Preventive Measures of Climate Change Health Risks and Health Status among Rural Older Adults

Enas Mohamed Mahmoud, [1] Eman Shokry Abdallah, [2] Nashwa Saber Atia, [3] Safia Gomaa Mohammed [4]

[1] B.Sc. Nursing, Faculty of Nursing, Zagazig University, Egypt, [2] Professor of Gerontological Nursing, Faculty of Nursing, Zagazig University, Egypt, [3] Assistant Professor of Community Health Nursing, Faculty of Nursing, Zagazig University, Egypt, [4] Lecturer of Gerontological Nursing, Faculty of Nursing, Zagazig University, Egypt.

Abstract

Background: There are serious health risks associated with climate change, and older adults living in rural areas are especially at risk. Rural areas frequently lack the infrastructure and resources necessary to effectively respond to climate-related health threats. **Aim of the study:** Assess preventive measures of climate change health risks and health status among rural older adults. **Subjects and Methods: Research design:** Cross-sectional descriptive research. **Setting:** The study was conducted at Sheiba village, Zagazig city, Sharkia governorate, Egypt, which was randomly selected by using the multistage cluster sampling technique. **Subjects**: **Sample** A purposive sample was used. The study subjects were 170 rural older adults. **Tools of data collection:** An interview questionnaire composed of three parts: demographic characteristics of the elderly, older adult's practices related to prevention of climate change health risks, and General Health Questionnaire (GHQ-28). **Results:** The study revealed that 57.1% of the studied elderly had totally unsatisfactory practices regarding prevention of climate change health risks. Concerning general health status, 57.1% of the studied elderly were stressed. As well as, the highly reported stress characteristic was a somatic complaint (61.8%), whereas the lowest was severe depression (53.5%). **Conclusion:** Since more than half of the rural older adults in the study had completely unsatisfactory practices and more than half had stressed health status, preventive measures against the health risks associated with climate change were moderately low. Additionally, there was a statistically significant correlation between the older adults' general health status and their practices for preventing the health risks associated with climate change. **Recommendations:** Developing and implementing tailored interventions for mitigating the impact of climate change on rural older adults' health and well-being.

Key words: Climate Change, Health Risks, Older Adults, Preventive Measures, Rural.

Introduction

Risks to human health from climate change are substantial, and older people living in rural areas are especially at risk. This demographic often faces unique challenges due to limited access to healthcare, socioeconomic disadvantages, and the physical impacts of aging. These problems are made worse by climate change, which raises the risk of respiratory disorders, vector-borne infections, heat-related illnesses, and other illnesses. Understanding and implementing preventive measures to mitigate these risks is crucial for safeguarding the health status of rural older adults **(Carlson et al., 2024).**

Rural areas frequently lack the infrastructure and resources necessary to effectively respond to climate-related health threats. The challenges older adults in these communities' face are exacerbated by a lack of emergency services, a shortage of healthcare providers, and limited access to healthcare facilities. Rural older adults are also more vulnerable to climate change because they frequently have lower incomes and a higher prevalence of

chronic illnesses. To address these disparities and safeguard this population of people who are at risk, focused interventions and preventive measures are therefore crucial **(Lykins et al., 2024).**

The negative effects of climate change are especially dangerous for older adults because of a number of physiological, social, and economic factors. Their ability to deal with extreme weather events is weakened by age-related physiological changes, such as a decreased ability to control body temperature and a higher prevalence of chronic conditions. Social isolation, limited mobility, and inadequate access to transportation further increase their risks during emergencies. Economic constraints restrict their ability to afford home adaptations and access healthcare services. Additionally, older adults are more vulnerable to vector-borne illnesses that are made worse by climate change, as well as to environmental contaminants. Extreme weather-related psychological stress can also have a substantial negative influence on people's mental health, which emphasizes the need for specialized public health interventions to lessen these exacerbated vulnerabilities **(Carlson et al., 2024).**

Preventive measures to mitigate climate change health risks can take many forms, including public health initiatives, community-based programs, and individual actions. Public health initiatives might involve improving healthcare infrastructure, increasing the availability of healthcare services, and enhancing emergency response capabilities in rural areas. Community-based programs can focus on educating rural older adults about climate-related health risks and promoting behaviours that reduce these risks, such as staying hydrated during heatwaves and using insect repellent to prevent vector-borne diseases **(Khine et al., 2023).**

Reducing the health risks linked to climate change requires individual action as well. Promoting healthier lifestyles among older adults living in rural areas, like eating a balanced diet, exercising frequently, and abstaining from tobacco use, can improve their general health. and resilience to climate-related stressors. Additionally, providing resources and support for home modifications, such as installing air conditioning and improving insulation, can help older adults maintain safe indoor environments during extreme weather events **(Neira et al., 2023).**

Gerontology nurses play a crucial role in addressing the vulnerabilities of older adults to climate change by providing specialized care, advocacy, and education. These nurses are trained to understand the unique health challenges faced by older adults and are skilled to manage chronic conditions that can be exacerbated by climate-related stressors. They conduct comprehensive assessments to identify at-risk individuals and develop personalized care plans that include measures to mitigate heat-related illnesses, respiratory issues, and other climate-induced health problems **(Molinsky et al., 2023).**

Additionally, older adults and their families are taught by gerontology nurses the value of being ready for severe weather events, such as staying hydrated during heatwaves and having a plan for emergencies. Furthermore, they advocate for improved healthcare policies and resources to support older adults, including better access to cooling centers, transportation, and emergency healthcare

services. By collaborating with community organizations and healthcare providers, gerontology nurses ensure that the resources and assistance required to increase older adults' resilience to the effects of climate change are provided **(Astone et al., 2023).**

Significance of the Study:

About 7 million people in Egypt are older adults, making up 7.1% of the country's total population. By 2052, this number is predicted to increase to 17.9%. Due to a number of factors, including rising temperatures, changes in air quality, drinking water, food, and vector-borne diseases, these older adults are particularly vulnerable to the effects of climate change **(Central Agency for Public Mobilization and Statistics (CAPMAS, 2020).**

In the upcoming decades, it is anticipated that the costs associated with illness will rise in the absence of proactive measures to mitigate and adapt to climate change. Finding gaps and paving the way for older adult awareness requires first identifying risk perception regarding climate change. With the introduction of the National Climate Change Strategy 2050, Egypt has entered a golden age. The strategy aims to serve as a roadmap for the updated Egypt Vision 2030 while giving priority to the Egyptian elderly's quality of life **(Patella et al., 2018).**

Aim of the study:

The aim of this study was to Assess preventive measures of climate change health risks and health status among rural older

Research questions:

- What are preventive measures of climate change health risks among rural older adults?
- What is the level of health status among rural older adults?

Subjects and methods:

Research design:

To conduct this study, a cross-sectional descriptive research design was utilized.

Study setting:

The current study was carried out in Sheiba village, which was selected using a multistage cluster sampling technique as follow;

Stage 1: Selection of district

The study was conducted in Sharkia Governorate, which consists of 21 districts. The researcher used simple random sampling technique to pick up one district, it was Zagazig district.

Stage 2: Selection of village

The researcher randomly selected one village out of 75 villages of Zagazig district (Sheiba village).

Stage 3: Selection of streets

The selected village was divided into eight areas and four areas were selected randomly. Each area was divided into streets and eight streets were selected randomly from each area.

Stage 4: Selection of participants

Finally, the researcher picked up eight houses from each street by the simple random sampling method. All eligible older adults in the randomly selected houses who accept to participate in the study were included in the study sample till reaching the calculated sample size.

Study subjects:

A purposive sample of 170 elderly selected from the above-mentioned village based on the following inclusion criteria;

- Aged 60 years or more.
- Accept to participate in the study (oral consent).
- Able to communicate.

Tool for data collection:

An interview questionnaire with three sections was used to collect data;

Part I: Demographic data: It was utilized to assess the socio-demographic characteristics of the elderly. It entails data about elderly's age, sex, educational level, occupation, monthly income, crowding index…..etc.

Part II: Older adult's practices related to prevention of climate change health risks:

This part is modified by the researchers guided by **(Kinay et al., 2021).** It contains 6 parts to assess preventative practices taken by older adults during climate changes as follow; High temperature (10 Items), extreme cold waves (11 Items), and high atmospheric pollution rate (6 Items, Spread of infectious diseases (15 Items), Exposure to injuries (10 Items), Heavy winter rains (5 Items)

Scoring system:

Responses were scored with one representing "done" and zero representing "not done." A total score of 60% or higher is considered satisfactory, while a score of 60% or lower is considered unsatisfactory.

Part III: General Health Questionnaire (GHQ-28).

It was adopted from **Sterling (Sterling 2011).** The 28-item GHQ-28 scale is used to measure an individual's perceived general health. Somatic symptoms, anxiety or insomnia, social dysfunction, and severe depression were the subscales that were categorized. The 28 items were evaluated using 2-point Likert scales, with 1 representing better than usual or the same as usual and 0 representing worse than usual or significantly worse than usual. Question 1,2,17,18,19,20,21 were positive question and the rest were formulated in a negative manner. The categorized subscales were;

- Somatic symptoms (Items 1-7).
- Anxiety or insomnia (Items 8-14).
- Social dysfunction (Items 15-21).
- Severe depression (Items 22-28).

Scoring system:

The respondent indicated if a statement was better or worse than it had been previously for each one. These could have received a maximum of 28 points, scoring 1 or 0 in each case. There are four domains into which the statements are categorized: "Somatic, Anxiety/Insomnia, Social dysfunction, and severe depression." A higher score indicated more stress. The scores were added up for each domain and the overall scale. The percent scores for these scores were computed. They were then divided into two categories: "Low stress: <60%" and "High stress: 60%."

Content validity and reliability:

Three community health nursing and medicine experts reviewed the study tool and made some modifications based on their opinions to test its content validity. In order to assess each item individually and determine whether or not it is relevant and appropriate to test the desired outcomes, the content validity of the study tools was measured.

The reliability of tools was tested by measuring their internal consistency. It demonstrated a good level of reliability

with Cronbach's Alpha as preventive measures was 0.827 and General Health Questionnaire was 0.850

Field work:

Following approval to continue with the study, the researchers set about creating a plan for data collection. The researchers conducted one-on-one interviews with each older adult, during which the researchers gave a brief explanation of the study's aim, identified herself, and assured the participants that the information which collected would be kept completely confidential and used only for research.

Following that, informed consent was acquired in order to gather the required information. The researchers would go to Sheiba village to interview older adults who met the inclusion criteria. Each elderly completed the study tools during the interview and depending on their cooperation and understanding, the time required varied from 20 to 30 minutes. The fieldwork was conducted twice a week, on Saturday and Friday, from 12 p.m. to 8 p.m., for a period of six months, starting in May 2023 and ending in November 2023.

Pilot study:

To ensure the clarity and comprehensiveness of the tool, a pilot study was conducted on a sample of 17 elderly people who were randomly selected from the chosen village; they were not included in the total number of subjects.

Administration and ethical consideration:

First, the study proposal was accepted by the Zagazig University Faculty of Nursing's Post Graduate Committee and Research Ethics Committee (REC) with the code of M.D.ZU.NUR\180\9\5\2023.

Before starting any step in the study, an official letter containing the aim of the study was issued to faculty of nursing Zagazig University to mayor of Sheiba village explaining the nature and aim of this study and seeking facilitating the role of researchers.

Following full explanation of the study's aim, each participant provided their informed consent to participate. Participants were given the right to refuse participation and were informed that they could withdraw at any time while filling out the questionnaire. The elderly was each assigned a code number to protect their anonymity, and they were given the assurance that the information would be kept confidential and used only for research.

Statistical analysis:

Data collected from the studied sample was revised, coded, and entered using Personal Computer (PC). Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 22. Data were presented using descriptive statistics in the form of frequencies, percentages, and Mean SD. A correlation coefficient “Pearson correlation” is a numerical measure of some type of correlation, meaning a statistical relationship between two variables. Chi-square (χ^2) is a statistical test used to determine the relationship between categorical variables. It is commonly employed to assess the independence or association between two categorical variables in a sample. Linear regression analysis is used to predict the value of a variable based on the value of another variable.

Results:

According to **Table 1**, the mean age of the elderly individuals under study were 93.68±5.63 years, with 61.2% of them falling between the 60 and under 65 age range. In addition, 70% of them were married and 75.9% of them were men. In terms of educational attainment, 44.1% of them had high school education and 16.5% of them had basic education. Concerning employment, 13.5% of them did not work. Regarding monthly income, 64.7% of the elderly had insufficient income for their daily needs. Regarding crowding index, 64.1% of elderly had two persons or more in the room. Moreover, 64.2% of them owned their houses. Also, 95.9% of the studied elderly lived with their families, and 62.9% of them were cared by their husbands/wives.

Table (2) demonstrates the studied elderly had total unsatisfactory practice of the preventive measures taken to avoid injuries and preventive measures practiced during high levels of air pollution in the atmosphere (66.6 % & 59.9%) respectively while, they had total satisfactory practice of preventive measures taken against infectious diseases, and preventive measures practiced during severe cold waves (46.7 % & 44.8%) respectively .

Figure 1 shows that 42.9% of the studied elderly had satisfactory practices regarding preventive measures against climate change health risks, compared to 57.1% who had unsatisfactory practices.

Table (3) reveals that the highly reported stress characteristic was somatic complaints (61.8 %), whereas the lowest was severe depression (53.5 %).

Figure (2) demonstrates that totally, 57.1 % of the studied elderly were stressed.

Table (4) demonstrates that, at p value <0.01**, there was a highly significant positive correlation between total practice and total general health status.

The result of **table (5)** reveals that the only statistically significant positive predictors of elderly practice scores was their educational level. Conversely, the negative ones were age and monthly income. The r-square value indicates that 38% of practice scores are explained by the model.

Discussion:

Human health is seriously threatened by climate change on a global scale. Rural areas are especially susceptible to the effects of climate change **(Austin et al., 2020).** Due to their increased sensitivity to environmental changes and infectious agents, older adults have a complex relationship with the environment and are significantly impacted by climate change. A slower metabolism, a more sluggish immune system, and a decreased physiological reserve capacity all contribute to this increased sensitivity. Gaining insight into the experiences of those most susceptible to climate change is crucial for boosting resilience and creating and executing efficient adaptation strategies **(Mohr et al., 2020).**

Considering preventive measures to be practiced by the studied elderly during high temperatures and severe cold waves, the current study results revealed that more than three fifths of the studied elderly did not leave the house during peak heat, and close curtains and blinds as preventive measures practiced during high temperatures respectively, while most of them didn't take shower with cold water nor turn on air conditioners,

respectively. In the opposite line, a previous study carried by **Kinay, 2019**. in China who found that during heat waves, most people (78%) stated that they preferred to drink more water, open windows, take baths, stay in the shade, and use public air conditioners.

Additionally, the present study revealed that majority of the elderly participants reported wearing bulky clothing and consuming warm beverages during extreme cold spells. However, the majority of them did not use heating appliances or wool bedding. Consistently, a study conducted in Germany by **Ayalon et al. 2022** revealed that 70.4% of the older adults had satisfactory practices during extremely cold waves as part of their attempts to adjust to the changing climate, such as dressing in heavy clothing, turning on the heat in their rooms, and consuming hot beverages.

The current study showed that almost half of the studied elderly ventilated the room well, while less than three quarters of them didn't move around by walking or cycling nor get rid of wood stoves used for heating, respectively. These results are consistent with those of **(Tolppanen and Kärkkäinen, 2021)** in Finland, who revealed that less than half of the participants engaged in insufficient recycling and environmental cleanup practices.

Moreover, the current study displayed that the highest percentage of the studied elderly washed vegetables and fruits well and covered foods, respectively. On the other hand, most of them didn't sterilize and disinfect the area around them that is most susceptible to infection nor wash their hands, respectively. Conversely, a study performed by **Ayalon and Roy, 2020** in United States of America who found that 60% of the participants had positive practices regarding preventive measures against infectious diseases as avoid contact with sick people, receive vaccinations, such as influenza vaccine and insects' control by using pesticides.

Concerning the preventive measures to be practiced by the studied elderly during heavy rains in the winter and measures taken to avoid injuries, the existing study revealed that more than two thirds of the rural older adults avoided touching electrical switches with wet hands as preventive measures practiced during heavy rains in the winter, while most of them didn't cover doors and windows nor disconnect all electrical switches, respectively. This finding was congruent with **Asifat, 2019** in southwestern Nigeria, who found that 82.5% of the participants had low level of preventive measures' practices regarding climate change.

Additionally, the current study showed that, in order to prevent injuries, the majority of the elderly subjects avoided leaving the house if there are storms or bad rain and standing in the sun to avoid injuries, respectively. On the other hand, most of them didn't use sunscreen nor have a first aid kit ready for physical injuries. This finding is supported by **Mohammed et al. 2022** in Egypt, who revealed that 55.7% of older adults had insufficient practices regarding climate change.

As for the studied elderly total practices regarding preventive measures of climate change health risks, this study demonstrated that about two thirds and more than half of them had total unsatisfactory practice of the preventive

measures taken to avoid injuries and preventive measures practiced during periods of high air pollution in the atmosphere, respectively. Conversely, less than half of them had total satisfactory practice of preventive measures taken against infectious diseases, and preventive measures practiced during severe cold waves, respectively. These findings might be likely stem from a complex interplay of factors including awareness, socioeconomic status, cultural norms, and the effectiveness of public health initiatives.

This is consistent with the study conducted in Nigeria by **Madaki et al. 2023** which found that 58% of the participants had insufficient total practices regarding adaptation to climate change. Furthermore, this result aligned with prior study conducted in Egypt by **Ofori et al. 2023** who reported that 72.3% of the participants had unsatisfactory practices related to climate change.

The current study showed that more than half of the studied older adults had unsatisfactory practices. The possible explanation of this finding might be lack of capabilities and the fact that the majority of older adults lack knowledge about how to cope with climate change. Consistently, a study carried out in Northern Malaysia by **Tiong et al. 2021** found that 56.2% of the subjects had unsatisfactory practices related to climate change before teaching program. Similarly, the Egyptian study of **Ghazy and Fathy, 2023** reported that 76% of the respondents had inadequate daily practices regarding climate change. Likewise, a study conducted in Florida by **McDermott-Levy et al., 2019** found that 55.7% had unsatisfactory preventive practices during extreme weather events.

Considering the studied elderly according to their general health, the present study illustrated that the highly reported stress characteristics was somatic complaints among more than three fifths of them, whereas the lowest was severe depression among more than half of them. This may be due to the intricate interplay between psychological stress and climate change impacts on the elderly population. Climate change can exacerbate existing health issues and contribute to increased stress levels among the elderly. For instance, extreme weather events, such as heatwaves or hurricanes, can directly threaten their physical health and safety, leading to somatic complaints. Moreover, the disruption of ecosystems and communities due to climate change can also heighten feelings of isolation and anxiety among older adults, further impacting their mental well-being **(Walinski, 2023).**

This result was consistent with a study conducted in Canada by **Casson et al., 2023** who found that 60.3% of the participants suffer from severe physical symptoms as a result of stress related to climate change. In a similar vein, the study of **Benevolenza and DeRigne, 2019** revealed that weather events either improved or worsened the participants' mental and physical health.

Regarding the total general health of the elderly, the current study found that more than half of them experienced stress. In contrast to this finding, the previous study of **Mohammed et al. 2022** in Egypt revealed that 56% of older adults had good health.

Regarding the correlation between the sociodemographic characteristics of the studied elderly and their total practice,

the results of this study indicated a highly statistically significant relation between practice and the participants' age level of education and monthly income. This indicating that older people are more likely to have satisfactory practices regarding climate change if they have a high level of education and a sufficient monthly income.

The results of the current study were in line with those of a study conducted in Malaysia by **Makhtar et al. 2021** who found a significant correlation between the age, education, and income of the study participants and their degree of climate change practices.

Pertaining relationship between socio-demographic characteristics of the studied elderly and their total general health status, the current study demonstrated that there was highly statistically significant association between the studied elderly's total general health status with their age. Also, there was statistically significant association with their gender, marital status, education level and monthly income. These can be explained as older elderly, males and married elderly and elderly who have high level of education and sufficient monthly income are more likely to be not stressed compared to others.

In a similar vein, a Swedish study by **Malmquist et al. 2022** found a strong correlation between the health status of the participants and their age, gender, and socioeconomic status. On the other hand, the Korean study of **Kim et al. 2020** found that there is no significant correlation between the health of the elderly and their gender, marital status, or occupation.

The current findings also are consistent with those of a study conducted in Egypt by **Ghazy and Fathy, 2023** which revealed that a little over three-quarters of the participants had inadequate daily practices related to climate change (76%). In a similar vein, **McDermott-Levy et al. 2019,** conducting a study in Florida and found that more than half of older adults (55.7%) lacked any comprehensive practices for handling extreme weather events.

The current study found that there was a highly significant positive correlation between total practice and total general health status. These findings can be explained by that adopting healthy practices may in fact help older people have better overall health outcomes, as indicated by the strong positive correlation between total practice and total general health status as actual behaviors and practices may have a greater direct influence on an individual's health status.

This result was consistent with a study conducted in the USA by **Molinsky and Forsyth, 2023** revealed a relation between health status and practices and found that a number of factors, such as disabilities and medical conditions, can limit an older adult's ability to adapt.

The current study's Multiple Linear Regression model showed that age and monthly income were the only statistically significant negative predictors of older adults' practice scores, while elderly educational level was the only statistically significant positive predictor. This can be explained by emphasizing the critical role of education in influencing older people's practices and behaviors related to climate change. There is a positive correlation between increased education and a

higher inclination to take environmentally conscious actions. On the other hand, people who are older and/or have lower incomes might be less proactive in addressing climate change issues.

According to a study conducted by **Ayalon et al. 2022,** participants who were older or had lower incomes were less likely than other participants to have a higher practices score, but those with a university education were more likely to have a higher practices score. Similarly, the study of **Tibola et al. 2020** conducted in the southern region of Brazil found that participants who were younger, had higher incomes, and had higher levels of education were statistically more likely to engage in climate change-related practices.

Conclusion:

In light of the study's findings and answer of research question, it was concluded that preventive measures of climate change health risks were moderately low as more than half of the studied rural older adults had total unsatisfactory practices and also more than half of them had stressed health status. Additionally, there was a statistically significant correlation between the older adults' general health status and their practices for preventing the health risks of climate change.

Recommendations:

Based on findings, the study recommended:

- Developing and implementing tailored interventions for mitigating the impact of climate change on rural older adults' health and well-being.
- Future research should be conducted with larger sample sizes in various geographic regions of Egypt in order for more generalizable findings.

Table (1): Distribution of the studied elderly according to their demographic characteristics (n=170).

Personal information	N	%
Age		
60 - < 65 years	104	61.2
65 - 70 years	59	34.7
>70 years	7	4.1
Mean ± SD 63.98 ± 5.63		
Gender		
Male	129	75.9
Female	41	24.1
Marital status		
Married	119	70
Divorced	6	3.5
Widow	45	26.5
Employment		
Unemployed\housewife	23	13.5
Employee	147	86.5
Monthly income		
Sufficient	46	27.1

Sufficient and saving	14	8.2
Insufficient	110	64.7
Crowding Index		
Less than two persons	61	35.9
Two persons or more	109	64.1
Residence		
Ownership	106	64.2
Rental	64	35.8
Live		
Alone	7	4.1
With the family	163	95.9
***Who cares for**		
Husband/ wife	107	62.9
Brother / Sister	7	4.1
Son /daughter	54	31.8
Neighbor	2	1.2

***more than one answer**

Table (2): Percentage distribution of the studied elderly according to domains of practices regarding prevention of climate change health risks (n=170).

Total domains	Satisfactory		Unsatisfactory	
	N	%	N	%
Preventive measures to be practiced during high temperatures	70	41.2	100	58.8
Preventive measures practiced during severe cold waves	76	44.8	94	55.2
Preventive measures practiced during high levels of air pollution in the atmosphere	68	40.1	102	59.9
Preventive measures taken against infectious diseases	79	46.7	91	53.3
Preventive measures to be practiced during heavy rains in the winter	74	43.5	96	56.5
The preventive measures taken to avoid injuries	57	33.4	113	66.6

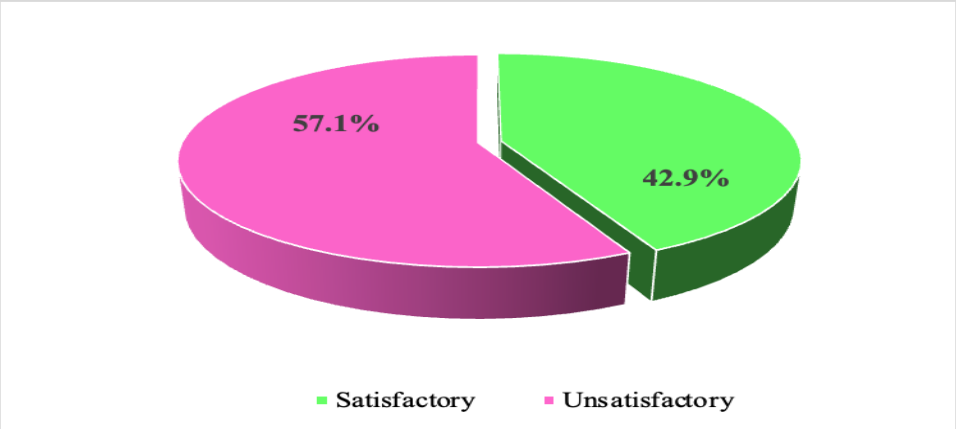

Figure (1): Percentage distribution of the studied elderly according to their total practices regarding prevention of climate change health risks (n=170).

Table (3): Percentage distribution of the studied elderly according to their general health (n=170).

Domains of General Health Scale	High		Low	
	No	%	No	%
Somatic	105	61.8	65	38.2
Anxiety/insomnia	102	60	68	40
Social dysfunction	99	58.2	71	41.8
Severe depression	79	46.5	91	53.5

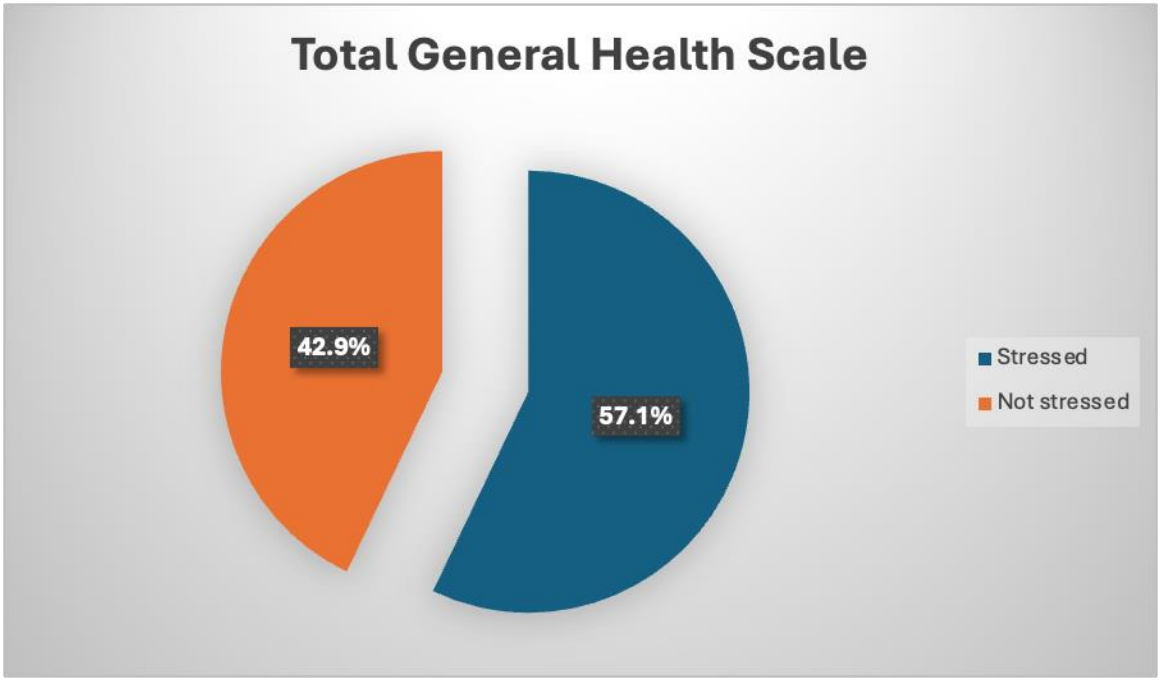

Figure (2): Percentage distribution of the studied elderly according to their total general health (n=170).

Table (4) Correlation between the studied variables (n=170).

		1	2
1. Total practice	R		.853
	P		.003**
2. Total general health		.853	
		.003**	

Table (5): Multiple Linear regression model for total practices regarding Prevention of Climate Change Health Risks.

Items	Unstandardized Coefficients	standardized Coefficients		
	B	B	T	P. value
Age	-.170	.129	3.801	.014*
Education level (High)	.299	.243	5.999	.008**
Monthly income (Not enough)	-.166	.121	3.600	.022*

References:

Asifat, J. T. (2019). Climate change awareness and its determinants in a growing city in the southwestern Nigeria using Multivariate Analysis. Journal of Environmental Sustainability, 7(1), 2-10. https://repository.rit.edu/cgi/viewcontent.cgi?article=1084&context=jes

Austin, E. K., Rich, J. L., Kiem, A. S., Handley, T., Perkins, D., & Kelly, B. J. (2020). Concerns about climate change among rural residents in Australia. Journal of Rural Studies, 75, 98-109. https://www.sciencedirect.com/science/article/pii/S0743016717307805

Astone, R., Vaalavuo, M. (2023). Climate change and health: Consequences of high temperatures among vulnerable groups in Finland. International Journal of Social Determinants of Health and Health Services, 53(1), 94-111. https://journals.sagepub.com/doi/10.1177/00207314221131208

Ayalon, L., Ulitsa, N., AboJabel, H., & Engdau, S. (2022). Older Persons' Perceptions concerning Climate Activism and Pro-Environmental Behaviors: Results from a Qualitative Study of Diverse Population Groups of Older Israelis. Sustainability, 14(24), 16366-16373. https://www.mdpi.com/2071-1050/14/24/16366

Ayalon, L., & Roy, S. (2020). The perceived contribution of older people to climate change impact, mitigation, and adaptation: Measurement development and validation. Innovation in Aging, 7(8), 110-116 https://pubmed.ncbi.nlm.nih.gov/37841578/

Benevolenza, M. A., & DeRigne, L. (2019). The impact of climate change and natural disasters on vulnerable populations: A systematic review of literature. Journal of Human Behavior in the Social Environment; 29(2), 266-281. https://pubmed.ncbi.nlm.nih.gov/37379518/

Casson, N., Cameron, L., Mauro, I., Friesen-Hughes, K., & Rocque, R. (2023). Perceptions of the health impacts of climate change among Canadians. BMC Public Health, 23(1), 1-13. https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-023-15105-z

Central Agency for Public Mobilisation and Statistics *(CAPMAS) (2020).* *[Online]. [Cited April 15 2013]. Avaialble at: https://www.capmas.gov.eg/Pages/Publications.aspx.*

Carlson, B., Kohon, J. N., Carder, P. C., Himes, D., Toda, E., & Tanaka, K. (2024). Climate change policies and older adults: an analysis of states' climate adaptation plans. *The gerontologist*, *64*(3), 77-83.

Ghazy, K.H., & Fathy, M.D. (2023). Effect of Awareness Program Regarding Climate Change on Knowledge, Attitudes and Practices of University Students. International Egyptian Journal of Nursing Sciences and Research, 3(2), 186-203. https://ejnsr.journals.ekb.eg/article_277896.html

https://livrepository.liverpool.ac.uk/3120071/1/PELIN%20KINAY%20PhD%20Thesis.pdf

Kinay, P., Morse, A.P., Morresey, K., Yucil, M.R., & Stadin, P.L (2021). Risk perception of Chinese elderly: An urban study on adaptation to climate change. An international journal of environmental health and sustainability. 7 :(1), 46-71 *https://backend.orbit.dtu.dk/ws/portalfiles/portal/265132344/Risk_perception_of_Chinese_elderly_An_urban_study_on_adaptation_to_climate_change.pdf*

Khine, M. M., & Langkulsen, U. (2023). The implications of climate change on health among vulnerable populations in South Africa: A systematic review. *International Journal of Environmental Research and Public Health*; *20*(4), 34-55. https://pubmed.ncbi.nlm.nih.gov/36834118/

Kim, S., Kim, S. Y., Oh, J., Chae, Y., Park, J., Kim, D., & Kim, Y. M. (2020). Effects of the 2018 heat wave on health in the elderly: implications for adaptation strategies to climate change. Environmental Analysis, Health and Toxicology, 35(4), 21-29. https://pubmed.ncbi.nlm.nih.gov/33434424/

Lykins, A. D., Nunn, P., Kumar, R., Sundaraja, C., & Cosh, S. (2024). ("This Is Our Only Land"): Adaptation to the Effects of Climate Change in Rural Indigenous Fijians. *Global Environmental Psychology*, *2*, 1-30. https://gep.psychopen.eu/index.php/gep/article/view/11239

Madaki, M. Y., Muench, S., Kaechele, H., & Bavorova, M. (2023). Climate Change Knowledge and Perception among Farming Households in Nigeria. Climate, 11(6), 115-118. https://www.mdpi.com/2225-1154/11/6/115

Makhtar, S. Z., Amirah, A. S. N., Ab Wahab, M., Hassan, Z., & Hamid, S. (2021). Study of environmental awareness, practices and behaviours among UniMAP students. In IOP Conference Series: Earth and Environmental Science, 646, 1, 403-417. https://www.researchgate.net/publication/349544783_Study_of_environmental_awareness_practices_and_behaviours_among_UniMAP_students

Malmquist, A., Hjerpe, M., Glaas, E., Karlsson, H., & Lassi, T. (2022). Elderly people's perceptions of heat stress and adaptation to heat: An interview study. International Journal of Environmental Research and Public Health, 19(7), 37-75. https://pubmed.ncbi.nlm.nih.gov/35409458/

McDermott-Levy, R., Kolanowski, A. M., Fick, D. M., & Mann, M. E. (2019). Addressing the health risks of climate change in older adults. Journal of gerontological nursing, 45(11), 21-29. https://pubmed.ncbi.nlm.nih.gov/31651985/

Mohammed Abdullah, K., Mohammad Esmat, O., Thabet Hasaneen, S., & Khalil Ibrahim, W. (2022). Health Risks Related to Climate Changes among Older Adults. Egyptian Journal of Health Care,13(3), 678-690. https://ejhc.journals.ekb.eg/article_254437.html

Mohammed, E., El-Mouty, A., & Ameen, N. (2022). Nursing student's knowledge, attitude, and practice regarding health effect of climate

change. Mansoura Nursing Journal, 9(2), 589-601.

https://mnj.journals.ekb.eg/article_295626.html

Mohr, S. M., Bagriantsev, S. N., & Gracheva, E. O (2020). Cellular, molecular, and physiological adaptations of hibernation: the solution to environmental challenges. Annual review of cell and developmental biology, 36 (9), 315-338. https://pubmed.ncbi.nlm.nih.gov/32897760/

Ghazy, K.H., & M Fathy, D. (2023). Effect of Awareness Program Regarding Climate Change on Knowledge, Attitudes and Practices of University Students. International Egyptian Journal of Nursing Sciences and Research, 3(2), 186-203. https://ejnsr.journals.ekb.eg/article_277896.html

Molinsky, J., Forsyth, A. (2023). Climate change, aging, and well-being: How residential setting matters. Housing Policy Debate, 33(5),1029-54. https://ideas.repec.org/a/taf/houspd/v33y2023i5p1029-1054.html

Neira, M., Erguler, K., Ahmady-Birgani, H., Al-Hmoud, N.D., Fears, R., Gogos, C., Hobbhahn, N., Koliou, M., Kostrikis, L.G., Lelieveld, J., Majeed, A. (2023). Climate change and human health in the Eastern Mediterranean and Middle East: Literature review, research priorities and policy suggestions. Environmental research, 21(6), 82-91. https://pubmed.ncbi.nlm.nih.gov/36273599/

Ofori, B. Y., Ameade, E. P., Ohemeng, F., Musah, Y., Quartey, J. K., & Owusu, E. H. (2023). Climate change knowledge, attitude and perception of undergraduate students in Ghana. PLOS Climate, 2(6), 46-62. https://journals.plos.org/climate/article?id=10.1371/journal.pclm.0000215

Patella, V., Florio, G., Magliacane, D., Giuliano, A., Crivellaro, M. A., Di Bartolomeo, D., Genovese, A., Palmieri, M., Postiglione, A., Ridolo, E., Scaletti, C., Ventura, M. T., & Zollo, A. (2018). Urban air pollution and climate change: "The Decalogue: Allergy safe tree" for allergic and respiratory diseases care. Clinical and Molecular Allergy, 16(1), 301-309. *https://europepmc.org/article/med/29808822*

Sterling, M. (2011). *General Health Questionnaire 28. Journal of Physiotherapy, 57:(4), 207-270. https://www.scirp.org/reference/referencespapers?referenceid=1834673*

Tibola da Rocha, V., Brandli, L. L., & Kalil, R. M. L. (2020). Climate change education in school: knowledge, behavior and attitude. *International Journal of Sustainability in Higher Education*; 21(4): 649-670.

Tiong, C. S., Lean, Q. Y., Ming, L. C., Abdullah, A. H. B., Mahalingam, S. R., Arshad, K., & Hock, L. S. (2021). Knowledge, perceptions of risks, attitudes and practices of environmental health among university students in northern Malaysia. International Journal of Health Promotion and Education, 59(1), 23-34. https://figshare.utas.edu.au/articles/journal_contribution/Knowledge_perceptions_of_risks_attitudes_and_practices_of_environmental_health_among_uni

versity_students_in_northern_Malaysia/23000897

Tolppanen, S., & Kärkkäinen, S. (2021). The blame-game: pre-service teacher's views on who is responsible and what needs to be done to mitigate climate change. International Journal of Science Education, 43(14), 2402-2425. https://www.researchgate.net/publication/354183074_The_blame-game_pre-service_teachers_views_on_who_is_responsible_and_what_needs_to_be_done_to_mitigate_climate_change

Walinski, A., Sander, J., Gerlinger, G., Clemens, V., Meyer-Lindenberg, A., & Heinz, A. (2023). The effects of climate change on mental health. Deutsches Ärzteblatt International, 120(8), 117. https://www.aerzteblatt.de/int/archive/article/229918