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Effect Of Climate Change On Asthma Patients' Quality Of Life

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Abstract
Climate change has an effect on the most fundamental aspects of health. The risk of developing asthma increases with exposure to various environmental allergens, climate change, irritants such as indoor and outdoor air pollution, house dust mites, molds, and occupational exposure to chemicals, fumes, or dust. ***Aim:*** *this study aimed to evaluate the effect of climate change on asthma patients' quality of life.*
Design: *A descriptive research design was used in this study.*
Setting: *The study was conducted in outpatient chest clinic at Zagazig University Hospital.*
Sample: *Convenience sample was used to choice 116 asthmatic patients.*
Tools: *Data collection utilized three tools: Asthma Quality of Life Questionnaire, Asthma Control Test, and Climate Change Anxiety Scale.*
Results: *63.8% of the studied sample were male. In addition, majority of patients (81 %) were married, and 79.3% of them were employed. There was a positive correlation between patients' quality of life, asthma symptoms control level, and climate change anxiety level.*
Conclusion: *The study findings concluded that climate change has negative effects on asthma patients' quality of life.*
Recommendation: *Further studies including larger samples of patients from different geographical areas to generalize the results in Egypt.*
Keywords: *Asthma, Climate change, Quality of life.*

INTRODUCTION

Chronic airway inflammation is the hallmark of asthma, a common non-communicable disease that affects both adults and children globally. The common overactive airway condition known as asthma affects people physically and psychologically. There is a significant correlation between severe asthma and health-related quality of life (HRQoL) **(Kharaba et al.,2022).**

Allergens like molds, pollen, house dust mites, or a specific food might occasionally act as the trigger. Emotional distress, aspirin, sulfiting agents (found in wine and beer and used to keep greens fresh in salad bars), exercise, and inhaling cold air or cigarette smoke are additional typical triggers for asthma episodes **(Humbarde et al., 2022).**

Variable expiratory airflow limitation and episodes of shortness of breath, wheezing, chest tightness, and/or cough are hallmarks of asthma that significantly burden patients and healthcare systems **(Tabberer et al., 2022).**

A pulmonary function test and spirometry are used to confirm the diagnosis of asthma. Spirometry is a noninvasive test used to diagnose and track a number of lung conditions. It measures the amount of air a patient can evacuate in a single forced breath **(Makki et al., 2024).**

The important components used to manage asthmatic patients are assessment, monitoring, health education, regulating environmental factors and co-morbid situations that contribute to allergies and severity. The worldwide prevalence of asthma across the globe is influenced by age, gender, residence, occupational status, comorbidity, smoking history, and family history of diseases **(Tilahun et al.,2022).**

Patients' and their families' quality of life (QOL) is significantly impacted by severe asthma. Age is one of the individual characteristics that influence the severity of this illness. It is anticipated that QOL will be enhanced by appropriate asthma management as well as adjustments to social roles and activities **(Hossny et al., 2022).** Health-related quality of life (HRQoL) is the relationship between an individual's subjective well-being in the physical, mental, and social spheres of life and their capacity to function9. A well-established component of health and overall well-being, HRQoL can be assessed using a range of tools **(Ilmarinen et al., 2022).**

Even though there are numerous effective treatments available, poor adherence and, consequently, poor asthma management are regarded as major worldwide health issues. Controlling asthma is influenced by a number of factors, including a patient's understanding of their medications, adherence to them, and proper inhaler usage. Patients' adherence to treatment is further impacted by incorrect perceptions that arise from inadequate drug understanding. low disease outcomes, including higher mortality, higher costs, and a higher rate of hospitalization, are associated with low adherence **(Almomani et al., 2020).**

Asthma is one of the most common non-communicable diseases in the world, affecting over 235 million people. Asthma symptoms, flare-ups, and triggers are linked to impaired quality of life (QoL), fatigue, decreased activity, detrimental impacts on relationships and social life, difficulty obtaining and retaining a job, and decreased productivity. In the UK, 16% of persons with asthma have panic disorder, compared to 1% of the general population, and people with asthma are up to six times more likely than the general population to experience anxiety or depression **(Stanescu et al., 2019).**

Significance of this study

Climate change is considered one of the most persistent issues in the world today. This is a global environmental problem that can lead to catastrophic events such as floods, storms, and hurricanes caused by droughts, heat waves, and rainfall, directly or indirectly affecting people's health and well-being, especially those with asthma. The risk of developing asthma increases with exposure to various environmental allergens, climate change, irritants such as indoor and outdoor air pollution, house dust mites, molds, and occupational exposure to chemicals, fumes, or dust **(El-afandy et al.,2024).**

Aim of the Study:

To assess the effect of climate change on asthma patients' quality of life.

Research Question:

Does climate change affect the quality of life of asthma patients?

2. Subjects And Methods

2.1. Research Design

A descriptive design was used in this study.

Setting:

The study was done in an outpatient chest clinic at Zagazig University Hospital.

Subjects:

A sample of convenience that includes 116 patients visited outpatient chest clinic at Zagazig University Hospital.

Tools for Data Collection

Three instruments were used to gather information in order to fulfill the goals of the study:

Tool One: Asthma Quality of Life Questionnaire

Using contemporary national and international literature, researchers employed this method (**El-afandy et al.,2024; Ilmarinen et al., 2022; Almomani et al., 2020**). There are two sections to it:

- **Part 1: Demographic Data Sheet**

This section collects participants' demographic information, including age, marital status, gender, educational level, occupation, residence, income, and onset of disease.

- **Part 2: Asthma Quality of Life Questionnaire**

This section includes 32 items covering various aspects of *asthma quality of life*, such as effect of strenuous activities on asthmatic patient, effects moderate activities on asthmatic patient, and social activities on asthmatic patient.

Scoring System:

- Scores range 1-7, with higher scores indicating better quality of life.
- Totally Limited=1, Extremely Limited=2, Very Limited=3, Moderately Limited=4, Some Limitation=5, A little Limitation=6, and Not at all Limited=7.

Tool Two: Asthma Control Test

This tool was used by researchers after reviewing relevant literature. It consists of 5 steps such as how much of the time has your asthma kept you from getting as much done at work, how often have you had shortness of breath, how often have your asthma symptoms woken you up at night , how often have you used your rescue inhaler medication, and How would you rate your asthma control during the last 4 weeks?

Scoring System:

- All of the time= [1], Most of the time= [2], Some of the time= [3], A little of the time= [4], and None of the time [5].
- If your score is 19 or less, your asthma symptoms may not be as well controlled as they could be. No matter what your score is, share the results with your healthcare provider

Tool Three: Climate Change Anxiety Scale

This tool was developed by researchers after reviewing relevant literature. It includes a 22-item measure of the emotional response to climate change. The measure has four sub-scales including cognitive and emotional impairment, functional impairment, personal experience of climate change, and behavioral engagement.

Scoring System:

- Scores range 1-5, Never = 1, Rarely =2, Sometimes = 3, Often= 4, and Almost always = 5.

Field work:

This study was carried out in the way described below.

1. Design for Administrative

The authorities in charge of the outpatient chest clinic at Zagazig University Hospital granted formal approval to carry out the study. In order to guarantee the validity and trustworthiness of the instruments, nursing specialists made necessary revisions.

Validity and Reliability

- The tools were evaluated for clarity, comprehensiveness, relevance, comprehension, applicability, and ease of use by three highly qualified professors in nursing and medicine. Minor changes were then made based on their feedback before the final version was created.
- The Cronbach's alpha value of the Asthma Quality of Life Questionnaire is 0.896, and of the Asthma control test is 0.904, and of the Climate Change Anxiety Scale is 0.900

A pilot study

- In July 2024, a pilot study was carried out to ascertain the study instruments' viability and practicability. Ten percent of the sample (4 patients) were included in the study. It also offered an approximate time frame for finishing the tools.

Data collection:

Data collection for this study was conducted by the researcher through:
The distribution of the questionnaires after explaining the aim of the study and after obtaining informed consent from the study subjects. Each patient took about 25-30 minutes to fill these tools. Data collection took a period of 6 months starting from 1/8/2024 to 28/2/2025.

Ethical considerations:

- Research approval was obtained from the ethical research committee at the Faculty of Nursing-Zagazig University, prior to the start of the study.
- An informed consent was obtained from the study subjects after explanation of the aim of the study.
- Right to refuse to participate or withdraw from the research were assured during the study.
- Privacy and confidentiality of the collected data were maintained during implementation of the study.

Statistical Analysis:

Version 20.0 of SPSS for Windows was used for all statistical analyses (SPSS, Chicago, IL). The mean ± standard deviation (SD) was used to express continuous data that had a normal distribution. Numbers and percentages were used to represent categorical data. When comparing more than two variables with continuous data, the one-way analysis of variance (ANOVA) test was employed. To compare variables using categorical data, the chi-square test (or fisher's exact test, if applicable) was employed. The correlation coefficient test was used to examine correlations between two variables with continuous data. The reliability (internal consistency) test was calculated for the study's questionnaires. $p<0.05$ was the cutoff point for statistical significance.

RESULTS:

Table1. Demonstrates that 37.9% of the studied sample aged from 31-40 years, and 63.8% of them were male. In addition, majority of patients (81 %) were married, and 79.3% of them were employed. 89.7% of the studied sample were living in rural areas and 71.6% of them had insufficient income.

Table 2 reveals that 68.1% of the participants had poor quality of life related to asthma disease, while only 31.9% of them had good quality of life.

Figure 1: shows that 68.1% of the participants had poor quality of life related to asthma disease, while only 31.9% of them had good quality of life

Table 3: clarifies that, 69.8% of the studied patients had asthma symptoms were not as well controlled, while only 30.2% of them were well controlled.

Figure 2: displays that, 69.8% of the studied patients had asthma symptoms were not as well controlled, while only 30.2% of them were well controlled.

Table 4: demonstrates that, 64.7% of the patients had moderate anxiety, while 19.8 % of them had low anxiety and only 15.5% had severe anxiety.

Figure 3: illustrates that, 64.7% of the patients had moderate anxiety, while 19.8 % of them had low anxiety and only 15.5% had severe anxiety.

Table 5: indicates that there was a statistically significant difference between patients' educational level, onset of the disease and quality of life.

Table 6: reveals that there was a statistically significant difference between patients' educational level, onset of the disease and asthma symptoms control level.

Table 7: shows that there was a statistically significant difference between patients' educational level, onset of the disease and climate change anxiety level.

Table 8: demonstrates that, there was positive correlation between patients' quality of life, asthma symptoms control level, and climate change anxiety level.

Table 1. Distribution of the demographic characteristics of the patients (n=116)

	n	%
Age (Years)		
18 – 30	27	23.3
31 – 40	44	37.9
41 – 50	20	17.2
50 or more	25	21.6
Gender		
Male	74	63.8
Female	42	36.2
Educational level		
illiterate	29	25.0
Basic	34	29.3
Secondary	27	23.3
University	26	22.4
Marital status		
Single	9	7.8
Married	94	81.0
Divorced	10	8.6
Widow	3	2.6
Occupation		
Employed	92	79.3
Not employed	24	20.7
Residence		
Urban	12	10.3
Rural	104	89.7
Income		
Enough	33	28.4
Not enough	83	71.6
Onset of the disease (years)		
< 5	60	51.7
5 – 10	35	30.2
> 10	21	18.1

Table 2. Distribution of the Asthma Quality of Life Questionnaire total score and level (n=116)

	n	%
Asthma Quality of Life Questionnaire level		
Poor quality of life	79	68.1
Good quality of life	37	31.9
Total score	109.7 ±33.4	

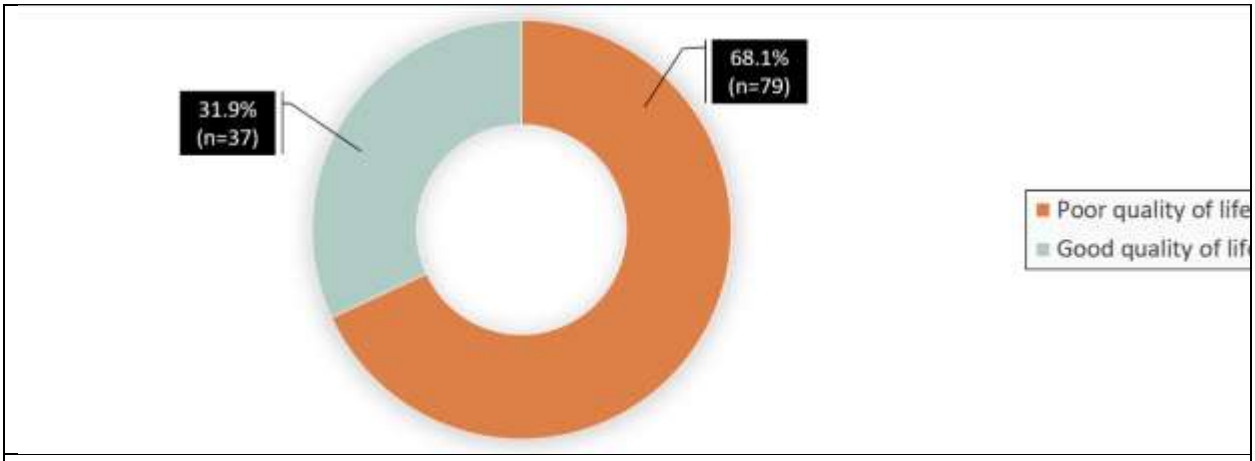

Figure 1. Distribution of the Asthma Quality of Life Questionnaire total level

Table 3. Distribution of the Asthma control test total score and level (n=116)

	n	%
Asthma control test		
Off target	81	69.8
On target	35	30.2
Total score	17.7 ±3.2	

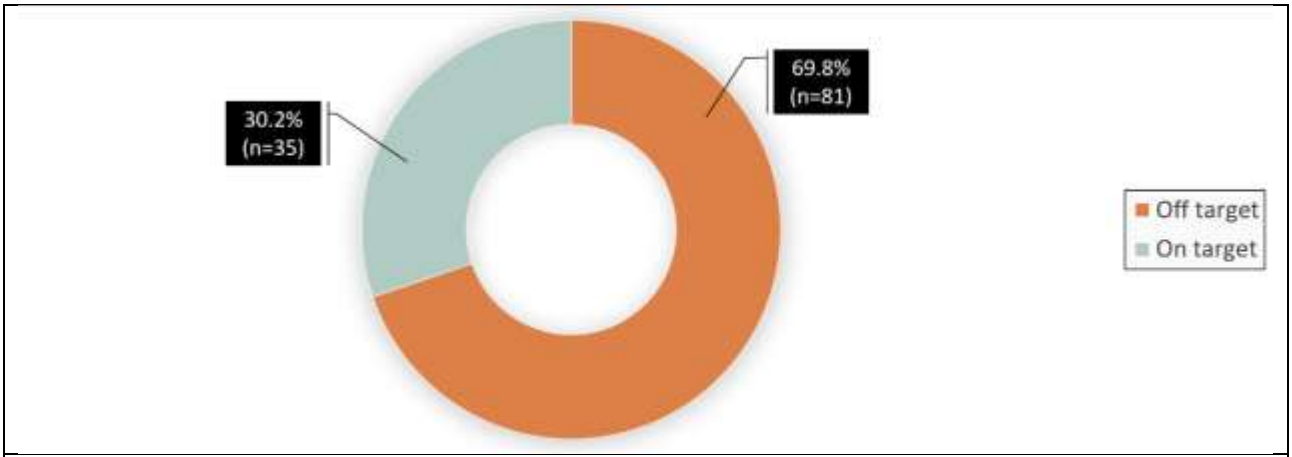

Figure 2. Distribution of the Asthma control test total level (n=116)

Table 4. Distribution of the Climate Change Anxiety Scale total score and level (n=116)

	n	%
Climate Change Anxiety Scale		
Low anxiety	23	19.8
Moderate anxiety	75	64.7
Severe anxiety	18	15.5
Total score	69.1 ±18.9	

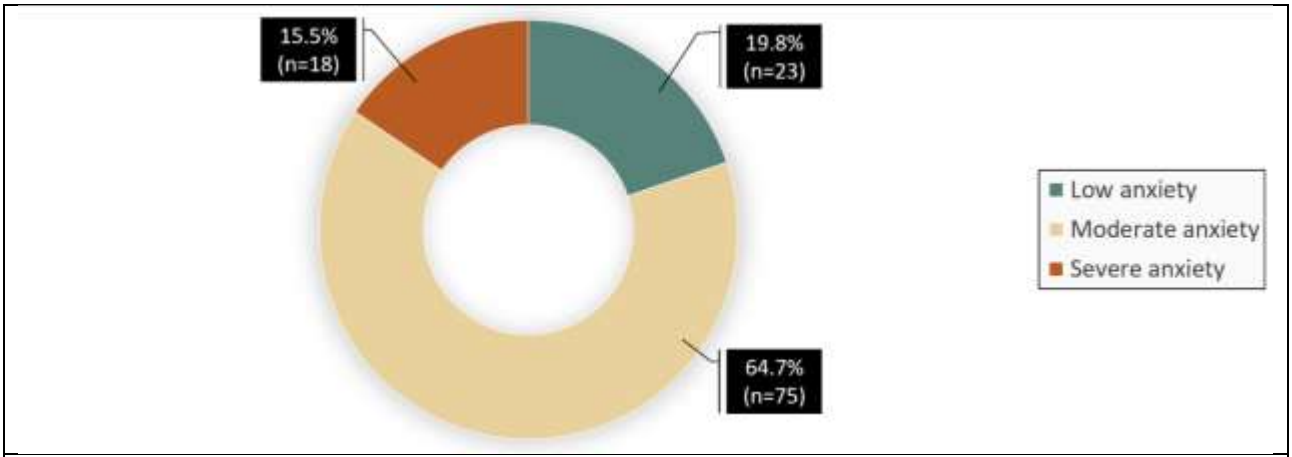

Figure 3. Distribution of the Climate Change Anxiety Scale total level

Table 5. Association between the demographic characteristics of the study sample and Asthma Quality of Life Questionnaire (n=116)

	Poor quality of life (n=79)		Good quality of life (n=37)		Chi – square / fisher's exact test	
	n	%	n	%	X^2	P
Age (Years)						
18 – 30	18	22.8	9	24.3		
31 – 40	28	35.4	16	43.2		
41 – 50	16	20.3	4	10.8		
50 or more	17	21.5	8	21.6	1.733	0.630
Gender						
Male	48	60.8	26	70.3		
Female	31	39.2	11	29.7	0.987	0.321
Educational level						
illiterate	29	36.7	0	0.0		
Basic	32	40.5	2	5.4		
Secondary	10	12.7	17	45.9		
University	8	10.1	18	48.6	52.853	<0.001**
Marital status						
Single	5	6.3	4	10.8		
Married	65	82.3	29	78.4		
Divorced	7	8.9	3	8.1		
Widow	2	2.5	1	2.7	0.719	0.869
Occupation						
Employed	63	79.7	29	78.4		
Not employed	16	20.3	8	21.6	0.029	0.865
Residence						
Urban	7	8.9	5	13.5		
Rural	72	91.1	32	86.5	0.588	0.443
Income						
Enough	23	29.1	10	27.0		

Not enough	56	70.9	27	73.0	0.054	0.816
Onset of the disease (years)						
< 5	33	41.8	27	73.0		
5 – 10	25	31.6	10	27.0		
> 10	21	26.6	0	0.0	14.756	<0.001**

Table 6. Association between the demographic characteristics of the study sample and Asthma control test (n=116)

	Off target (n=81)		On target (n=35)		Chi – square / fisher's exact test	
	n	%	n	%	X^2	P
Age (Years)						
18 – 30	21	25.9	6	17.1		
31 – 40	31	38.3	13	37.1		
41 – 50	15	18.5	5	14.3		
50 or more	14	17.3	11	31.4	3.341	0.342
Gender						
Male	55	67.9	19	54.3		
Female	26	32.1	16	45.7	1.962	0.161
Educational level						
illiterate	29	35.8	0	0.0		
Basic	34	42.0	0	0.0		
Secondary	12	14.8	15	42.9		
University	6	7.4	20	57.1	62.451	<0.001**
Marital status						
Single	7	8.6	2	5.7		
Married	67	82.7	27	77.1		
Divorced	4	4.9	6	17.1		
Widow	3	3.7	0	0.0	5.883	0.117
Occupation						
Employed	67	82.7	25	71.4		
Not employed	14	17.3	10	28.6	1.898	0.168
Residence						
Urban	9	11.1	3	8.6		
Rural	72	88.9	32	91.4	0.170	0.680
Income						
Enough	23	28.4	10	28.6		
Not enough	58	71.6	25	71.4	0.002	0.985
Onset of the disease (years)						
< 5	32	39.5	28	80.0		
5 – 10	28	34.6	7	20.0		
> 10	21	25.9	0	0.0	18.541	<0.001**

Table 7. Association between the demographic characteristics of the study sample and Climate Change Anxiety Scale (n=116)

	Low anxiety (n=23)		Moderate anxiety (n=75)		Severe anxiety (n=18)		Chi – square / fisher's exact test	
	n	%	n	%	n	%	X^2	P
Age (Years)								
18 – 30	6	26.1	16	21.3	5	27.8		
31 – 40	10	43.5	28	37.3	6	33.3		
41 – 50	2	8.7	13	17.3	5	27.8		
50 or more	5	21.7	18	24.0	2	11.1	3.903	0.690
Gender								
Male	17	73.9	45	60.0	12	66.7		
Female	6	26.1	30	40.0	6	33.3	1.551	0.460
Educational level								
illiterate	11	47.8	18	24.0	0	0.0		
Basic	8	34.8	21	28.0	5	27.8		
Secondary	4	17.4	17	22.7	6	33.3		
University	0	.0	19	25.3	7	38.9	18.373	0.005*
Marital status								
Single	2	8.7	6	8.0	1	5.6		
Married	19	82.6	58	77.3	17	94.4		
Divorced	2	8.7	8	10.7	0	0.0		
Widow	0	.0	3	4.0	0	0.0	4.234	0.645
Occupation								
Employed	18	78.3	58	77.3	16	88.9		
Not employed	5	21.7	17	22.7	2	11.1	1.201	0.549
Residence								
Urban	4	17.4	7	9.3	1	5.6		
Rural	19	82.6	68	90.7	17	94.4	1.759	0.415
Income								
Enough	7	30.4	20	26.7	6	33.3		
Not enough	16	69.6	55	73.3	12	66.7	0.373	0.830
Onset of the disease (years)								
< 5	18	78.3	42	56.0	0	0.0		
5 – 10	5	21.7	21	28.0	9	50.0		
> 10	0	0.0	12	16.0	9	50.0	30.174	<0.001**

Table 8. Correlation between Asthma Quality of Life Questionnaire, Asthma control test and Climate Change Anxiety Scale (n=116)

	Asthma Quality of Life Questionnaire		Asthma control test		Climate Change Anxiety Scale	
	r	p	r	p	r	p
Asthma Quality of Life Questionnaire			0.309	<0.001**	- 0.441	<0.001**

Asthma control test	0.309	<0.001**			-0.204	0.028*
Climate Change Anxiety Scale	- 0.441	<0.001**	-0.204	0.028*		

DISCUSSION

Human activity and increased use of fossil fuels have led to climate change. These changes are adversely affecting human health, including increasing the risk of developing asthma**(Goshua et al., 2023).**The purpose of this study was to assess the effect of climate change on asthma patients' quality of life.

According to the age group of the nurses, the current study showed that more than one third (37.9%) of the patients were around 31-40 years, This result was supported with **(Kharaba et al.,2022)** with found that The mean (±SD) age was 31.79 ± 20.92.

The finding of the present study revealed that majority of the studied patients (81%) were married. This is inconsistent with **(Makki et al.,2024)** reported that more than half of the participants in the study (59%) were married.

The results of the current study revealed that more than two-thirds of the studied patients (63.8%) were male and majority of them were living in rural areas and most of them had insufficient income. This result as well is in accordance with the results of the study carried out by **(Ahmed et al.,2024)** who reported that almost two thirds were male, also slightly less than three quarters of them were from rural areas and had insufficient monthly income.

Based on study, about two-thirds of the participants had poor quality of life related to asthma disease. These findings are not different from those of **(Rönnebjerg et al., 2023)** demonstrated that individuals with severe asthma had worse physical HRQoL, and worse mental HRQoL. Lower HRQoL, both physical and mental, was especially pronounced among women with severe asthma.

The current Study have demonstrated that two-thirds of the studied patients had asthma symptoms were not as well controlled, while only one third of them were well controlled. This finding aligns with **(Matsunaga et al., 2015),** who noted that only 27% of the studied patients had controlled asthma.

In the present study, findings showed that there was a statistically significant difference between patients' educational level, onset of the disease and quality of life. Similar results were reported by **(Uchmanowicz et al., 2016),** who found that the higher education level of respondents correlated positively with QoL in all domains of the AQLQ.

The current study indicated that there was a statistically significant difference between patients' educational level, onset of the disease and asthma symptoms control level, this is in agreement with that of **(Konar et al., 2023)**, who cleared that uncontrolled asthma levels were related to patients having primary school degrees, and illiterate participants.

The study revealed that there was a positive correlation between patients' quality of life, asthma symptoms control level, and climate change anxiety level. Such findings aligned with those reported by **(Atta et al.,2024),** who cleared that climate anxiety showed strong negative correlations with asthma control and asthma quality of life. Climate anxiety and asthma control are powerful predictors of quality of life among asthmatics. Climate anxiety moderates the relationship between asthma control and quality of life.

CONCLUSION

The study findings concluded that climate change has negative effects on asthma patients' quality of life. There was a positive correlation between patients' quality of life, asthma symptoms control level, and climate change anxiety level.

Recommendations

Based on the research hypothesis the results of the present study recommend that:

- Conducting an educational program that would help asthmatic patients to improve knowledge and practices in facing the effect of climate change.
- Further research studies in the other settings.

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