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## Predictors of Climate Change Knowledge and Risk Perception among the Adults in El-Beheira Governorate

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### Abstract

**Background:** Investigating the risk perception and the public awareness concerning the issue of climate change is essential for finding gaps and laying the ground for educational programs that address causes of climate change and mitigation strategies. **Aim of the study:** to determine the predictors of climate change knowledge and risk perception among the adults in El-Beheira governorate. **Design:** descriptive cross-sectional exploratory survey research design was adopted. **Setting:** An online survey using Google form was sent to the respondents in all centers of El-Beheira governorate. **Subjects:** A convenient sample of 550 adults with the minimum age 19 years and had accessibility to the internet. **Data Collection Tools:** an online questionnaire was utilized that involved three sections; Section one: socio-demographic characteristics of the study participants, section two: knowledge of the study participants about climate change, section three: risk perception of the study participants toward climate change. **Results:** The multivariate logistic regression analysis illustrated that the significant predictors for climate change knowledge were increasing age, university education, male gender, urban residence, extended family, healthcare occupation, enough income and high risk perception. Additionally, increasing age, university education, male gender, urban residence, health care occupation, enough income and satisfactory knowledge were the determinants of climate change risk perception. **Conclusion:** It can be concluded that several factors were significantly associated with climate change knowledge and risk perception such as age, gender, family type, place of residence, education level, occupation and monthly income. **Recommendations:** Conducting community mobilization campaigns to raise the community awareness concerning climate change and foster the risk perception toward this issue.

**Key words:** *Predictors, Climate change, Risk perception & Knowledge*

### Introduction

Climate change (CC) is considered as a threat to human societies and natural ecosystems. The general public's understanding of it, though, varies widely (WHO, 2022). Climate change is described as major, sustained changes in the world's temperature, precipitation, and wind patterns, whether resulting from natural processes or human activities. Around the world, there are huge regional differences in knowledge, awareness, perceived risk, and adaptation tactics related to climate change. The most affected continent by the effects of CC was found to be Africa (Steynor & Pasquini, 2019). Extreme weather events, rising sea levels, altered precipitation patterns, and global warming are all possible effects of climate change. Particularly in developing nations, climate change threatens human health, water security, food security, and socioeconomic development (Brown, 2015).

Egypt is now dealing with a number of environmental issues, including climate change. Because the link between climate change and common human behaviors like driving a car is not clearly established, the Egyptian public lacks knowledge about the precise causes of climate change (Salem et al., 2022).

It has been discovered that a variety of factors, such as demographic factors like age, gender, income, and education level, cognitive factors like knowledge about climate change, experiential factors like firsthand knowledge of the effects of climate change like extreme weather events, and sociocultural factors like values and social norms, can affect how the public perceives climate change (Van Eck et al., 2020).

Risk perception is the way in which individuals perceive dangers that pose a threat to the values they hold dear. It demonstrates how the person views risks and the variables that affect this perception. Elevated perception of risk encourages people to take decisive actions (Van Valkengoed Steg, 2019). Most of the information on how Egyptians feel about climate change comes from surveys conducted in other nations. Studies are scarce in Egypt. In the late 1990s, data from Egypt began to appear in multi-country polls; this decreased popular understanding of climate change. By the way, a 1999 poll of 25 nations indicated that 43% of Egyptian respondents were unaware of the cause, which was the greatest number among the other surveyed nations. Similarly, a study done in 2008 revealed that 65% of Egyptians had

never heard of climate change. Additionally, a study looking into how Egyptians perceived climate change in 2020 found that participants had misconceptions and were unsure about the precise origin of the phenomenon (Elshirbiny & Abrahamse, 2020).

It has been discovered that climate change has a negative impact on human health in Egypt, which can be made worse by the country's high population densities. Increased prevalence and severity of asthma, infectious disorders such as vector-borne infections, respiratory illnesses, diarrhea, and dysentery are possible effects. Additionally, it raises the risk of death by causing heat stroke, eye cataracts, and skin cancer. Malnutrition cases and the infant mortality rate are anticipated to be increased (Elshirbiny, 2018). Egypt emits 221.1 million tons of carbon dioxide annually, ranking 31st in the world. This makes up 0.6% of all emissions. Egypt is ranked as one of the top countries in by the World Bank (The World Bank, 2023).

Climate change also affects people's social and economic standing, and it will gradually worsen the health of future generations and make them more vulnerable. The implications of rural-to-urban migration, which increases urban population density, will be most severe for people in emerging countries. Water supplies and food production may be impacted negatively by climate change (Gunes et al., 2016). High temperatures are predicted to result in a 10–60% decrease in agricultural activity. An increase in the global average surface temperature of more than 3 degrees Celsius may also contribute to global warming. Additionally, increasing sea levels (floods) make the economic hazards that low-income residents face greater. In addition, tourism can be influenced by climate change (Hyland et al., 2016).

Since it cannot be contained by national boundaries, climate change is a problem that must be controlled on a global scale. People everywhere can be harmed by emissions (Chi, 2021). To assist developing nations in reducing their carbon emissions, management calls for international cooperation. As a result, community health nurses should create locally based awareness programs to highlight the causes and effects of CC. She might also push for the backing of strong government regulations to deal with it as a matter of urgency. Egypt adopted the National Climate Change Strategy 2050, which prioritizes quality of life of Egyptians people and serve as a road map to achieve Egypt Vision 2030 (Egypt's Minister of Planning and Economic Development, 2021-2022)

The Sustainable Development Goals are viewed in the context of Egypt Vision 2030 as a roadmap for achieving a better and more sustainable future for all. They deal with issues including poverty, inequality,

climate change, environmental degradation, and justice and peace on a worldwide scale (United Nations, Economic and Social Commission for Asia and the Pacific, 2022). Goal 13 is concerned with taking immediate action to mitigate climate change and its effects, and it specifically mentions combating climate change. All other Goals are inextricably tied to it (Sanchez-Rodriguez, 2018). Additionally, the Paris Agreement was ratified in 2015 to bolster international efforts to keep global warming below 2 degrees Celsius (United Nations, 2022).

The National Climate Change Strategy 2050 tackles key critical issues in the sector and addresses in its fifth objective; scientific research, technology transfer, knowledge management and increasing awareness to combat climate change. For the Egyptian government, to implement an effective climate agenda, it must address the perceptions, awareness, and willingness of the public to act. Thus, all this must integrate into national plans and the decision-making process. Understanding peoples' perception is challenging in eliciting climate action, developing effective policies and communication strategies for enhancing public engagement. Additionally, Egypt hosted the 27th Conference of the Parties (COP27) of the United Nations Framework Convention on Climate Change (UNFCCC), which significantly increased media emphasis on climate change (UNICEF, Egypt, 2022).

### Significance of the study:

Due to its magnitude, climate change (CC) is an inescapable problem that poses a serious risk to human health on a worldwide scale (Johnston, 2016). As a result of climate change, many nations today experience issues including snowstorms, wind, and increasing sea levels (Egypt's Minister of Planning and Economic Development, 2021–2022). Between 2030 and 2050, CC is predicted to result in an additional 250,000 deaths annually from diseases like malaria and diarrhea, hunger, heat exhaustion, and CC globally. Additionally, by 2030 it is anticipated that health-related global costs will increase from \$2 to \$4 billion yearly (WHO, 2022).

Egypt is a developing nation that is a part of Africa. According to reports from the Intergovernmental Panel on Climate Change, Egypt is extremely vulnerable to the effects of CC because of its location and dependence on other nations that are climate change sensitive in terms of extreme weather, heat waves, dust storms, and storms along the Mediterranean coast (2023; African Development Bank). Egypt ranked 107th out of 181 nations in the 2019 ND-GAIN Index, which forced the public sector to assess its risk and level of preparedness to deal

with CC and its effects as well as to set priorities for its efforts and financial investments to do so. The public sense of danger rises as a result of increased awareness of CC. To develop awareness, campaigns that address CC causes, affects, and adaption options is essential. However, little studies are done in Egypt (Chen et al., 2021). Thus, this study aims to determine the predictors of climate change knowledge and risk perception among the adults in El-Beheira governorate.

**Aim of the study:** The aim of the study was to determine the predictors of climate change knowledge and risk perception among the adults in El-Beheira governorate.

**Research question:** What are the predictors of climate change knowledge and risk perception among the adults in El-Beheira governorate?

## Subjects and Method

### Study design

Descriptive cross-sectional exploratory survey research design was adopted to conduct the study

### Study Setting:

The study conducted in El-Beheira governorate that is located in the west of the delta in the north of Egypt, and its capital is Damanhour. El-Beheira governorate is considered the first in terms of the area of agricultural land in Egypt. It is divided into 15 centers namely; Abu ElMatamir, Damanhour, Kafr-Eldawar, Abu Hummus, El delengat, El-Mahmoudiyah, El-Rahmaniya, Badr, HoshEssa, Edku, Itay ElBarud, Kom Hamada, Rashid, Natron valley, and Shubrakhit. An online survey using Google form was sent to the respondents to cover all centers in El-Beheira governorate.

### Study Subjects:

A convenient sample of 550 adults was included in the study. They were chosen according to the following inclusion criteria:

- Willing to take part in the study
- Aged at least 19 years old
- Live in El-Beheira governorate
- Have access to the internet

### Sample size

The sample size was calculated using EPI info 7 software based on the following parameters; total population (3 Millions), expected frequency 50%, confidence level 95 % and precision rate at 0.05. Thus the minimum required sample size was 384. The responses received far exceeded the required sample size (550) to compensate for invalid responses.

### Sampling technique

Convenient sample was utilized to collect the required sample. A snow ball sampling technique was utilized to reach to large number of participants in all centers of El-Beheira governorate during data

collection time. It was not allowed to send more than one response for each participant. The online survey form was closed when the number of the participants exceeded the required sample size and after a week of no new responses has been received.

### Tools of data collection

Data was collected using an electronic questionnaire. It was designed by the researchers after reading the updated literature and involved three sections:

**Section one : Socio-demographic Characteristics of The study Participants** this part included age, sex, level of education, residence, marital status, type of family, occupation, and monthly income as reported by the participants.

**Section two: Knowledge of the study participants about climate change**

It was adapted from previous studies (Salem et al., 2022 and Chairunnisa et al., 2022) and consisted of fifteen questions. The questions were designed in close-ended format (Yes, No and don't know). The correct answer took one and the incorrect answer/don't know took zero. The total score ranged from zero to fifteen and was categorized as following:

- Unsatisfactory : $\leq$  60% (0-9)
- Satisfactory:  $>$  60% (10-15)

An additional question (not involved in the total score) was added concerning sources of information regarding climate change.

**Section Three: Risk perception of the study participants toward climate change**

Risk perception scale was adapted from prior studies (Van Eck et al., 2020 & Lee et al., 2015) to assess the risk perception of the survey participants toward climate change. It included 8 items rated on five point likert scale ranging from strongly disagree (1) to strongly agree (5). The total score ranged from 8 to 40 and categorized as following:

- Low level:  $\leq$  60% (8-24).
- High level : $>$  60% (25-40).

### Methods

- An online structured questionnaire was created by using google forms. In the beginning of the questionnaire, the researchers illustrated the purpose of the survey and reassuring the participants that their responses will be utilized for the study purpose only maintaining their anonymity and privacy.
- The questionnaire was translated into Arabic and checked for content validity by five professors in the field of community health nursing. Their suggestions were done before sending the questionnaire link to the participants.
- Reliability of section two and three were tested using Cronbach's  $\alpha$  coefficient test ( $r=$  0.88, 0.92 respectively) indicating high reliability.

- A pilot study was conducted by the researchers on 50 adults that are excluded from the original sample to assure applicability, clarity, and comprehension of the study tool and to detect barriers that may hinder data collection process.
- The questionnaire link was sent to the respondents in each center through various social media platforms such as Facebook, Twitter, Instagram, Telegram and WhatsApp. The participants were encouraged to distribute the link of the questionnaire to reach large number of participants in the entire governorate.
- Data collection took about two months from September 2022 to October 2022.

#### Statistical Analysis

The survey participant's responses were exported to excel sheet and then coded to be utilized in SPSS sheet. SPSS version 23 was utilized for analyzing the data. A value of  $P < 0.05$  was considered statistically

significant. The following statistical procedures were employed:

- Descriptive: count, percentage, arithmetic mean, standard deviation
- Analytical : multivariate logistic regression model was utilized to determine the predictors of climate change knowledge and risk perception

#### Ethical Considerations:

The recruitment process started after obtaining approval from the Ethical Committee of Faculty of Nursing, Damanshour University. Written online consent was obtained from participants at the beginning of the online questionnaire. Anonymity and confidentiality of the survey participants was maintained by a statement at the startup of the questionnaire. No personal identifiers were recorded throughout the study.

#### Results:

**Table (1): Distribution of the study participants according to their socio-demographic characteristics (n=550)**

Socio-demographic data		No	%
Age	< 20	124	22.5
	20 <30	134	24.4
	30<40	145	26.4
	40<50	120	21.8
	50-60	27	4.9
	Mean $\pm$ SD	36.7 $\pm$ 6.5	
Gender	Male	236	42.9
	Female	314	57.1
Educational level	Basic education	6	1.1
	Secondary education	74	13.5
	University education	379	68.9
	Post-graduate	91	16.5
Residence	Rural	336	61.1
	Urban	214	38.9
Marital status	Single	295	53.6
	Married	228	41.5
	Divorced	14	2.5
	Widow	13	2.4
Type of family	Nuclear	386	70.2
	Extended	164	29.8
Occupation	Not working	231	42
	Non-health care worker	201	36.5
	Health care worker	118	21.5
Monthly income	Not enough	166	30.1
	Enough for basic needs only	294	53.5
	Enough and saving	90	16.4
Heard about climate change	Yes	470	85.5
	NO	80	14.5

**Table (2): Distribution of the study participants according to their knowledge about climate change (n=550)**

	Questions	Yes		NO		Don't know	
		No	%	No	%	No	%
1.	Emissions from industries and vehicles are likely to contribute to climate change	405	73.6	31	5.6	114	20.8
2.	Climate change has negative consequences on human health	419	76.2	47	8.5	84	15.3
3.	Climate change raises the incidence of floods	401	72.9	45	8.2	104	18.9
4.	People are displaced by climate change, and the number of refugees rises	387	70.4	59	10.7	104	18.9
5.	The rate of glacier melting can be accelerated by climate change	431	78.4	31	5.6	88	16
6.	Extreme cold waves are more likely to happen because of climate change	420	76.4	42	7.6	88	16
7.	Health institutions may be unable to fulfill their duties during periods of extreme cold or heat due to climate change.	366	66.5	81	14.7	103	18.8
8.	Contagious diseases are accelerated by climate change	407	74	58	10.5	85	15.5
9.	Climate change raises the prevalence of malnutrition disorder	375	68.2	78	14.2	97	17.6
10.	climate change contributes to increased chronic diseases such as bronchial asthma	345	62.7	86	15.6	119	21.7
11.	Climate change has an impact on mental health and increases anxiety and depression	403	73.3	61	11.1	86	15.6
12.	Climate change will increase the likelihood of extreme heat waves	420	76.4	48	8.7	82	14.9
13.	Climate change consequences are dangerous for developed countries than developing nations	295	53.6	120	21.8	135	24.6
14.	Climate change will become more severe in the future	380	69.1	53	9.6	117	21.3
15.	Climate change contributes to the water scarcity problem	370	67.3	69	12.5	111	20.2

**Table (3): Risk perception of the study participants toward climate change (n=550)**

Items	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
	NO	%	NO	%	NO	%	NO	%	NO	%
Due to climate change, there are likely to be significant risks to your health or general well-being.	129	23.4	310	56.4	84	15.3	22	4	5	0.9
The effects of climate change on society are anticipated to be exceedingly negative and long-lasting.	170	30.9	288	52.4	63	11.4	23	4.2	6	1.1
The natural environment is seriously threatened by climate change.	185	33.6	284	51.6	56	10.2	19	3.5	6	1.1
Climate change has very serious impacts around the world nowadays	166	30.2	281	51.1	71	12.9	26	4.7	6	1.1
Climate change has a serious threat to you personally	117	21.3	273	49.6	106	19.3	48	8.7	6	1.1
Climate change has serious impacts on your place of residence	132	24	246	44.8	110	20	54	9.8	8	1.4
I constantly worry about how climate change might have harmful effects.	139	25.3	293	53.3	87	15.8	26	4.7	5	0.9
I am not concerned about climate change	112	20.4	152	27.7	91	16.5	152	27.6	43	7.8

**Table (4): Distribution of the study participants according to their total score of climate change knowledge and risk perception (n=550)**

Total score	No	%
<b>Overall knowledge</b>		
Satisfactory	365	66.4
Unsatisfactory	185	33.6
<b>Overall risk perception</b>		
Low	240	43.6
High	310	56.4

**Table (5): Multivariate logistic regression analysis for predictors of climate change knowledge**

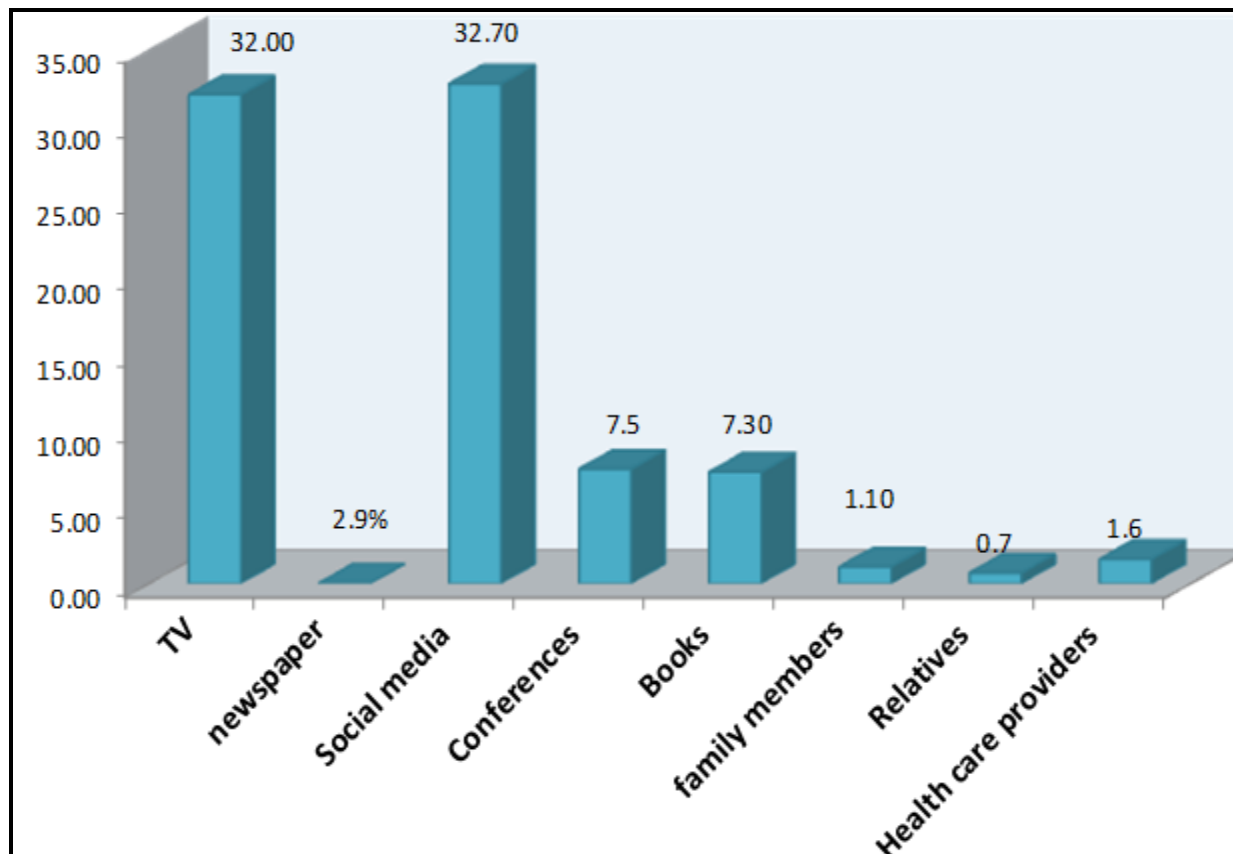
Variables	P	OR	95% CI	
			L. L	U. L
Age (40<50)	0.000*	3.340	2.560	6.540
Gender (male )	0.041*	2.305	2.250	5.640
Educational level ( university education)	<0.001*	5.414	3.220	5.252
Residence (urban)	<0.001*	3.230	1.540	3.540
Marital status (married)	0.088	0.640	3.215	7.420
Family type (extended)	<0.001*	2.643	1.230	3.262
Occupation (health care workers)	0.001*	3.260	3.340	7.240
Monthly income (enough)	<0.001*	2.182	1.340	5.340
Risk perception (high)	0.000*	2.153	2.560	6.530

OR: Odds ratio CI: Confidence interval LL: Lower limit UL: Upper Limit Statistically significant at  $p \leq 0.05$

**Table (6): Multivariate logistic regression analysis for predictors of climate change risk perception**

Variables	P	OR	95% CI	
			L. L	U. L
Age (40<50)	<0.001*	2.435	1.678	4.780
Gender (male )	<0.001*	3.231	2.870	5.890
Educational level ( university education)	<0.001*	4.541	2.860	4.740
Residence (urban)	<0.001*	2.130	3.780	8.850
Marital status (married)	0.415	1.540	1.870	5.830
Family type (extended)	0.465	1.320	2.450	6.340
Occupation (health care workers)	0.000*	3.340	3.240	7.430
Monthly income (enough)	0.000*	2.542	4.340	8.240
Knowledge ( satisfactory )	0.000*	4.342	2.780	8.540

OR: Odds ratio CI: Confidence interval LL: Lower limit UL: Upper Limit Statistically significant at  $p \leq 0.05$



**Figure (1): Distribution of the study participants according to their source of knowledge about climate change**

**Table (1): Portrays the socio-demographic characteristics of the study participants.** It is evident from the table, the age of the participants ranged from 19 to 60 years with a mean of  $36.7 \pm 6.5$ . Additionally, more than half (57.1%) were females. More than two-thirds (68.9%) of the participants had a university education. Furthermore, more than half of the participants were rural residents and were single (61.1%, 53.6% respectively). In addition, slightly less than three-quarters (70.2%) were nuclear families. Moreover, less than half (42%) of the participants were unemployed. Slightly more than half (53.5%) of the study participants had enough income for basic needs only. Most participants heard about climate change as displayed in the table.

**Table (2): Depicts the study participants' knowledge about climate change.** The table clearly shows that more than two-thirds of the participants provided accurate responses to all questions pertaining to the catastrophic implications of climate change. The highest frequencies were for increasing the possibility of extreme weather such as extreme cold, heat waves, the incidence of floods, ice melting, and increased contagious diseases. On the other hand, the least correct answer was for the following statement: climate change contributes to increased chronic diseases such as bronchial asthma as reported by 62.7% of the study participants.

**Table (3): Illustrates the risk perception of the study participants toward climate change.** It was found that, more than half of the participants agree that due to climate change, there are likely to be significant risks to their health (56.4%), the effects of climate change on society are anticipated to be exceedingly negative and long-lasting (52.4%), the natural environment is seriously threatened by climate change (51.6%), climate change has very serious impacts around the world nowadays (51.1%), they frequently worry about how climate change might have harmful effects (53.3%). Additionally, slightly less than half of the participants agree that climate change has a serious threat to them personally and has serious impacts on their place of residence (49.6%, 44.8% respectively). Moreover, 27.7% agree that they were not concerned about climate change.

**Table (4): Reveals the distribution of the study participants according to their total score of climate change knowledge and risk perception.** It is clear from the table that about two-thirds (66.4%) of the participants have satisfactory knowledge. Besides, more than half (56.4%) of the participants have a higher risk perception concerning climate change.

**Based on multivariate logistic regression analysis of climate change knowledge shown in table (5),** older participants had a three-time higher probability

of having knowledge compared to the younger (OR=3.340, P= 0.000\*). Additionally, males were two times more likely than females to have knowledge (OR=2.305, P=0.041\*). University education participants had five-time higher likelihood of having knowledge when compared to participants who are not highly educated (OR= 5.414, P= <0.001\*). Besides, compared to rural inhabitants, urban dwellers had a three-time higher probability of having knowledge (OR= 3.230, P=<0.001\*). Moreover, living in extended family increase the chance of having knowledge two-times compared with nuclear family (OR= 2.643, P=<0.001\*). Furthermore, healthcare workers had a three-time higher probability for having knowledge when compared to non-healthcare workers (OR= 3.260, P = 0.001\*). Participants with sufficient income have two-fold higher probability for having knowledge compared to those with insufficient income (OR=2.182, P = <0.001\*). Finally, participants who have high climate change risk perception had a two-fold higher probability for having knowledge compared to participants who have low risk perception (OR= 2.153, P = 0.000\*).

**Table (6): Reveals Multivariate logistic regression analysis for predictors of climate change risk perception.** It indicated that older participants had two-times higher likelihood of having a higher risk perception than younger participants (OR= 2.435, P=<0.001\*). Additionally, males were three-time more likely than females to perceive risks as being higher (OR= 3.231, P=<0.001\*). Besides, participants with a university degree had a four-fold higher likelihood of perceiving risks than those with less education (OR=4.541, P=<0.001\*). Also, compared to rural inhabitants, urban dwellers had a two-fold higher probability of having a higher risk perception (OR=2.130, P=<0.001\*). Moreover, compared to non-health care workers, healthcare employees had a three-fold higher probability of having a higher perception of danger (OR= 3.340, P=0.000\*). Furthermore, participants with a sufficient income had a two-fold higher likelihood of having a higher risk perception than participants with insufficient income (OR=2.542, P = 0.000\*). Last but not least, participants with satisfactory knowledge were four times more likely to perceive danger as higher than participants with insufficient knowledge (OR=4.342, P = 0.000\*).

**Figure (1): Reveals distribution of the study participants according to their source of knowledge about climate change.** It is evident from the figure that the study participants' main sources of information on climate change were television and social media

## Discussion

Climate change is considered one of the most significant environmental issues of the twenty-first century, threatening both food security and public health. Research on how the population in developing nations perceives the risk of climate change is, however, lacking. These nations are the most vulnerable to the effects of climatic change due to their heavy reliance on natural resources and their inability to adjust to its effects (Linden 2017).

Finding gaps and creating awareness campaigns that address the causes of climate change and take action to implement mitigation measures can be aided by identifying public perceptions of risk and awareness of climate change dangers. But there weren't many researches done in Egypt (Venghaus et al., 2022). Therefore, the current study aimed to determine the predictors of climate change knowledge and risk perception among the adults in El-Beheira governorate.

Studying predictors of climate change among public is an essential step to develop strategies to adapt climate change. Knowledge, perceived risk, experiential, physical, psychological and socio-cultural variables are determinants of climate change (Elshirbiny, 2018). By the way, the current study illustrated that socio-demographic characteristics including age, gender, educational level, residence, family type, occupation, monthly income were the significant predictors of climate change knowledge and risk perception.

The current study showed that old age participants had three- time higher probability of having knowledge compared to younger age. Also, participants who were older had two-times higher likelihood of having a higher risk perception than participants who were younger. In addition, university education participants had five-time higher likelihood of having knowledge and a four-fold higher likelihood of perceiving risks when compared to participants who are not highly educated. Moreover, males were two- times more likely to have knowledge and three- time more likely than females to perceive risks. This can be justified as older population, getting higher education are more knowledgeable about community events as climate change. Thus, they can identify its consequences elevating their risk perception. Males are more working and in contact with other people so they can have higher knowledge and risk perception.

Similarly, (ÇİFTÇİ, 2022) who studied predictors associated with perception of climate change in Mexico showed that socio-demographic factors are considered significant predictors of climate change knowledge and risk perception. Older respondents, college educated and those who have full time job are

more likely to be concerned about climate change issues. Besides, (Sun & Han 2018) discovered that people with greater levels of education are more likely to perceive the risk of climate change. This was reasoned as greater education can improve risk perception due to having more information about climate change.

On the other hand, a study on the public's perception of climate change risk in Egypt conducted by Elshirbiny & Abrahamse (2020) revealed that age was not a significant predictor of risk perception, while being female was associated with higher risk perception. Additionally, experiential elements, specifically affect and personal experience, were the most effective predictors of climate change risk perception. Additionally, knowledge of the climate change causes was not a highly significant predictor of risk perception. Meanwhile, knowledge of impact was a significant predictor. They justified this as the climate change event used in their study was flash floods and negative feelings were expressed from personal experiences with the impacts of flash floods. Also, there were misconceptions about climate change causes among the participants.

Moreover, (Steynor et al., 2021) investigated how perceptions of climate change risk and behavior were related in order to guide climate services initiatives in the east African region. They discovered that perceptions of climate change risk were not significantly influenced by age, gender, or education. These results are in contrast. This may be attributed to the focus on psychological closeness and social norms in their study.

The current study illustrated that, urban dwellers had a two-fold higher probability of having a higher risk perception and three times higher probability of having knowledge compared to rural inhabitants. Health care employees had a three-fold higher probability of having a higher perception of danger and knowledge. Also, participants with sufficient income had a two-fold higher likelihood of having a higher risk perception and knowledge than participants with insufficient income. This may be due to accessibility to internet and social media among people with sufficient family monthly income and urban dwellers which helps them to get contact with information about current events as climate change. Additionally, workers in health field usually have higher knowledge and perception of health risks. These results are consistent with (Salem et al., 2022), who conducted a study on climate change-related knowledge and attitudes among a sample of the general population in Egypt. They found that climate change-related knowledge was statistically higher among married, urban residents, and employed participants.



Public perspectives of climate change include knowledge. It is a further indicator of how the public will perceive climate change and is crucial for inspiring adaptive behavior (Chi, 2021). With regard to total knowledge score of climate change, the current study showed that more than two-thirds of the study participants gave correct answers regarding all items concerned with the serious effects of climate change. Also, about two-thirds of the participants have satisfactory knowledge score. This may be attributed as more than two-thirds of the participants of this study had a university education and most of participants heard about climate change. In addition, social media and television were the main sources of information on climate change among the study participants and it is available in wide range in Egypt. Likewise, (Salem et al., 2022), reported that more than three quarters of the participants were knowledgeable regarding climate change. Social media and the internet were the main sources of information as well. Otherwise, Aksit et al. (2017), who examined instructions, prior knowledge, and values affected undergrads' perceptions of the risk of climate change at a public research institution in the Southeast United States, showed that the respondents had poor knowledge about climate change. This may be due to geographical difference between the two countries.

Risk perception is to perceive the unfavorable effects on valuable goods. People's assessments of the nature and seriousness of danger are subjective (Zobeidi et al., 2020). People usually underestimate climate change risks as it is usually perceived as risk that happens in distant areas. Increased public risk perception can motivate public willingness to reduce climate change effects (Xie et al., 2019). The current findings illustrated that more than half of the participants have a higher risk perception concerning climate change. This may be due to higher knowledge score among participants. This agrees with (Elshirbiny & Abrahamse, 2020), who reported that the mean of total risk perception in his study was moderate ( $5.46 \pm 0.93$ ).

Additionally, a study conducted by (UNICEF, 2022), showed that the majority of people in North Macedonia are worried about climate change and its detrimental effects on children's quality of life. Moreover, a study on risk perceptions and attitudes about climate change among people of Southeastern Louisiana was undertaken by (Brown, 2015), and the results revealed that more than half of the respondents have high concern. Furthermore, (Sun & Han 2018) discovered that the majority of respondents considered climate change to be a significant global issue. The rise in adverse effects of climate change in recent years worldwide may be the cause of this.

The current study demonstrated that there was a substantial relationship between climate change knowledge and risk perception. It was found that participants with satisfactory knowledge were four times more likely to perceive danger as higher than participants with insufficient knowledge. This can be justified as more than two thirds of participants are knowledgeable about negative impacts of climate change, which in turn make them more likely to perceive its risk.

This is in line with the findings of (Lee et al., 2015), who evaluated determinants of public climate change awareness and risk perception around the world and discovered that understanding the effects of climate change was a strong predictor of risk perception. Meanwhile, understanding the reasons was a weak predictor. On the other hand, risk perception was found to have a small but positive correlation with climate change content knowledge (Aksit et al., 2017). This was explained as they were given insufficient knowledge about climate change.

The negative effects of climate change on human health in Egypt will be made worse by the country's high population density. The next generation will determine our future. They will, however, live longer and be subjected to CC's dangerous side effects. A child's capacity to endure, develop, and thrive is directly threatened by climate change. A crucial first step toward protecting the environment, preserving natural resources, and ensuring their effective utilization is climate awareness. In order to raise students' awareness of the environment, which in turn improves their perception of the risk posed by it, and ultimately to achieve the Sustainable Development Goals 2030 to protect both the environment and their lives, the ministry of education must incorporate terms related to climate change into high school and college curricula (UNICEF, 2022).

## Conclusion

The current study concluded that about two-thirds of the respondents have satisfactory knowledge concerning climate change. Besides, more than half of the participants have a higher risk perception concerning climate change. Old age adults, living in urban areas, living in extended family and health care workers have a three- time higher probability for having knowledge. Additionally, male gender, university education, sufficient income and satisfactory knowledge double the likelihood of having knowledge. Also, male gender and health care occupations triple the chance of having higher risk perception. Moreover, increasing age, urban residence and sufficient income double the probability of having higher risk perception. Furthermore, university education and satisfactory knowledge

increase the chance of having higher risk perception by four-fold.

### Recommendations

**Based upon the current findings, the following recommendations are suggested:**

- Conducting educational programs and workshops to raise the public awareness concerning climate change
- Using social media platforms to enhance the public knowledge and foster their risk perception concerning climate change.
- Utilizing digital health education to disseminate evidence-based information about climate change and enhance the public risk perception toward this issue.
- Developing climate change hotlines to answer any queries of the citizens
- Conducting community mobilization campaigns to raise the community awareness concerning climate change especially among the rural residents
- Conducting school based health education sessions to enhance the students' knowledge and foster their risk perception.
- Establishing university based health education sessions concerning climate change and integrating the issue in their curricula to prepare the students to apply their role in climate change mitigation measures.

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