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Anxiety and hopelessness levels related to climate change in oncology patients

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ABSTRACT

Aims: Anxiety related to an uncertain and changing natural environment is defined as climate change anxiety. Oncology patients may experience the effects of climate change both directly and indirectly, which can negatively impact their mental well-being. According to Beck's Cognitive Model, persistent exposure to stressors, such as climate change-related disruptions, may lead to negative automatic thoughts, reinforcing feelings of anxiety and hopelessness. This theoretical framework supports the exploration of the relationship between climate change anxiety and hopelessness. This study aimed to examine the relationship between climate change anxiety, conceptualized as a secondary stressor, and hopelessness among patients receiving oncology treatment, as well as to identify sociodemographic and clinical factors associated with hopelessness.

Methods: This descriptive cross-sectional study was conducted with 203 patients undergoing treatment in an oncology clinic. Patients' anxiety regarding climate change and hopelessness levels were assessed using the Beck Hopelessness Scale (BHS) and the Climate Change Anxiety Scale (CCAS). The study was reported in accordance with the STROBE checklist.

Results: Sixty-four percent of the participants were between the ages of 45 and 59, with the majority being women. Climate change anxiety and hopelessness levels were found to be moderate. According to the hierarchical regression analysis, the duration of cancer treatment were significant predictors of hopelessness. Additionally, when climate change anxiety was included in the model, the explanatory power increased. This finding suggests that higher climate anxiety is associated with an increase in hopelessness levels.

Conclusion: The findings indicate that when climate change anxiety is conceptualized as a secondary contextual stressor, it is associated with hopelessness in oncology patients; however, its relative impact remains limited compared to cancer-related factors. These results underscore the importance of considering broader environmental concerns as part of the psychological context influencing emotional well-being in clinical populations.

Keywords: Climate change, oncology patients, hopelessness level, climate anxiety

INTRODUCTION

Climate change encompasses phenomena such as rising global temperatures, sea level rise, and an increase in the frequency of extreme weather events. These changes-including elevated temperatures, droughts, floods, wildfires, and other disasters-negatively impact ecosystems and public health, increasing the risk of numerous diseases, including cardiovascular, respiratory, and cancer-related Conditions (Limaye, 2021; Schiller, 2024). Furthermore, climate change exacerbates the burden on healthcare systems, disrupting medical services and hindering access to critical treatments. Oncology patients, who often require long-term and specialized care, are particularly vulnerable to these disruptions (Schiller, 2024).

The effects of climate change not only contribute to the rise in disease incidence but also interfere with cancer treatment (Schiller 2024). Environmental disasters, extreme weather conditions, and healthcare system breakdowns can delay or limit access to necessary therapies, thereby intensifying the psychological distress experienced by oncology patients. Research has shown that impeded access to treatment and disrupted communication with healthcare teams due to climate crises and natural disasters can lead to increased anxiety and despair among oncology patients (Ginex et al., 2023; Jemal et al., 2019; Karabulut Gul et al., 2024). In addition, extreme weather events and disasters can result in the destruction of healthcare infrastructure, affecting energy and communication systems and further delaying cancer treatment (Lynch & Merdjanoff, 2023). These challenges amplify feelings of hopelessness among oncology patients, a population already at heightened psychological risk due to the physical and emotional burden of their illness. Cancer itself accounts for approximately 10% of global deaths, and climate-related disruptions in healthcare may exacerbate patient

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suffering, increasing both anxiety and hopelessness (Jemal et al., 2019; Ogunbode et al., 2022).

Recent research highlights the psychological toll of climate change, demonstrating that uncertainty about the future triggers a condition known as climate change anxiety (Jemal et al., 2019). This form of anxiety not only intensifies emotional distress and concerns about environmental issues but may also contribute to a broader sense of hopelessness. According to Beck's Cognitive Model, persistent exposure to stressors, such as climate-related disruptions in healthcare, can foster negative automatic thoughts, reinforcing feelings of anxiety and hopelessness (Beck, 1970). Within this framework, individuals experiencing high levels of climate change anxiety may develop an increased sensitivity to climate-related threats, exacerbating their general anxiety and leading to more pronounced feelings of hopelessness.

Climate change anxiety can be considered a secondary contextual stressor for oncology patients, as it is not directly related to the disease itself but may increase the existing stress burden. In line with Beck's Cognitive Model, environmental and societal uncertainties accompanying primary stressors such as a cancer diagnosis and its treatment may create a basis for the development of negative automatic thoughts. In this context, anxiety related to climate change may influence overall anxiety levels by increasing perceptions of uncertainty about the future and may intensify feelings of hopelessness. However, this effect is considered to be more limited and indirect compared to cancer-related clinical and psychosocial factors (Dickman et al., 2022; Hawaamdah & Fowler, 2023; Karabulut Gul et al., 2024; Samba et al., 2023).

Research Questions

What is the level of climate change anxiety among oncology patients?

What is the level of hopelessness among oncology patients?

Does climate change anxiety affect the level of hopelessness among oncology patients?

METHODS

Ethics

This study was conducted with the approval of the Ethics Committee for Non-interventional Clinical Researches at İzmir Bakırçay University (Date: 10.07.2024, Decision No: 1663). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Written informed consent was obtained from all individual participants prior to their inclusion in the study.

Design

This descriptive cross-sectional study was conducted in the oncology clinic of a hospital between July and October 2024. The study was reported in accordance with the STROBE checklist.

Participants and Setting

The sample size was calculated using an approach for an unknown total population. Using the G*Power program with a 95% confidence level, 5% margin of error, and 11.8% population proportion, the required sample size was determined to be at least 169 participants. To account for potential sample loss, a 20% additional participant rate recommended in the literature was applied, setting the target sample size at 202 participants (Unvar, 2019).

A total of 250 patients were screened for eligibility. After screening, 20 patients were deemed ineligible, and 27 declined to participate. Ultimately, 203 patients were included in the analysis (**Figure**).

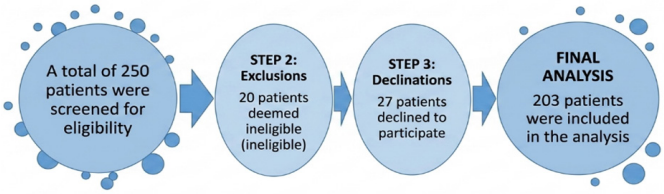

Figure. Flowchart of the study participants

The inclusion criteria were as follows: being hospitalized in the oncology clinic, aged 18 years or older, and possessing sufficient cognitive and language ability to answer the questions.

Instruments

Data were collected from patients selected through convenience sampling. The instruments used included the "Climate Change Anxiety Scale," the "Beck Hopelessness Scale," and a "Patient information form" prepared by the researchers. The data collection process, conducted face-to-face, took approximately 15-20 minutes.

Patient Information Form

Developed by the researchers based on a review of the literature, this form contains questions about demographic characteristics (e.g., gender, age, marital status, presence of children, education level, occupation, employment status, economic status, social security, place of residence, living arrangements) (Yıldırım et al., 2009).

Climate Change Anxiety Scale

Developed by Stewart (2021) to measure climate change anxiety, this scale was adapted into Turkish by Gezer and İlhan (2021). It comprises two subdimensions-Anxiety (items 1, 2, 3, 4, 5, 8, 10) and Helplessness (items 6, 7, 9)-with a total of 10 items rated on a five-point Likert scale ranging from "never" (1) to "always" (5). The Cronbach's alpha coefficients were 0.87 for the Anxiety subdimension, 0.83 for Helplessness, and 0.91 for the overall scale. Scores range from 10 to 50, with higher scores indicating higher levels of climate change anxiety (Gezer & İlhan, 2021).

Beck Hopelessness Scale

This scale, developed by Beck et al. (1971), measures pessimism about the future and consists of 20 items categorized into three subdimensions: Feelings and Expectations about the Future, Loss of Motivation, and Hopelessness. Items are answered as true or false, with total scores ranging from 0 to 20. Higher scores indicate greater hopelessness. Scores are categorized as follows: 0-3 minimal, 4-8 mild, 9-14 moderate, and >15 severe hopelessness.

Statistical Analysis

Data were analyzed using SPSS 22.0. First, the distribution of the scale subdimension and total scores was examined for normality using skewness and kurtosis values, confirming a normal distribution. For hypothesis testing, independent sample t-tests were used to compare two groups, and one-way ANOVA was applied for comparisons among more than two groups. LSD post hoc tests were conducted to identify specific group differences in ANOVA analyses. Pearson correlation analysis was performed to assess relationships between variables.

To examine relationships between the dependent variable (Beck Hopelessness Scale [BHS] score) and independent variables (Climate Change Anxiety Scale [CCAS] score, and demographic characteristics such as age, gender, education, and income), hierarchical regression analysis was conducted. Model fit was evaluated using R^2 and Adjusted R^2 values. A p-value <0.05 was considered statistically significant for all analyses.

The internal consistency of the scales was assessed using Cronbach's alpha coefficient. The Cronbach's alpha values were 0.816 for the CCAS and 0.896 for the BHS, indicating good to excellent reliability.

RESULTS

Participants' Characteristics

The demographic and clinical characteristics of the 203 oncology patients included in the study are presented in Table 1. More than half of the participants (64.0%) were aged between 45 and 59 years, and the majority were female. Most patients were diagnosed with rare cancer types (e.g., pancreatic, biliary, thyroid), with treatment durations generally ranging from 1 to 5 years.

Comparison of CCAS and BHS Scores Table 2 summarizes the comparison of the CCAS and BHS scores based on patients' characteristics.

Climate change anxiety: The analysis revealed significant differences in CCAS scores based on education, occupation, and income levels ($p<0.05$). University graduates, administrative employees, and patients with income exceeding their expenses demonstrated significantly higher CCAS scores. Furthermore, patients diagnosed with breast cancer or rare cancer types reported higher levels of climate-related helplessness compared to other cancer types.

Hopelessness: Regarding BHS scores, married patients, those with primary education, and patients with a cancer treatment duration of 1-5 years exhibited significantly higher total BHS scores ($p<0.05$). Patients with head and neck cancer displayed higher levels of hopelessness compared to other diagnosis groups. No significant differences were found between sex and total scale scores ($p>0.05$).

Descriptive Statistics of the Scales

The descriptive statistics for the scales and their sub-dimensions are presented in Table 3. The mean total score for the CCAS was 19.52 (SD=8.41), while the mean total score

Table 1. Sociodemographic characteristics of patients (n=203)

Variables	Category	Mean±SD (n=203)	
		n	%
Age	15-24	6	3
	25-45	29	14.30
	45-59	130	64
	60 year and above	38	15.80
Gender	Female	103	53.2
	Male	94	46.3
Marital status	Married	173	85.2
	Single	27	13.3
Number of children	0	18	8.9
	1 and 2	142	69.2
	3 and above	43	21.2
Household composition	Spouse	89	43.8
	Child	3	1.5
	Spouse and child	92	39.4
	Parents	3	1.5
	Grandparents	9	4.4
	Alone	13	6.4
	Other	6	3
Education level	Illetrate	5	2.5
	Primary school graduate	21	10.3
	Middle school graduate	65	32
	High school graduate	78	38.4
	University and above	34	16.8
Occupation	Husewife	34	16.7
	Worker	2	1.0
	Civil servant	26	12.8
	Retired	98	48.3
	Other	43	21.2
Health insurance	Yes	182	89.7
	No	21	10.3
Economic status	Income less than expenses	16	7.9
	Income equal to expenses	122	60.1
	Income more than expenses	65	32
Cancer type	Breast cancer	21	16.5
	Lung cancer	13	9.4
	Colon cancer	6	4.7
	Prostate cancer	20	15.7
	Liver	7	4.7
	Rare (pancreas, gallbladder, thyroid)	21	29.9
	Head and neck cancer	2	1
	Skin	10	4.9
	female reproductive system	9	4.4
	Other	8	3.9
Cancer treatment duration	6 month-1 year	45	22.2
	1-5 year	115	74.4
	6-10 year	7	3.5

SD: Standard deviation

Table 2. Comparison of sociodemographic characteristics of patients and CCAS and BHS total score means - relationship analysis

	CCAS-total score	CCAS subscale of-helplessness	CCAS subscale of anxiety	BHS total score	BHS subscale of motivation	BHS subscale of-anxiety about the future	BHS subscale of hopelesness
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Age							
15-24	20±0.	7 ± 6.7	12±3.3	7±5.	2±8.33	2±1.66	2±5.
25-45	22±2.41	7± 5.2	14±9.3	10±3.10	3±5.86	3±1.37	3±4.82
45-59	17 ± 8.76	6±1.5	11±7.2	9±5.84	3±6.07	2±9.46	3±0.61
60-74	21 ± 8.43	7±1.6	14±6.9	12±4.68	4±3.75	4±1.87	3±8.75
75-89	16 ± 6.66	6±0.0	10±6.7	11±4.5	3±4.66	3±4.83	4±0.
F/p	2.785/ .028	1.500 /.204	3.446 /.010	3.838/0.05	1.472 /0.212	6.529 /.000	2.112 /.081
Gender							
Female	19±7.	6±6.8	13±0.9	10±4.8	3±7.96	3±3.88	3±3.51
Male	18±4.	6±3.7	12±0.6	9±7.	3±5.85	2±9.04	3±1.48
t/p	1.075/0.286	.632/0.53	1.075/0.201	1.290/.201	6.472 /.012	1.912/.168	,001/ .970
Marital status							
Married	19±1.9	6±7.8	12±6.	10±6.2	3±9.19	3±3.17	3±3.87
Single	19±8.1	6±7.	13±1.1	7±5.9	2±4.81	2±4.44	2±6.66
t/p	.-358/0.721	.-170/0.865	.-400/0.690	3.525/0.01	.000/.988	1.826 /.178	.251 /.617
Number of children							
0	19±4.44	6±8.3	12±6.1	8±7.77	2±8.88	2±5.55	3±3.33
1	18±2.07	6±1.9	12±0.5	9±6.36	3±5.06	3±0.2	3±0.64
2	20±1.84	6±7.5	13±4.8	10±6.	3±8.30	3±4.	3±4.61
3	19±4.51	6±8.4	12±6.1	10±8.06	4±2.58	3±1.2	3±3.22
4	18±4.16	6±5	11±9.2	11±1.66	4±0.83	3±9.16	3±1.66
F/p	.521/.721	.352/ .842	.610/.656	1.272/.282	1.969/.101	2.319 /.058	.474 /.755
	CCAS-total score	**CCAS subscale of helplessness**	**CCAS subscale of anxiety**	**BHS total score**	**BHS subscale of motivation**	**BHS-subscale of -anxiety about the future**	**BHS-subscale of hopelesness**
Household composition	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**
Spouse	17±7.4	6±1.2	11±6.4	10±4.94	3±8.20	3±3.25	3±3.03
Child	24±0	10±0	14±0	9±0	2±0	3±0	4±0
Spouse and child	20±7.5	7±0.9	13±7.4	10±5.5	3±8.62	3±2.62	3±4.87
Parents	20±6.67	5±0	15±6.7	6±3.33	1±6.66	2±3.33	2±3.33
Grandparents	19±3.33	6±7.8	12±5.6	9	3±8.88	2±8.88	2±2.22
Alone	14±5.38	4±8.5	9±6.9	8±3.84	3±3.84	2±2.30	2±6.92
Other	25	8	17	7±3.33	2±1.66	2±6.6.67	2±5.
F/p	2.287/.037	1.976/.071	2.424/.028	1.576/.156	1.953/.074	1.544/.166	1.420/.209
Education level							
Illiterate	16±6	5±2.	11±4.	12±2.	4±8.	4±4.	3±0
Primary school graduate	17±2.38	6±0	11±2.4	12±3.81	4±2.38	4±0.47	4±0.47
Middle school graduate	16±9.07	5±5.4	11±3.7	8±9.23	3±3.23	2±8.15	2±7.53
High school graduate	18±7.62	6±5.9	12±1.8	10±0.64	3±8.59	3±0.64	3±2.17
Unıversty	25±8.78	8±8.2	17±2.4	11	3±6.36	3±3.93	3±8.78
Unıversty and above	26	12±0	14	9	2	3	4
F/p	6.365 .000*	5.410/ .000*	6.157/ .000*	2.831 /.017	1.514 /.187	3.569/ .004*	2.955 /.014*
Occupation							
Housewife	16±7.94	5±7.1	11±0.9	10±5.29	3±7.05	3±7.64	3±3.52
Civil servant	23±8.84	8±2.	15±6.9	10±4.61	3±5.38	3±2.69	3±4.23
Retired	18±5.20	6±3.	12±2.4	10±3.46	3±8.57	3±1.53	3±3.06
Worker	27±0.	9±5.	17±5.	13±5	5±5.	5±0.	3±0.

(table continues)

Table 2. Comparison of sociodemographic characteristics of patients and CCAS and BHS total score means - relationship analysis (table continues)

	CCAS-total score	CCAS subscale of helplessness	CCAS subscale of anxiety	BHS total score	BHS subscale of motivation	BHS-anxiety about the future	BHS subscale of hopelessness
Other	19±2.32	6±6	12±6.7	9±0.	3±37.21	2±6.0.47	3±0.
F/p	3.460/.009*	2.596/.038*	3.158/.015*	1.236/.297	1.007/.405	4.241/.003*	.340/.851
Health insurance	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**	**Mean±SD**
Yes	21±8.5	7±9.0	13±9.5	11±7.5	4±3.0	3±6.5	3±8.0
No	18±8.8	6±4.0	12±5.2	9±9.3	3.62±4	3±1.09	3.±0.33
t/p	1.499/0.355	1.887/0.308	1.73/0.91	1.801/0.488	3.531/ .062	.431/.512	2.132/.146
Economıc status							
Income more than expenses	25±1.25	8±3.80	16±7.50	10±2.04	4±0.	2±5	3±2.5.
Income equal to expenses	18±4.50	6±3.8	12±1.20	10±2.04	3±5.73	3±2.86	3±3.85
Income less than expenses	19	6±4.2	12±5.8	10±0.92	3±8.76	3±1.23	3±0.30
F/p	4.628/0.011*	2.555/0.080	4.933/0.008*	0.064/0.938	.766/.466	2.215/.112	.866/.422
Cancer type							
Breast cancer	21±0.	6±5.1	12±8.5	9±4.5	3±4.09	3±1.14	3±0.65
Lung ca	13±0.	5±2.6	11±7.	10±5.6	3±7.82	3±2.17	3±4.34
Colon ca	6±0.	6±8.	13±4.	10±6.	3±8.	3±4	3±4
Prostate cancer	20± 0.	4±6.1	10±7.2	7±05.	2±3.88	2±1.66	2±3.33
Liver	7±0.	4±1.4	9±0.29	8±0.	2±8.57	2±5.71	2±5.71
Rare (pancreas, bile, triod)	21±0.	8±0.7	13±0.82	11±5.8	4±3.81	3±4.72	3±6.90
Head and neck cancer	2±0.	1±0.	21±0.	16±0.	5±0.	5±0.	6±0.
Skin cancer	10±0.	4±9.	10±4.	8±0.	3±2	2±4.	2±5
female reproductive system	9±0.	4±4.	13±7.8	11±7.7	4±2.22	3±8.89	3±6.66
Other	8±0.	3±9.	11±2.5	11±6.2	4±3.7.5	3±6.25	3±6.25
F/p	2.395 /0.014*	3.387/0 .001*	1.676/0 .097	3.367/0 .001*	2.670/ .006*	2.632 /.007*	2.106 .031*
Cancer treatment duration							
6 month-1 year	16±3.7	5±4.7	10±9.1	7±4.4	2±4.44	2±1.56	2±7.11
1-5 year	19±7.9	6±7.4	13±0.6	10±7.3	3±8.7.5	3±5.	3±4.86
6-10 year	20±0.	6±9.3	13±1.4	11±0.	4.1519	3±3.6.71	3±2.91
F/p	2.323/0.76	2.160/0.94	1.98/0.118	8.727/0.00*	8.189 /.000*	9.143/ .000*	1.886/ .114

F:one- way Anova test;* p<0,05 t:Independent samples t-test result, CCAS: Climate Change Anxiety Scale, BHS: Beck Hopelessness Scale SD: Standard deviation

Table 3. Climate change anxiety scale and beck hopelessness scale score averages of patients

	n	Min	Max	Mean	SD
CCAS subscale of helplessness	203	3	16	6±5.5	3.398
CCAS subscale of anxiety	203	6	30	12±6.4	5.649
CCAS total score	203	9	42	19±1.52	8.4127
BHS subscale of motivation	203	0	8	3±7.04	1.87778
BHS subscale of future hopelesness	203	1	5	3±1.72	1.43328
BHS subscale of anxiety about the future	203	0	7	3±2.61	1.75359
BHS total score	203	3	20	10±1.37	4.28914

Min: Minimum, Max: Maximum, SD: Standard deviation, CCAS: Climate Change Anxiety Scale, BHS: Beck Hopelessness Scale

for the BHS was 10.37 (SD=4.29). These findings provide a baseline for the psychological burden of climate anxiety and hopelessness in the study population.

Relationship Between Climate Change Anxiety and Hopelessness

Pearson correlation analysis was performed to examine the relationship between the scales. As shown in Table 4, a moderate, positive, and statistically significant correlation was found between the CCAS total score and the BHS total score (r=0.43, p<0.001). This finding indicates that higher

Table 4. Relationship of scale scores to each other

		CCAS total score	BHS total score
CCAS total score	Pearson correlation	1	.431**
	Sig. (2-tailed)		0
	n	203	203
BHS total score	Pearson correlation	.431**	1
	Sig. (2-tailed)	0	
	n	203	203

**. Correlation is significant at the 0.01 level (2-tailed). Pearson Correlation Coefficient, *: p<0.05 CCAS: Climate Change Anxiety Scale, Sig: Significance, BHS: Beck Hopelessness Scale

levels of climate change anxiety are associated with increased levels of hopelessness among oncology patients.

Factors influencing hopelessness: Hierarchical Regression Analysis a hierarchical regression analysis was conducted to identify the significant predictors of hopelessness (Table 5). Following the reviewers' recommendation to simplify the model, only variables that showed significance in the univariate analysis were included. In model 1, cancer treatment duration was entered, explaining 8.0% of the variance (R^2=.08, p<0.05). In model 2, the CCAS total score was added to the model. The explanatory power of the model increased significantly to 27.0% (R^2=0.27, ΔR^2=0.19, F=7.69, p<0.001). In the final model, both treatment duration (B=0.74, p=0.009) and total CCAS score (B=0.21, p<0.001) were identified as significant independent predictors of hopelessness. These results suggest that climate change anxiety significantly contributes to the psychological state of hopelessness, even when clinical factors are controlled.

DISCUSSION

Recent studies on climate change have largely overlooked its effects on feelings of hopelessness and anxiety in cancer patients. This study reveals a significant relationship between oncology patients' concerns about climate change and their levels of hopelessness. In this study, the average score on the CCAS for cancer patients was found to be 19.52 (SD=8.41), indicating a significant level of anxiety regarding climate change.

The research was conducted in İzmir, Turkiye's third-largest city, which has been characterized by increasing temperatures, forest fires, and more severe weather events in recent years, typical of the Mediterranean climate (Ercanlı & Savaşır, 2022). Major environmental events such as the large forest fires and heatwaves in İzmir in 2021 are likely to have exacerbated climate change anxiety, especially among cancer patients.

The study found that individuals with higher levels of education exhibited greater concern about climate change. The literature similarly suggests that individuals with higher education and economic well-being are more environmentally conscious, which consequently leads to heightened climate change anxiety (Bouman et al., 2020; Meyer, 2015). Poortinga et al. (2019) have presented findings indicating that an increase in knowledge about climate change among highly educated individuals raises environmental anxiety (Poortinga et al., 2019). Moreover, Meyer (2015) emphasizes that the environmental awareness of educated individuals directly affects their anxiety levels, with increased awareness leading to higher anxiety (Meyer, 2015).

Consistent with education levels, individuals with better economic status also exhibited higher levels of climate change anxiety. This phenomenon is associated with the tendency of economically well-off individuals to be better informed about environmental issues and to consider the potential future effects in greater depth (Bouman et al., 2020). Hoekstra et al. (2024) identified social status as a contributing factor in their study on why education causes significant differences in attitudes toward climate change (Hoekstra et al., 2024). Findings showing that economic well-being increases individuals' environmental anxiety support this Notion (Bouman et al., 2020; Ronen & Kerret, 2020). Economically stronger individuals may be more capable of assessing the long-term impacts of climate change, which could lead to increased anxiety.

Our study found that individuals with breast cancer and rare cancer types exhibited higher levels of climate change anxiety. Research indicates that cancer patients develop increased sensitivity to environmental issues (Ronen & Kerret, 2020). This sensitivity, when combined with uncertainties about their health and the potential impacts of climate change, can elevate anxiety levels. Extreme temperatures caused by climate change, such as heatwaves or cold weather conditions, may negatively affect cancer patients' immune systems and thermoregulation functions, worsening their condition. For example, a recent randomized controlled trial examining the effects of environmental temperature on breast cancer survival outcomes in mice demonstrated that exposure to

Table 5. Regression analysis on factors affecting the level of hopelessness

						95% CI	
Model$_p$	**B**	**β**	**t**	**p**	**Adjust R^2**	**Lower bound**	**Upper bound**
F=7.691							
Constant	7.287		2.543	0.012	0.267	1.635	12.938
CCAS total score	0.214	0.419	6.053	0	0.267	0.144	0.283
Age	0.416	0.071	0.950	0.343		-0.448	1.281
Gender	-1.000	-0.119	-1.729	0.085		-2.141.	0.141
Educatiyon	-0.281	-0.064	-0.780	0.436		-0.993.	0.430
Marital status	-1.405	-0.120	-1.632	0.104		-3.102	0.293
Number of children	0.025	-0.006	-0.082	0.935		-0.627.	0.577
Household composition	-0.202	-0.092	-1.307	0.193		-0.506	0.103
Occupation	-0.085	-0.026	-0.376	0.707		-0.534,	0.363
Economic status	0.057	0.008	0.106	0.916		-1.007,	1.121
Health insurance	-0.011	-0.001	-0.011	0.991		-1.924,	1.902
Cancer type	0.052	0.037	0.571	0.568			
Cancer treatment duration	0.874	0.194	2.821	0.005		0.263	1.486

CI: Confidence interval, CCAS: Climate Change Anxiety Scale, Adjust R2, coefficient of determination; B, unstandardised coefficients

cold, non-thermoneutral temperatures was associated with higher tumor growth rates and an immunosuppressive tumor microenvironment compared to thermoneutral Conditions (Nogueira et al. 2023). Additionally, Nogueira (2023) highlights that some chemotherapy drugs exert pressure on the thermoregulation system, making cancer patients more vulnerable to heatwaves (Nogueira, 2023). In this context, considering that anti-estrogen treatments used in breast cancer may cause vasomotor symptoms such as hot flashes, the high levels of climate change anxiety observed in this patient group are understandable (Gupta et al., 2024).

Another significant finding of our study was the total BHS score of 10.37 (SD=4.29), which indicates a moderate level of hopelessness. Similar levels of hopelessness have been observed in the literature, although some studies have reported lower hopelessness scores in cancer patients. Mystakidou et al. (2007, 2008) reported higher levels of hopelessness (7.7±5.9) in cancer patients treated at a palliative care center in Greece (Mystakidou et al., 2008. In contrast, Yıldırım et al., in their study on Turkish cancer patients, reported a BHS score of 5.20±4.39 (Yıldırım et al., 2009). These comparisons suggest that cultural, social, and health-related differences may contribute to variations in hopelessness levels among cancer patients.

Hierarchical regression analysis in our study revealed a significant relationship between treatment duration and hopelessness. The prolonged treatment processes of cancer patients can strain psychological resilience due to physical fatigue, treatment-related side effects, and uncertainty. Literature reports that as the duration of illness increases, patients' anxiety levels rise, and their expectations for the future decrease (IBrintzemhofe-Szoc et al., 2009; Izci et al., 2018; Rustøen & Wiklund, 2000) Furthermore, our analysis demonstrated a significant and positive relationship between hopelessness and climate change anxiety. The results of the hierarchical regression showed that adding climate change anxiety to the model significantly increased the explanatory power (delta R^2=0.19) and significantly impacted hopelessness levels. This suggests that climate change anxiety is a critical factor influencing the psychological state of oncology patients.

The higher scores observed in head and neck cancer patients on the subscales of "future expectations" and "loss of motivation" also support this finding. Jones et al. (2003) highlighted that as disease duration extends, the severity of physical and psychological symptoms increases, leading to higher levels of hopelessness (Scharloo et al., 2005).

The findings of our study indicate a significant and positive relationship between hopelessness levels and climate change anxiety. Hierarchical regression analysis results showed that adding climate change anxiety to the model increased explanatory power and significantly impacted hopelessness. This finding suggests that climate change anxiety is a critical factor influencing hopelessness levels in oncology patients and significantly affects their psychological state.

These results support previous studies in the literature and highlight the impact of environmental concerns on the psychological state of cancer patients (Hiyatt et al., 2020). The literature indicates that the health impacts of climate change on cancer patients extend beyond disruptions in care access and represent a significant concern (Hiyatt et al., 2020). Individuals diagnosed with cancer are considered more vulnerable to health hazards associated with climate change due to the physical, psychological, and socioeconomic challenges of their treatment processes (Kiraz, 2019). Hopelessness is a critical factor that affects individuals' ability to cope with challenges and uncertainties (Yıldırım et al., 2009). In this context, it has been observed that individuals with high levels of hopelessness develop greater sensitivity to environmental issues, particularly climate change, as their concerns about the future increase (Özturk et al., 2022). Fritze et al. (2008) noted that climate change anxiety contributes to the psychological burden of individuals, emphasizing the necessity for tailored interventions to address these concerns (Fritze et al., 2008).

Additionally, Hayes et al. (2018) emphasized in their study that increased environmental concerns can have direct or indirect adverse effects on individuals' mental health (Hayes et al., 2018).

Our analysis suggests that climate change anxiety is significantly associated with hopelessness, contributing incremental explanatory value beyond primary clinical stressors. Rather than indicating a direct causal effect, this association may reflect the role of climate-related concerns as a secondary contextual stressor influencing future-oriented cognitions in oncology patients. In line with this interpretation, Bednarek (2020) conceptualizes climate anxiety not as a pathological condition requiring treatment, but as an expression of heightened awareness of environmental threats. Within the present clinical context, such awareness may coexist with adaptive cognitive engagement, rather than constituting a dominant source of psychological distress when compared to cancer-related stressors (Bednarek, 2019).

This study highlights the need for developing psychosocial support interventions for oncology patients. According to Beck's Cognitive Model, ongoing stressors like climate change concerns can exacerbate anxiety and hopelessness. The data from the CCAS provide valuable evidence for understanding the strong link between environmental concerns and hopelessness. Developing interventions that address both the emotional burden of climate change and the specific psychological needs of oncology patients is crucial in mitigating these effects.

Limitations

One of the strengths of this study is its unique approach, as it is the only research to examine in detail and from multiple perspectives the relationship between climate change anxiety and hopelessness in oncology patients. Analyses based on various demographic characteristics contribute to a better understanding of the effects of climate change on individuals' mental health. Furthermore, conducting the study on a large sample and using reliable measurement tools enhance the validity of the findings.

The study's limitation lies in its confinement to patients in an oncology clinic, which may restrict the generalizability of the findings. The research was conducted in a region with a Mediterranean climate; therefore, the results are specific to this region and may not be generalizable to other cities with different geographical and climatic conditions.

For future studies, longitudinal research tracking the long-term psychological effects of climate change anxiety is recommended.

CONCLUSION

This study found that oncology patients reported moderate levels of both climate change anxiety and hopelessness, with a statistically significant association between these variables. Higher levels of climate change anxiety were accompanied by higher levels of hopelessness; however, this relationship should be interpreted within the context of cancer-related stressors as the primary psychological burden.

The findings suggest that climate change may constitute a secondary, contextual psychological stressor that contributes to the broader emotional landscape of patients undergoing cancer treatment, rather than acting as a direct determinant of hopelessness. In this sense, climate-related concerns may influence future-oriented cognitions alongside clinical and sociodemographic factors.

Recognizing environmental concerns as part of the psychosocial context of oncology care may help clinicians better understand patients' emotional experiences. Integrating awareness of such background stressors into supportive care approaches may contribute to a more comprehensive assessment of psychological well-being and quality of life among oncology patients.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was conducted with the approval of the Ethics Committee for Non-interventional Clinical Researches at İzmir Bakırçay University (Date: 10.07.2024, Decision No: 1663).

Informed Consent

Written informed consent was obtained from all individual participants prior to their inclusion in the study. Participants were fully informed about the study's aims, procedures, potential risks and benefits, and their rights-including the right to withdraw at any time without consequence. All participants voluntarily signed a written informed consent form.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

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Author Contributions

Concept: DAU, ŞÖ, YY; Design: YY, FŞA; Control: YY, FŞA; Data Collection and/or Processing: DAU, ŞÖ, YY; Analysis and/or Interpretation: DAU, ŞÖ, YY; Literature Review: YY, FŞA; Article Writing: DAU, ŞÖ, YY; Critical Review: All Authors

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