4.73	3.02	3.78	13.58
Minimum	8.00	6.00	3.00	5.00	6.00
Maximum	40.00	30.00	15.00	25.00	110.00
Possible score range	8–40	6–30	3–15	5–25	22–110
% of maximum score	37.0%	64.4%	46.0%	32.8%	44.8%

Table 3
Classification of Climate Change Anxiety Based on Total Score (Clayton, 2020)

Status	Score Range
No climate change anxiety	Less than 48
Moderate climate change anxiety	49–96
High climate change anxiety	More than 97

3.4. Association Between Demographic Variables and Climate Change Anxiety

Mann-Whitney U tests were conducted to examine the relationship between binary demographic variables (gender, residence location, type of residence) and climate anxiety subscales. Kruskal-Wallis H tests were used for variables with more than two categories (income level). Spearman's rank-order correlation was used to assess the relationship between age (as a continuous variable) and anxiety scores.

As summarized in Table 4, no statistically significant associations were found between any of the demographic variables—including age (rho = -0.082, p = 0.198 for total score), gender (U = 4752.5, p = 0.467 for total score), occupation, income level (H = 1.342, p = 0.511 for total score), residential location (urban vs. rural), or type of residence (owner vs. renter)—and the total climate anxiety score or any of its four subscales ($p \geq 0.05$ for all comparisons). These findings suggest that, in this sample, climate change-related psychological distress is not systematically influenced by sociodemographic factors such as age, gender, or economic status.

Table 4
Association Between Demographic Variables and Climate Change Anxiety Subscales (p-values)

Demographic Variable	Cognitive-Emotional Disturbances	Functional Impairment	Personal Experience	Behavioral Engagement	Total Score
Age (Spearman's rho)	0.184	0.421	0.312	0.287	0.198
Gender (Mann-Whitney U)	0.342	0.521	0.289	0.401	0.467
Income level (Kruskal-Wallis H)	0.237	0.108	0.412	0.335	0.511
Residence location (urban vs. rural)	0.625	0.742	0.538	0.691	0.683
Type of residence (owner vs. renter)	0.812	0.895	0.763	0.847	0.856
All p-values ≥ 0.05, non-significant.					

3.5. Effect of Education Level on Climate Change Anxiety

Given the lack of significant findings for other demographic variables, we specifically examined the role of education level, as prior literature has suggested that climate awareness—often associated with higher education—may influence climate anxiety. Participants were divided into two groups: Group 1 (university education, n = 187, including associate degree to PhD) and Group 2 (high school diploma or less, n = 63, including illiterate through high school diploma).

As shown in Table 5, Mann-Whitney U tests revealed statistically significant differences between the two educational groups for three of the four subscales:

- **Cognitive-emotional disturbances**: Group 1 reported significantly higher scores than Group 2 (p = 0.005)
- **Personal experience**: Group 1 reported significantly higher scores than Group 2 (p = 0.008)
- **Behavioral engagement**: Group 1 reported significantly higher scores than Group 2 (p = 0.033)

However, for functional impairment, no statistically significant difference was observed between the two groups (p = 0.142). This suggests that while university-educated individuals experience more cognitive, emotional, and behavioral responses to climate change, the degree to which these responses interfere with daily functioning does not differ by education level.

Table 5
Comparison of Climate Change Anxiety Subscales Between Education Groups (Mann-Whitney U Test)

Variable	Sum of Squares	df	Mean Square	F-statistic	p-value (Sig.)	Interpretation
Cognitive-emotional disturbances	5.26	2	2.63	5.38	**0.005**	Significant
Functional impairment	3.89	2	1.95	3.46	**0.033**	Significant
Personal experience	9.65	2	4.82	4.93	**0.008**	Significant
Behavioral engagement	2.43	2	1.22	1.97	0.142	Non-significant

Note: Group 1 = university education (associate degree to PhD, n = 187); Group 2 = high school diploma or less (n = 63). Significant p-values (< 0.05) are shown in bold.

4. Discussion

The present study aimed to investigate the psychological effects of climate change among citizens of Mazandaran Province, Iran a region increasingly vulnerable to environmental shifts such as rising temperatures, decreased rainfall, and recurrent droughts. Our findings revealed that participants reported a moderate level of climate change-related anxiety (mean total score = 49.24), with functional impairment and cognitive-emotional disturbances emerging as the most prominent domains. Notably, while demographic variables such as age, gender, income, and residence type showed no significant associations with climate anxiety, education level emerged as a distinguishing factor: university-educated individuals reported significantly higher levels of cognitive-emotional disturbances, personal experience, and behavioral engagement compared to those with lower educational attainment. Below, we discuss these findings in relation to existing literature, interpret their implications, and acknowledge the study's limitations.

4.1. Overall Level of Climate Change Anxiety

The mean total score of 49.24 (out of a possible 110) places the average participant in the "moderate climate change anxiety" category according to Clayton's classification [19]. This finding aligns with studies from other climate-vulnerable regions. For instance, Tam et al. (2023) reported moderate to high levels of climate anxiety in China and India countries with significant environmental pressures similar to Iran [20]. However, the mean score in our sample is somewhat lower than that reported among environmental science students in the United Kingdom [21] and young adults in the United States [12], which may reflect differences in sample composition, cultural attitudes toward climate change, or varying levels of media exposure. Importantly, nearly half of our sample (44.8% of the maximum possible score) reported some degree of climate-related distress. This suggests that even in a province not typically associated with extreme desertification unlike southern or central Iran climate change is already

affecting mental health. Given that Mazandaran has historically enjoyed a temperate, humid climate, the perception of environmental change may be particularly unsettling for long-term residents, as it disrupts their expectations of local stability.

4.2. Domains of Climate Anxiety: Functional Impairment as the Most Prominent Finding

A noteworthy finding was that functional impairment (mean = 19.33, 64.4% of its maximum possible score) was the highest-rated subscale, followed by cognitive-emotional disturbances (mean = 14.78, 37.0% of its maximum). This pattern differs from some previous studies where cognitive-emotional symptoms (e.g., worry, intrusive thoughts) typically dominate [2, 22]. The relatively high functional impairment score in our sample suggests that climate change is not merely a source of abstract worry for citizens of Mazandaran; rather, it may be interfering with daily activities such as concentration at work, decision-making, or social functioning.

One possible explanation is that participants in our study have directly or indirectly experienced tangible consequences of climate change such as reduced agricultural yields, water shortages, or economic instability which translate into measurable functional difficulties. This interpretation is consistent with research by Vecchio et al. (2022), who found that prolonged exposure to climate-related adverse conditions can shift non-clinical mental health issues toward clinically significant functional impairment[23]

The relatively lower score for behavioral engagement (mean = 8.21, 32.8% of maximum) is also worth noting. This may indicate that while participants experience distress and functional difficulties, they may not feel empowered or able to engage in pro-environmental actions a phenomenon sometimes referred to as "eco-paralysis" [7]. Alternatively, cultural or structural factors (e.g., limited access to recycling facilities, low civic engagement opportunities) might constrain behavioral responses to climate concern in this setting.

4.3. The Role of Education: An Unexpected but Consistent Finding

One of the most consistent findings in this study was the significant association between university education and higher scores on three of the four climate anxiety subscales: cognitive-emotional disturbances, personal experience, and behavioral engagement ($p \leq 0.05$ for all). This pattern aligns with several recent studies. Daeninck et al. (2023) found that environmental science students in the UK reported higher climate anxiety than their non-environmental science peers, partly because their education made them more aware of the severity and urgency of climate change[21]. Similarly, Ramírez-López et al. (2023) reported that greater climate knowledge is associated with heightened emotional responses [24].

Why might university education be associated with greater climate anxiety? Several mechanisms are plausible. First, higher education particularly university-level science education often includes exposure to environmental issues, climate models, and future projections, which can increase awareness of risks [38]. Second, educated individuals may have greater access to climate-related information through digital media, academic networks, or professional circles. Third, critical thinking skills developed in university settings may lead individuals to more deeply process the implications of climate change, resulting in greater emotional engagement. Importantly, however, functional impairment did not differ significantly between educational groups ($p = 0.142$). This suggests that while university-educated individuals experience more cognitive, emotional, and behavioral responses to climate change, these responses do not necessarily translate into greater disruption of daily functioning. In other words, educated individuals may worry more and take more action, but they may also possess better coping strategies or resources that buffer the functional impact of that worry. This interpretation is consistent with the concept of "adaptive anxiety" where concern motivates action without becoming debilitating [7].

The lack of a significant relationship between functional impairment and education also has practical implications. If functional impairment is equally distributed across educational groups, then mental health interventions aimed at reducing climate-related functional difficulties should target the general population rather than focusing exclusively on educated subgroups.

4.4. The Absence of Significant Demographic Associations: Age, Gender, and Income

Contrary to some previous studies, we found no statistically significant associations between climate anxiety and age, gender, or income. While women in our sample had higher raw scores on several subscales (consistent with studies by Man et al., 2024 [25] and Clayton et al., 2021 [11]), these differences did not reach statistical significance ($p \geq 0.05$). This null finding may be attributable to the small number of male participants ($n = 52$, 20.8%), which reduced statistical power to detect gender differences. Alternatively, it is possible that in the cultural context of Mazandaran Province, gender roles do not differentially shape climate concern as strongly as they do in Western societies.

Regarding age, our findings diverge from studies that report higher climate anxiety among younger individuals [11, 20]. Tam et al. (2023) found that climate anxiety was stronger among younger individuals in India and the United States, while in China it was more prevalent among older adults [20]. Our null finding may reflect the relatively narrow age range of our sample or the fact that age-related differences in climate concern are context-dependent and may not generalize to northern Iran.

For income, our finding of no significant association aligns with Tam et al. (2023), who also reported no meaningful relationship between climate anxiety and income level [20]. This suggests that climate concern may cut across socioeconomic strata, perhaps because the perceptual and emotional drivers of climate anxiety (e.g., media exposure, personal observations of weather changes) are not strongly correlated with income.

4.5. Type and Location of Residence

We found no significant associations between climate anxiety and urban versus rural residence, or between homeownership status (owner vs. renter). This was somewhat unexpected, as rural residents particularly farmers and those dependent on natural resources might be expected to experience greater climate anxiety due to direct livelihood impacts [26]. However, it is possible that rural residents in Mazandaran have developed adaptive coping strategies over generations, or that our sample size for rural participants (n = 57, 22.8%) was insufficient to detect existing differences. Additionally, urban residents may experience climate anxiety through different pathways, such as concerns about air pollution, heat islands, or infrastructure vulnerability [16].

4.6. Comparison with Regional and International Studies

Our findings are broadly consistent with the growing body of literature on climate change and mental health. Walinski et al. (2023), in a narrative review of 128 studies, concluded that extreme weather events and chronic climate stressors increase risks of affective and anxiety disorders, particularly post-traumatic stress disorder [8]. Similarly, Clayton and Parnes (2025) emphasized that awareness of climate threats can lead to feelings of anxiety, weakened social ties, and interpersonal conflicts, but also noted that this awareness can inspire activism which in turn benefits mental well-being [9].

In the Iranian context, our study fills an important gap. While previous research has documented the environmental and economic impacts of climate change in Iran [13, 17], no study has systematically assessed climate-related psychological distress in any province. Our finding that Mazandaran citizens report moderate levels of climate anxiety suggests that the psychological dimensions of climate change are already present in relatively less arid regions of the country. This has implications for health policymakers, who may need to expand mental health services to address climate-related distress even in areas not traditionally associated with desertification or drought.

4.7. Implications for Policy and Practice

Several practical implications arise from our findings. First, given that functional impairment was the most prominent domain of climate anxiety, screening for climate-related functional difficulties could be integrated into routine primary care or community mental health services in vulnerable regions. Second, the significant association between education and climate anxiety suggests that universities and colleges should provide mental health resources specifically tailored to students and staff who study or work on environmental topics. As Ojala et al. (2021) note, climate anxiety in sustainability education can sometimes be severe and even overshadow academic or personal concerns [7].

Third, the absence of significant differences across income levels suggests that climate anxiety is not a "luxury concern" limited to affluent populations. Public health campaigns should therefore avoid framing climate anxiety as an elite preoccupation and instead address it as a widespread phenomenon affecting all socioeconomic strata. Fourth, strengthening social and economic infrastructures such as community

support networks, climate-resilient livelihoods, and accessible mental health services can help enhance community resilience to the psychological challenges posed by climate change [19].

4.8. Limitations of the Study

Several limitations should be considered when interpreting our findings. First, the cross-sectional design precludes any causal inferences. We cannot determine whether climate anxiety leads to greater educational attainment, whether education increases climate anxiety, or whether a third variable (e.g., socioeconomic status, media exposure) influences both. Longitudinal studies are needed to establish temporal relationships.

Second, the online distribution method may have introduced selection bias. Individuals without internet access or with limited digital literacy particularly older adults, rural residents, and those with lower socioeconomic status were likely underrepresented. This may explain why we found no age or income effects; the true population may show such differences, but our sampling method failed to capture them.

Third, the sample was predominantly female (79.2%). While this reflects the higher voluntary participation of women in online health surveys, it limits the generalizability of our findings to the male population of Mazandaran Province.

Fourth, self-reported data are subject to recall bias and social desirability bias. Participants may have over- or under-reported climate anxiety based on perceived social norms.

Fifth, the convenience sampling approach, while practical, means that our findings may not be representative of all citizens of Mazandaran Province. Future studies should employ stratified random sampling to ensure broader generalizability.

Finally, the Clayton Climate Change Anxiety Questionnaire, while validated, is a self-report measure rather than a clinical diagnostic tool. Our findings should not be interpreted as indicating clinical prevalence of anxiety disorders, but rather as reflecting a continuum of climate-related distress.

4.9. Directions for Future Research

Future research should address the limitations of the present study. Longitudinal studies are needed to examine how climate anxiety evolves over time and whether it predicts subsequent mental health outcomes. Qualitative studies could explore the lived experiences of climate anxiety in the Iranian cultural context, including how individuals make meaning of environmental changes and what coping strategies they find helpful. Comparative studies across different Iranian provinces ranging from arid regions (e.g., Khuzestan, Sistan and Baluchestan) to humid regions (e.g., Gilan, Golestan) could identify context-specific risk and protective factors. Finally, intervention studies should evaluate whether psychoeducation, cognitive-behavioral techniques, or community-based programs can reduce climate-related functional impairment while preserving the adaptive aspects of climate concern.

5. Conclusion

This descriptive-analytical cross-sectional study revealed that citizens of Mazandaran Province, Iran, experience a moderate level of climate change-related anxiety (mean total score = 49.24 out of 110), with functional impairment emerging as the most prominent domain, followed by cognitive-emotional disturbances. No statistically significant associations were found between climate anxiety and demographic variables including age, gender, income, occupation, residential location, or type of residence. However, education level significantly distinguished participants: university-educated individuals reported higher levels of cognitive-emotional disturbances, personal experience, and behavioral engagement compared to those with a high school diploma or less ($p \leq 0.05$), while functional impairment did not differ significantly between the two groups ($p \geq 0.05$), suggesting that educated individuals experience greater cognitive and emotional responses to climate change without necessarily experiencing more daily functional disruption. These findings carry important implications for policy and practice: screening for climate-related functional difficulties should be integrated into routine primary care and community mental health services, particularly in climate-vulnerable regions; universities should establish targeted mental health support systems for students and staff in environmentally-focused programs; public health campaigns should normalize climate distress as a widespread phenomenon affecting all socioeconomic strata rather than an elite concern; and social and economic infrastructures including community support networks, climate-resilient livelihood programs, and both digital and offline mental health resources must be strengthened to enhance community resilience. Future research should employ longitudinal designs to examine causal relationships, qualitative methods to explore lived experiences of climate anxiety in the Iranian cultural context, comparative studies across different Iranian provinces to identify context-specific risk factors, and intervention studies to evaluate the effectiveness of psychoeducation, cognitive-behavioral techniques, and collective environmental activism in reducing functional impairment while preserving adaptive aspects of climate concern. Addressing the psychological dimensions of climate change must become an integral component of national climate adaptation strategies, as mental health infrastructure is equally critical to protecting human well-being and social cohesion as physical and economic resilience in an era of unprecedented ecological transformation.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki. The research protocol was approved by the Student Research Committee of Mazandaran University of Medical Sciences (Approval Code: IR.MAZUMS.REC.1404.099). Informed consent was obtained electronically from all individual participants included in the study. The first page of the online questionnaire explained the study purpose, assured confidentiality, and stated that participation was voluntary; completion of the questionnaire constituted informed consent.

Consent to participate

All participants provided informed consent electronically before completing the questionnaire.

Human Ethics and Consent to Participate declarations

Not applicable (all required ethics approvals and consents are provided above).

Competing interests

The authors declare no competing interests.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was supported by the Vice Chancellery for Research and Technology at Mazandaran University of Medical Sciences solely in the form of administrative and institutional support, not financial funding.

Author Contribution

Hanieh Badakhshanian-Fard: Conceptualization, Formal analysis, Investigation, Writing - Original Draft, Writing - Review and Editing, Visualization Atefeh Jabbari: Methodology, Validation, Investigation, Resources, Writing - Review and Editing. Kosar Kouhi: Conceptualization, Investigation, Writing - Original Draft, Writing - Review and Editing, Fathollah Gholami-Borujeni: Supervision, Methodology, Validation, Investigation, Resources, Writing - Original Draft, Writing - Review and Editing.

Acknowledgement

This article is derived from a research project entitled "Investigating the Psychological Effects of Climate Change on the Residents of Mazandaran Province," approved by the Student Research Committee of Mazandaran University of Medical Sciences (Code: IR.MAZUMS.REC.1404.099) in 2024. The study was conducted with the support of the Vice Chancellery for Research and Technology at Mazandaran University of Medical Sciences.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. Wei J, et al. Perception, attitude and behavior in relation to climate change: a survey among CDC health professionals in Shanxi province, China. Environ Res. 2014;134:301–8.
2. Clayton S. Climate anxiety: Psychological responses to climate change. J Anxiety Disord. 2020;74:102263.
3. Doherty TJ, Clayton S. The psychological impacts of global climate change. Am Psychol. 2011;66(4):265.
4. Ricart S, Olcina J, Rico AM. Evaluating public attitudes and farmers' beliefs towards climate change adaptation: Awareness, perception, and populism at European level. Land. 2018;8(1):4.
5. Rehman T et al. *Knowledge, perception and attitude in relation to climate change: a cross-sectional survey.* 2021.
6. Helm SV, et al. Differentiating environmental concern in the context of psychological adaption to climate change. Glob Environ Change. 2018;48:158–67.
7. Ojala M, et al. Anxiety, worry, and grief in a time of environmental and climate crisis: A narrative review. Annu Rev Environ Resour. 2021;46(1):35–58.
8. Walinski A, et al. The effects of climate change on mental health. Deutsches Ärzteblatt international. 2023;120(8):117.
9. Clayton S, Parnes MF. Anxiety and activism in response to climate change. Curr Opin Psychol. 2025;62:101996.
10. Hayes K, et al. Climate change and mental health: risks, impacts and priority actions. Int J mental health Syst. 2018;12:1–12.
11. Clayton SD, et al. Psychological and emotional responses to climate change among young people worldwide: Differences associated with gender, age, and country. Sustainability. 2023;15(4):3540.
12. Schwartz SE, et al. Climate change anxiety and mental health: Environmental activism as buffer. Curr Psychol. 2023;42(20):16708–21.
13. Doulabian S, et al. Evaluating the effects of climate change on precipitation and temperature for Iran using RCP scenarios. J Water Clim Change. 2021;12(1):166–84.
14. Karimi V, Karami E, Keshavarz M. Climate change and agriculture: Impacts and adaptive responses in Iran. J Integr Agric. 2018;17(1):1–15.
15. Sajjadi H, et al. Impact of climate change on health in different climate of Iran. Nivar. 2020;44(108–109):115–21.
16. Sarvari H. A survey of relationship between urbanization and climate change for major cities in Iran. Arab J Geosci. 2019;12(4):131.
17. Mansouri Daneshvar MR, Ebrahimi M, Nejadsoleymani H. An overview of climate change in Iran: facts and statistics. Environ Syst Res. 2019;8(1):1–10.

18. Dadashpoor H, Salarian F. Urban sprawl on natural lands: Analyzing and predicting the trend of land use changes and sprawl in Mazandaran city region, Iran. Volume 22. Environment, Development and Sustainability; 2020. pp. 593–614.
19. Goli I, et al. Contributions of Climate Smart Agriculture Toward Climate Change Adaptation and Food Security: The Case of Mazandaran Province, Iran. Trends in Food Science & Technology; 2024. p. 104653.
20. Tam K-P, Chan H-W, Clayton S. Climate change anxiety in China, India, Japan, and the United States. J Environ Psychol. 2023;87:101991.
21. Daeninck C, Kioupi V, Vercammen A. Climate anxiety, coping strategies and planning for the future in environmental degree students in the UK. Front Psychol. 2023;14:1126031.
22. Clayton S, Karazsia BT. Development and validation of a measure of climate change anxiety. J Environ Psychol. 2020;69:101434.
23. Vecchio EA, Dickson M, Zhang Y. Indigenous mental health and climate change: A systematic literature review. J Clim Change Health. 2022;6:100121.
24. Ramírez-López AS, Rosetti MF, Poma A. Gender, exposure to news, knowledge about climate change, and prosociality predict climate anxiety scores in Mexican students. Ecopsychology. 2023;15(2):184–92.
25. Man LL, et al. Eco-Depression and Eco-Anxiety Among Youth: A Sex and Gender Analysis. Can J Psychiatry. 2024;69(11):831–3.
26. Nath PK, Behera B. A critical review of impact of and adaptation to climate change in developed and developing economies. Environ Dev Sustain. 2011;13:141–62.

Figures

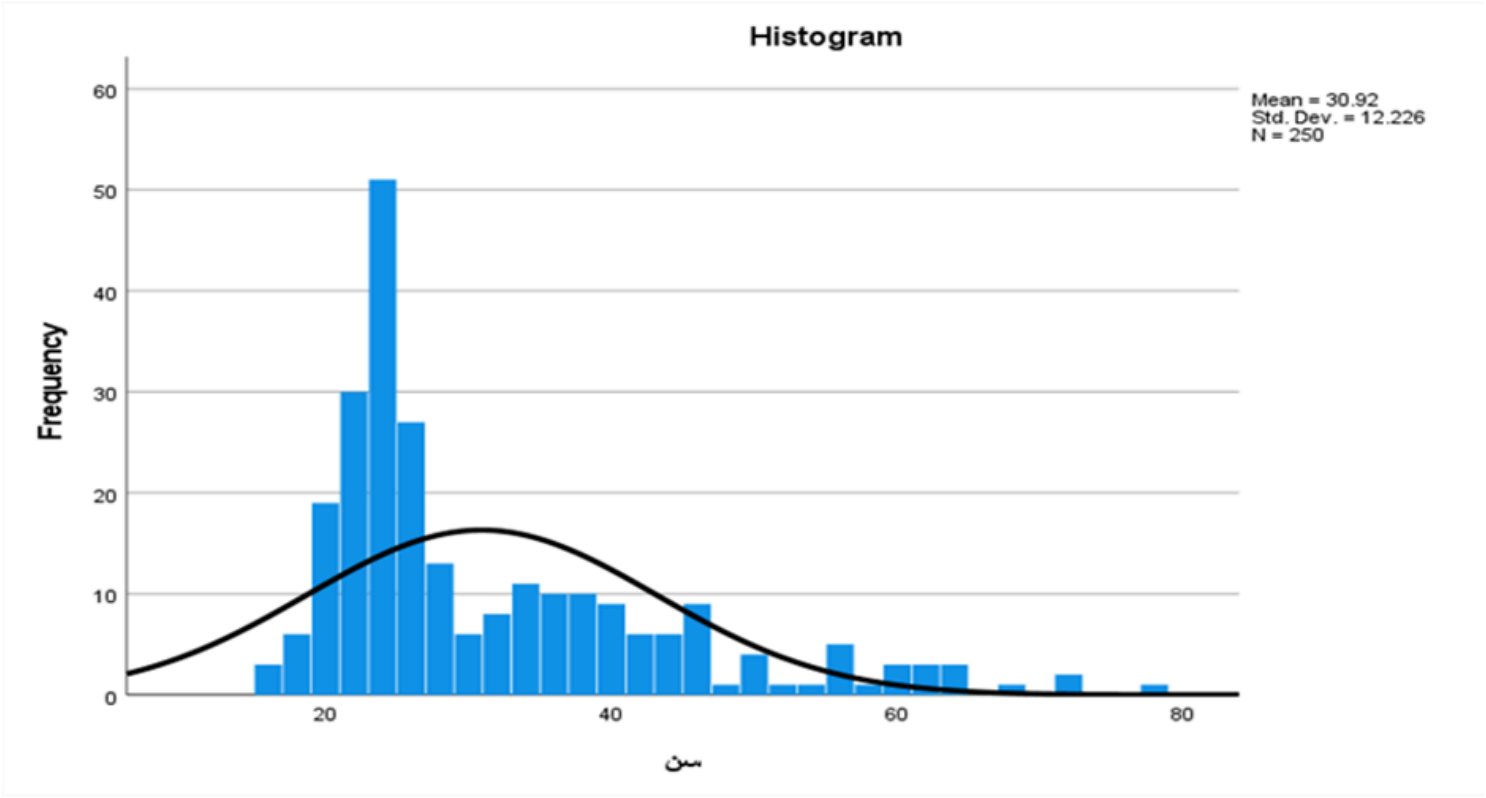


Figure 1

Age Distribution of Study Participants