How to Cite:
Mahmoud, M. A. M., Farag, E. M. R., Rahman, B. I. A. A. A. E., & Khalil, B. M. (2022). The effect of training program on improving awareness regarding climate change-related disasters among hospitalized patients undergoing surgical procedure. *International Journal of Health Sciences*, *6*(S8), 7151–7174. https://doi.org/10.53730/ijhs.v6nS8.14848

The effect of training program on improving awareness regarding climate change-related disasters among hospitalized patients undergoing surgical procedure

Marwa Abdelhamid Mohammed Mahmoud
Lecturer of Medical Surgical Nursing, Faculty of Nursing, Mansoura University

Eman Mohamed Ramadan Farag
Lecturer of Medical-Surgical Nursing Department, Faculty of Nursing, Ain Shams University, Egypt

Badr Ibrahim Ahmed Abdou Abd El Rahman
Fellow Medical Surgical Nursing, University Student Hospital, Mansoura University

Basma Mohamed Khalil
Assistant Professor in Medical-Surgical Nursing, Faculty of Nursing, Ain Shams University, Egypt

***Abstract*---**Climate change is impacting human lives and health in a variety of ways. It threatens the essential ingredients of good health as; clean air, safe drinking water, nutritious food supply, and safe shelter, and has the potential to undermine decades of progress in global health. Hospitals have a very important role in responding to disasters. Patients' improvement of their knowledge and practices helps them to better outcomes in disasters. This study aimed to investigate the effect of training programs on improving awareness regarding climate change-related disasters among hospitalized patients undergoing surgical procedures. Design: To achieve the aim of the current study quasi-experimental design was used (with a pretest post-test design on a group). Setting: The study was conducted in the surgical departments at Mansoura University Hospital, Egypt. Sampling: A convenient sample of 100 hospitalized patients undergoing surgical procedures were selected from previous settings within six months. The study tools:

International Journal of Health Sciences ISSN 2550-6978 E-ISSN 2550-696X © 2022. *Manuscript submitted: 09 Jan 2022, Manuscript revised: 18 Jan 2022, Accepted for publication: 27 Jan 2022*

Tool I: Structured questionnaire form; composed of two parts. Part 1: Patients' demographic data. Part 2: Patients' knowledge regarding climate change, Tool II: Patients' reported practices questionnaire, and Tool III: Patients' preparedness for climate change-related disaster questionnaire. Results: There was an improvement in patients' knowledge, self-reported practices, and preparedness post-training program than pre-training program implementation that were statistically significant at ($p < 0.001$). Furthermore, there was a statistically positive significant correlation between the total knowledge, practices, and preparedness post-training program implementation. Conclusion: According to the results of the study, the training program increased the patients' awareness containing their knowledge, practice, and preparedness in responding to climate change-related disasters. The training program has a significant positive effect on improving awareness regarding climate change-related disasters. Recommendations: Continuous education programs on climate change-related disasters are necessary. The patients are also recommended to participate in these programs to increase their awareness related to climate change and their preparedness.

***Keywords*---**awareness, climate change-related disaster, nurses, patients undergoing surgical procedure, training program.

Introduction

The frequency of climate disasters has increased fivefold in the past fifty years. During this time, weather-related calamities have been responsible for almost 90% of global deaths, or about 2 million deaths. Every year, some 7 million surgical procedures are carried out to treat injuries caused by natural disasters, and this figure is predicted to rise dramatically and unreasonably (Sherman et al., 2019). It is prepared to handle the added weight of physical or psychological injuries that arise from climate disasters because of limited resources and infrastructure, a lack of healthcare workers, and geographical and transportation constraints. With a population of over 220 million, there is approximately one surgeon for every 140,000 people. In 2022, flooding caused over 1,460 healthcare facilities to be damaged, over 1,700 people to die, and 13,000 traumatic injuries, these floods also disrupted surgical care (Meara et al., 2020).

In addition to natural calamities, a significant study conducted in 2019 linked rising ambient temperatures to an increase in interpersonal gun violence. Although this tendency has not been confirmed in other contexts, nations with larger wealth disparity have higher rates of conflict and criminal violence. They may also be more vulnerable as a result of the political, social, and economic fallout from climate change (Global Study on Homicide, 2019)

More than 16% of lung cancer occurrences worldwide and 40% of cases in East Asia are linked to air pollution, which is acknowledged as a risk factor for the disease. Additionally, a growing body of research links environmental pollution to the emergence of additional cancers, including bladder and breast cancer (Turner et al., 2020). Warmer weather, excessive rain, and flooding can also exacerbate

illnesses that require surgery, such as trachoma, filariasis, fungal and parasite infections, and infections of the eyes and skin (Shirley et al., 2022). Acute myocardial infarction mortality may be elevated by extreme temperature events, air pollution, and even long-term stress resulting from severe natural catastrophes (Xu et al., 2023).

The results of surgeries may also be impacted by climate change. According to Sahtoe et al. (2021), ambient air pollution has been linked to higher hospital length of stay, healthcare expenses, and readmission rates; conversely, warmer temperatures are associated with a greater incidence of surgical site infections, which can reach up to 39%. Additionally, according to Liu et al. (2022), air pollution can worsen lung function recovery and potentially raise mortality rates following lung cancer lobectomies.

Numerous effects of climate change are being felt on human health and wellbeing. It has the potential to undo decades of gains in global health by endangering the necessities of good health, which include clean air, safe drinking water, a plentiful supply of nutrient-rich food, and a secure place to live. Therefore, to address climate change and its connected issues, public awareness and knowledge of the issue are crucial (Buloshi, & Ramadan, 2017). Air pollution, forced migration, and shifting infectious disease patterns are among the health risks associated with climate change; these effects are more likely to affect disadvantaged people (Aronsson et al., 2020).

The globe today and in the future faces serious challenges due to climate change and global warming. Reducing global climate change requires immediate action, according to the National Centers for Environmental Information (NOAA, 2022). Rising greenhouse gas emissions have been linked to human activity as the primary cause of climate change. According to an analysis released by the Egyptian Meteorological Service, five years before to summer of 2021, there had been an extraordinary temperature increase of three to four degrees above average. Due to the harmful effects of climate change, the Egyptian government was forced to take more decisive and effective measures (Al-Ahram Center for Political & Strategic Studies (ACPSS), 2021).

It is essential to raise knowledge of climate change if developing nations are to become sustainable. In underdeveloped nations, a major obstacle to adapting to climate change is a lack of awareness. It is imperative to increase local understanding of climate change since its effects are escalating the frequency and severity of disasters in this nation that is prone to natural disasters. The 12th most vulnerable country in the world is extremely vulnerable to the effects of climate change (Abbas, 2019).

The primary cause of the alteration in climate patterns is greenhouse gases. A few examples of greenhouse gases (GHGs) are carbon dioxide (CO2), water vapor (H2O), methane (CH4), nitrous oxide (N2O), and fluorinated gases, such as sulfur hexafluoride (SF6), per-fluorocarbons (PFCs), and hydro-fluorocarbons (HFCs). Global warming is one of the world's most significant and pressing issues (United Nations, 2021) & (NASA, 2021).

Over 100 million individuals could be affected negatively by the effects on population health globally by 2030. Additionally, it is predicted that developing nations will be the most severely impacted because of their disproportionate exposure as well as their less-developed infrastructure and health systems (Torre et al., 2020). Rising sea levels, an increase in the spread of infectious diseases, food and water shortage, political unrest, mass migration and loss of finances are all consequences of climate change that negatively impact people's physical, mental, and social well-being (Álvarez et al., 2022).

Extreme heat waves and unseasonably high temperatures can also exacerbate chronic illnesses and cause heat exhaustion and heat stroke. According to Zhao et al. (2021), severe heat or cold is a contributing factor in about 5 million deaths worldwide annually. Exacerbation of severe lung illnesses, such as asthma or chronic obstructive pulmonary disease (COPD), and higher mortality have been associated with global warming. Air pollution, prolonged heat waves, forest fires, droughts, and changes in food sources are all contributing factors to the rise in respiratory illness and mortality (Bein et al. 2020). During Portugal's 2006 heat wave, every degree Celsius that the country's temperature raised increased the morbidity of COPD by 5.4%, mostly in women and people over 75 (Monteiro et al. 2019).

Effective management of infections also referred to as hospital-acquired or other treatment-related infections, depends on the capacity to separate patients who have significant infections to prevent others from contracting the infection. Patients may find it difficult to remain isolated during natural catastrophes like storms or floods, and some patients may contract infections from other people (Ayeni, 2017). Moreover, it is questionable if the current critical care system can accommodate the additional demands brought on by climate change, such as increased ICU bed capacity and supplies, as well as the staff's quantitative and qualitative capacity to manage high patient volumes and challenging situations, like patients with heat stroke and chronic illnesses (International Council of Nurses, 2018).

Significance of the study

Healthcare systems need to address the global implications of climate change since it poses a serious threat to human health. Among the biggest threats to world health in the twenty-first century is this one. livelihoods that are sensitive to climate change and widely held health concerns; in this regard, the healthcare workforce is essential to tackling climate change and its health implications. Although there are global efforts to equip the healthcare workforce, it is unknown if these projects have any awareness of or desire to address this issue (Sambatha et al., 2022).

It impacts the most fundamental aspects of human health, including having access to clean air, food, and water, as well as a secure environment (Anåkeret al., 2021). Egypt applied to host the 27th Conference of States Parties to the United Nations Convention on Climate Change (COP 27) in 2022, citing the need to represent the priorities, problems, and efforts of the climate crisis (Enterprise,2022).

One of the primary reasons Egypt is so vulnerable to Climate Change is its excessive population. Additionally, the heavily populated Nile Delta is extremely vulnerable

to rising sea levels. The health of residents will be impacted by global climate change as well (International Journal of Environmental Studies, 2022). Although only 5% of Egypt's landmass is in the delta, or narrow depression formed by the Nile, over 95% of its population and agricultural output is concentrated there. The following sectors are the most susceptible in terms of severity and predictability of outcomes: agriculture, coastal zones, aquaculture and fisheries, water resources, human surroundings and settlements, and human health (CDC, 2020).

Aim of the study

To investigate the effect of training programs on improving awareness regarding climate change-related disasters among hospitalized patients undergoing surgical procedures through:

1. Assess the patient's knowledge regarding climate change.
2. Assess the patients' reported practices regarding climate change.
3. Assess the patients' preparedness regarding climate change.
4. Design training programs based on actual patients' needs.
5. Implement a training program about climate change-related disasters.
6. Evaluate the effect of the training program on improving knowledge, reported practices, and preparedness regarding climate change-related disasters among hospitalized patients undergoing surgical procedures.

Research hypotheses

H1: The training program implementation will improve patients' knowledge of climate change-related disasters.
H2: The training program implementation will improve patients' reported practices of climate change-related disasters.
H3: The training program implementation will improve patients' preparedness for climate change-related disasters.

Subjects and Methods

Research Design

To achieve the aim of the current study, a quasi-experimental design was used (with a pre-test post-test design on a group).

Setting

The study was conducted in the surgical departments at Mansoura University Hospital, Egypt.

Sample

A total of 100 adult male and female hospitalized patients undergoing surgical procedures, were able to communicate, available at the time of data collection, and willing to take part in the study. Patients were selected from previous settings within six months based on convenient sampling.

Data collection tools

The data was gathered using the following three tools:

Tool I: A structured questionnaire form:
Following an assessment of pertinent contemporary literature, the researchers constructed it (CDC, 2020; International Council of Nurses, 2018; Ghanbari et al., 2019; Idrose et al., 2021). It is divided into two parts:

Part 1: Patients' data: Such as age, gender, occupation, and residence.

Part 2: Patients' knowledge regarding climate change: Eight items about its meaning, major environmental issues, the health effects of climate change, the use of solar energy, accelerated global warming, gases that contributed to aggravating climate change, the dangers of increasing CO2 in the atmosphere, greenhouse gases that allow solar radiation to escape into space, and how to stop climate change. This tool was used in the pre-and post-test.

Scoring system

About the pre- and post-program knowledge assessment of the patients, a right response received a score of 1, an incorrect response received a score of 0, and 60% and above were considered satisfactory knowledge levels, whereas less than 60% was considered unsatisfactory knowledge levels.

Tool II: Patients' reported practices questionnaire (pre/post):
The researchers designed it based on the most recent research and a review of relevant recent literature (CDC, 2020, International Council of Nurses, 2018; Ghanbari et al., 2019; Idrose et al., 2021). Ten statements were used to measure indoor practices, and eight statements measured outdoor practices.

The scoring system

Each statement received a score of either "done" or "not done." After adding up all completed practices, a total score was determined and expressed as a percentage, yielding the following results: inadequate practices were less than 60% and adequate practices were equal to or more than 60%.

Tool III: Patients' Preparedness for climate change-related disaster questionnaire (pre/post):
It was developed by the researchers after a review of relevant recent literature (CDC, 2020, International Council of Nurses, 2018; Ghanbari et al., 2019; Idrose et al., 2021). The researchers created it to get the subjects to provide the required data to effectively extract the precise replies from the respondents, this 14-item questionnaire was scored on a 3-point Likert-type scale with categories like agree, uncertain, and disagree. assigning a score (2, 1,0) to each statement's response. When a respondent's score falls below 50%, it indicates a poor level of preparedness. Respondents with a medium level of preparedness (scoring between 50% and 75%) and a high level of preparedness (scoring greater than 75%).

Pilot Study

It was carried out before the start of the data gathering. The feasibility, clarity, applicability, and simplicity of the instruments were examined on 10% of the total sample (10 patients), and there were no adjustments, so adding them to the study sample.

Validity and reliability

Three specialists in the department of medical-surgical nursing validated the research tool. With the assistance of additional specialists, content and construct validity was established. The final version of the instrument was prepared with all the expert modifications and constructive comments taken into account. The researchers assessed the instruments' internal consistency using reliability; they also tested the instruments' dependability to determine the measurement consistency. By figuring out the correlation coefficient for every scale, it was discovered. The range of Cronbach's alpha coefficient, which was 0.82 for tool I, 0.81 for tool II, and 0.78 for tool III.

Ethical consideration

Mansoura University's Dean of the Faculty of Nursing has officially approved the current study's conduct. Every patient was made aware of the goals and advantages of the research as well as their freedom to decline participation. Tight confidentiality was maintained for all data submitted. Before beginning the data collection, oral consent was sought from each patient who agreed to participate. The process of gathering data took ethical considerations into account.

Administrative design

To conduct this study, administrative approval was acquired via a letter sent to the directors of the previously chosen setting by the dean of Mansoura University's faculty of nursing. The course on climate change was structured into four phases: Assessment, planning, implementation, and evaluation.

Assessment phase

To gather baseline data for a pre-intervention assessment, patients were interviewed in the prearranged setting using the pre-intervention assessment.

Planning phase

Began by using the pre-test results to inform the design of the training program created by the researchers. Through the program, patients' understanding of the meaning of major environmental issues, the health effects of climate change, the use of solar energy, accelerated global warming, gases that contributed to the worsening of climate change, the risks associated with increased atmospheric carbon dioxide (CO2), how greenhouse gases allow solar radiation to return to space, and strategies for mitigating climate change were improved.

General objective for the training program:

Patients' awareness about climate change-related disasters will be improved by the end of the training program.

Specific objectives of the training program:

After completing the training course, patients will:
-Know satisfactory information regarding climate change-related disasters.
-Have adequate self-reported practices regarding climate change-related disasters.
-Be well-prepared for disasters brought on by climate change.

Implementation phase

The study's fieldwork took place over six months, starting in February 2021 and ending in August 2021. By utilizing a range of instructional strategies, including brainstorming, group discussions, and lectures. Furthermore, using other audiovisual tools, such as exchanging images and posters, the researcher completed the training program. It took place over two weeks in four sessions, lasting 45-50 minutes each. The training program covered the patients' knowledge of basic facts about climate change, including what it means, what causes it, and how it affects the environment. It also covered the patients' reported indoor and outdoor practices that may contribute to climate change. Additionally, how to prepare well for disaster brought on by climate change.

Evaluation phase

Using the same study questionnaires that were used before, it was also used after the training program was implemented to evaluate the differences, similarities, places for improvement, and flaws. Additionally, it's utilized to gauge how much the patients know and do about climate change before and after the program after a month of implementation, using the same instruments.

Statistical design

Using the statistical software program SPSS 20.0, data input and statistical analysis were completed. Descriptive statistics were used to display the data; for the qualitative variables, this meant using frequencies and percentages, and for the quantitative variables, mean and standard deviation. The qualitative category variables were compared using the chi-square test (X2). The interrelationships between ranking quantitative variables were evaluated using Pearson rank correlation coefficient analysis, with a p-value of less than< 0.05 being deemed significant.

Results

Table 1: Shows that three-quarters of the patients under study were in the 40–60 age range. Male patients made up about two-thirds (63%) of the total, 60% of whom were employed, and 61% of whom resided in cities.

According to Figure (1) the temperature changes were ranked as the most noticeable environmental change in Egypt by 78.0% of the patients surveyed.

When compared to before the training program was implemented, Table (2) demonstrated an improvement in the studied patient's knowledge after a month of training program implementation, a highly statistically significant difference was discovered between all knowledge items (P-value <0.000).

According to Figure (2), a highly significant increase was detected in the total satisfactory knowledge score level of the studied patients about climate change from 22% in the pre-training program implementation to 88% in the post-training program implementation.

Table (3): demonstrated that the self-reported practices of the patients under study had improved after the training program was put into place as opposed to before. All elements of self-reported practices were shown to differ significantly (highly statistically) before and after a month of training program implementation (P-value <0.001).

Figure (3) shows that there was a highly statistically significant difference ($p < 0.000$) regarding the total adequate self-reported practices level among the studied patients concerning climate change, going from 16% in pre-training program implementation to 93% in post-training program implementation.

Table (4) makes it clear that there has been progress in all statements of the patient's preparedness for climate change-related disasters with highly statistically significant differences at $p < 0.000$ post-training program implementation compared to pre-training program implementation.

Figure (4) illustrates how the overall study patients' high preparedness regarding climatic changes improved, going from 13% in pre-training program implementation to 87% in post-training program implementation.

In addition to a significant association between post-test total patient practices & preparedness and gender, Table (5) demonstrates a favorable relationship between the post-training program implementation of total patient knowledge and their residence.

Table (6) shows that the post-training program implementation total patients' knowledge score level, total practices, and preparation reflect a highly favorable correlation at $p < 0.001$; however, no correlation was identified with the pretraining program implementation.

Table (1): The studied patients' distribution regarding their demographic data (n=100)

Demographic data	No.	%
Age		
21≤ 40 years	25	25.0
40 ≤ 60 years	75	75.0
Gender		
Male	63	63.0
Female	37	37.0
Occupation		
Working	60	60.0
Not working	40	40.0
Residence		
Rural	39	39.0
Urban	61	61.0

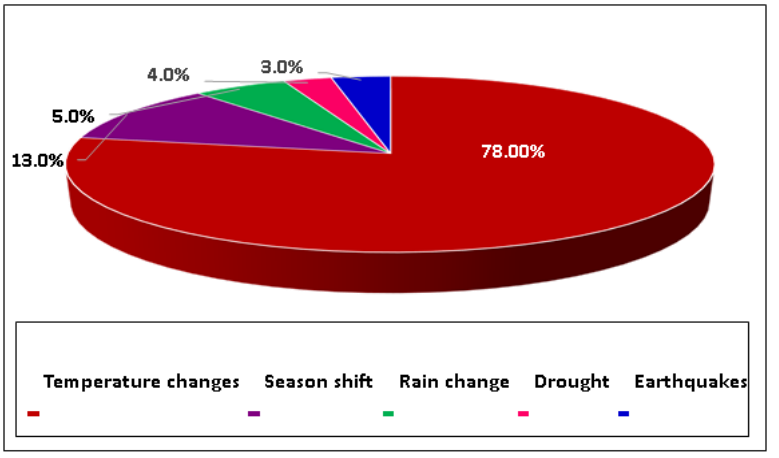

Figure (1): The studied patients' ranking distribution of the most observable environmental changes in Egypt (n=100)

Table (2): Differences between pre- and post-training program implementation among studied patients regarding their knowledge about climate change (n=100)

knowledge about climate change	Pre		Post		Chi-Square	
	N	%	N	%	X2	P value
Meaning of climate change						
Correct	35	35.0	86	86.0	219.34	0000**
Incorrect	65	65.0	14	14.0		
Major environmental problems						
Correct	30	30.0	82	82.0	194.67	0000**
Incorrect	70	70.0	18	18.0		
Health impacts related to Climate change Correct						
Incorrect	40	40.0	83	83.0	179.89	0000**
	50	50.0	17	17.0		
Solar use energy, and accelerated global warming						
Correct	10	10.0	80	80.0	435.45	0000**
Incorrect	90	90.0	20	20.0		
Gases that contributed to aggravating climate change Correct						
	21	21.0	93	93.0	499.33	0000**
Incorrect	79	79.0	7	7.0		
Dangers of increased Carbon dioxide in the atmosphere Correct						
	14	14.0	89	89.0	456.77	0000**
Incorrect	86	86.0	11	11.0		
Greenhouse gases allow solar radiation to pass back into space						
Correct	20	20.0	86	86.0	377.0	0000**
Incorrect	80	80.0	14	14.0		
Ways for Eliminating Climate Change						
Correct	13	13.0	87	87.0		
Incorrect	87	87.0	13	13.0	457.22	0000**

*Statistically significant level at P < .05

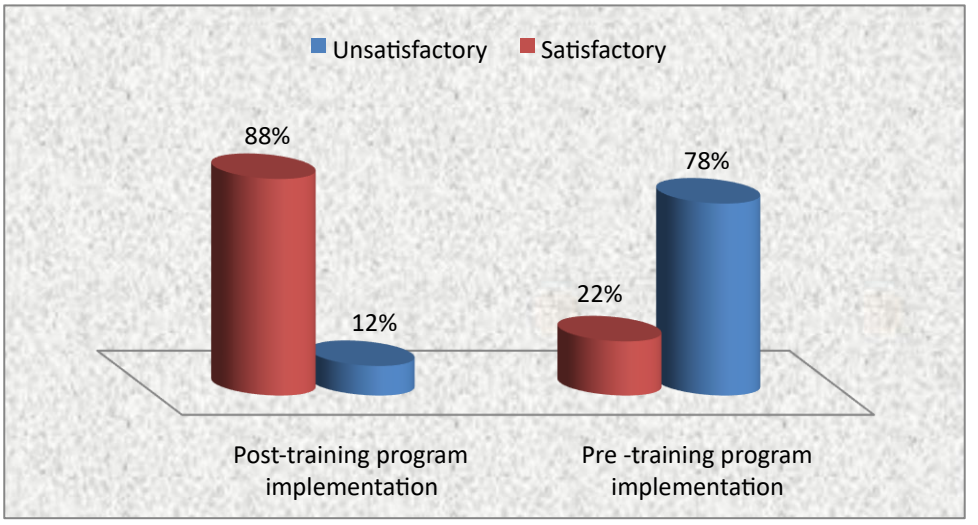

Figure (2): Total knowledge score level among the studied patients regarding climate Change pre- and post-training program implementation (n=100)

Table (3): Differences between pre- and post-training program implementation among studied patients regarding their self-reported practices about climate change (n=100)

Self-reported practices	Done practices				X2	P
	Pre-test		Post-test			
	N	%	N	%		
Indoor practices:						
Switching off home/work appliances (TV/ laptop/ computer) at the power point and not keeping on stand-by/screensaver mode.	15	15.0	91	91.0	25.34	.000
Switching off lights when not in use.	14	14.0	87	87.0	17.25	.000
Replacement of regular incandescent lights with compact fluorescent lights.	12	12.0	76	76.0	19.22	.000
Limit using of air conditioning in summer.	16	16.0	88	88.0	17.33	.000
Set air condition temperature at 24°C.	22	22.0	84	84.0	24.44	.000
Use rechargeable batteries.	17	17.0	63	63.0	32.54	.000
Paying more for "green energy" as wind/solar.	14	14.0	67	67.0	26.67	.000
Decrease domestic plastic products.	8	8.0	62	62.0	25.98	.000
Use recyclable products.	14	14.0	58	58.0	8.68	.024
Segregating the wet & dry household waste.	13	13.0	73	73.0	19.28	.000
Outdoor daily life practices:						
Regular PUC for vehicles. (n=93)	21	22.6	85	91.4	25.054	.001
Use stairs instead of elevators.	22	7.3	212	70.7	21.133	.000
Walking for short distances rather than vehicles.	48	16	223	74.3	14.184	.000

Minimum use of papers.	39	13.0	207	69.0	20.918	.000
Use cloth/cartoon bags in shopping not plastic.	18	6.0	144	48.0	4.501	.034
Reduction in consumption of packaged foods.	51	17.0	219	73.0	16.631	.000
Participation in tree plantation drives.	29	9.7	176	58.7	7.021	.021
Participation in cleanliness drives.	19	6.3	98	32.7	2.541	.068

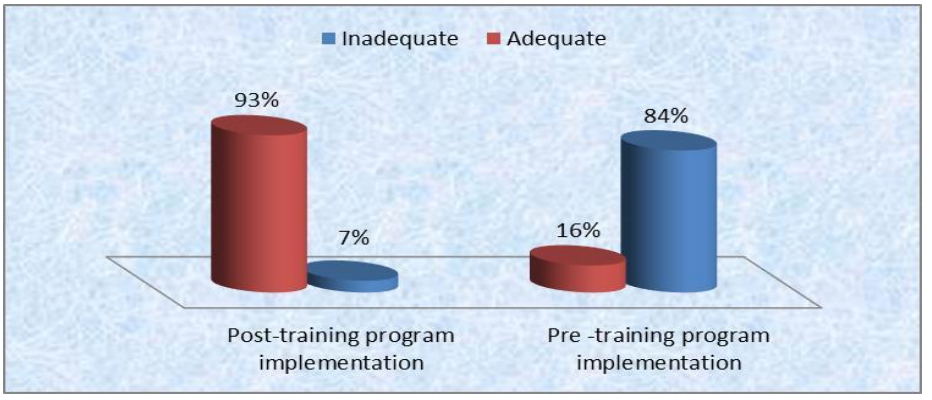

Figure (3): Total self-reported practice level among the studied patients regarding climate Change pre- and post-training program implementation (n=100)

Table (4): the studied patient distribution concerning their preparedness for climate change pre- and post-training program implementation (n=100)

Preparedness for climate change	Pre		Post		Chi-Square	
	N	%	N	%	X2	P-value
Climate change is occurring.	28	28.0	69	69.0	116.33	0000**
Around the world, there are several ways that climate change appears.	20	20.0	64	64.0	213.55	0000**
Climate change is already having an influence on us.	15	15.0	85	85.0	442.44	0000**
I believe that there is an urgent need to address climate change.	29	29.0	72	72.0	227.78	0000**
Sustainable development faces a challenge from climate change.	33	33.0	92	92.0	315.66	0000**
I am aware of national and international organizations dedicated to studying climate change.	22	22.0	82	82.0	276.69	0000**
Climate change has more negative effects than positive ones.	18	18.0	79	79.0	283.58	0000**
The primary source of climate change is human activity rather than environmental changes that occur naturally.	17	17.0	91	91.0	446.22	0000**
Surface temperatures rise due to climate change.	24	24.0	83	83.0	332.46	0000**
Sea levels rise as a result of climate change.	16	16.0	86	86.0	347.37	0000**
Coastal erosion is caused by climate change.	13	13.0	58	58.0	146.56	0000**

The impact of climate change on agricultural production.	18	18.0	88	88.0	398.78	0000**
The security of food is threatened by climate change.	24	24.0	94	94.0	427.94	0000**
Economic depression is caused by climate change.	16	16.0	60	60.0	135.86	0000**

Highly significant: P<0.001

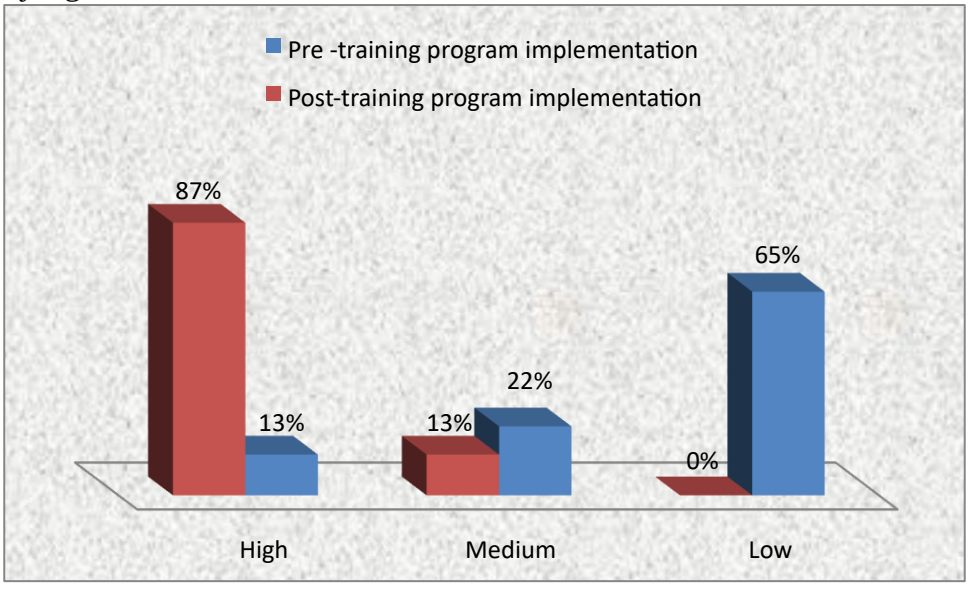

Figure (4): Total preparedness level of the studied patients regarding climate change pre- and post-training program implementation (n=100)

Table (5): Correlation between pre- and post-training program implementation patients' total knowledge, preparedness & practices, and their demographic data

Demographic data	Pearson correlation coefficient					
	Post-test					
	Knowledge		Preparedness		Practices	
	r	p	r	p	r	p
Age	.078	.436	.184	.085	.137	.089
Gender	.186	.083	.308	.008*	.303	.009*
Residence	.307	.007*	.105	.273	-.026-	.294
Occupation	.123	.124	.021	.228	-.038	.704

(*) Correlation is significant at p<0.05

Table (6): Correlation between total knowledge, total preparedness, and reported practices of the studied patients' pre- and post-program

Items	Total knowledge			
	Pre-test		Post-test	
	r	p	r	P
Total Practices	.078	.506	.949	.000**
Total preparedness	-.036-	.695	.789	.000**

(**) Correlation is highly significant at p<0.001

Discussion

The word "climate change" refers to long-term variations in weather and temperature. These weather occurrences might be natural, but since the 1800s, human activity has been the main driver of climate change. This is mostly because burning fossil fuels like coal, oil, and gas releases gases that trap heat (United Nations 2022). The physical and mental health of patients may deteriorate due to various environmental changes, and they may also become more susceptible to newly discovered diseases. Nearly nine out of 10 (86%) people who live in urban areas globally are exposed to dangerous particulate matter quantities, which contribute to the 1.8 million excess deaths annually, according to research that looked into urban air pollution and related mortality patterns in over 13,000 locations worldwide (Southerland et al. 2022).

The world is currently experiencing one of its biggest challenges: climate change. Catastrophic effects and even the possibility of human extinction are possible consequences of climate change. To start the changes related to the economies, general approach to nature, behavior, and resource utilization, everyone, especially those in the scientific community, must fully understand the problem and its potential solutions (Yang et al., 2018).

Regarding the patients' opinions of the current study, over three-quarters of them ranked the weather temperature over the last ten years as their top concern out of all the observable environmental problems in Egypt. In a similar vein, the findings of an online poll concerning climate change among Macedonian citizens revealed that over 75% of them had negative opinions about seasonal variations and surface temperatures (Bojovic D. & Dooel A., 2014).

The results of the current study demonstrated that the patients' knowledge had improved after the training program was implemented as opposed to before. All knowledge items were shown to differ significantly (P-value <0.000) before and after a month of training program implementation. Low levels of results before the intervention re-test to the necessity of a training program in this area.

Additionally, the success and efficacy of the awareness program are demonstrated by the increase in the researched patient knowledge following the implementation of the training program. These results were in line with those of Almulhim (2021), who found that less than two-fifths of the participants had inadequate knowledge

about climate change. The study was titled "Knowledge and Perception of Climate Change and Global Warming in the Context of Environmental Challenges and Policies" and was conducted in Dammam, Saudi Arabia. Additionally, at the posttest, three-quarters of the study sample demonstrated strong knowledge and awareness of climate change.

The current study found that there was a very statistically significant difference in patients' knowledge score levels about climate change between pre-and post-program implementation. The results of the study "The health impacts of climate change and their preparation to address those impacts" by Tiitta et al. (2021) corroborated these findings, pointing out that the studied sample lacked the knowledge required to support and engage in strategies for climate change.

According to Ibrahim et al.'s (2022) study in Egypt titled "The Effectiveness of Educational Interventions about Sustainability Development among the Studied Sample," most of the study's sample had insufficient knowledge about climate change before the educational intervention. However, after the intervention, it was found that awareness of sustainability advancements and climate change had significantly improved. According to the researchers, the studied sample received the necessary education to know the connection between climate change and health issues, which reflects the success of the training program. This was achieved by having knowledge of environmental themes and climate change awareness.

Additionally, the study's findings contradict several other studies that have discovered that the studied sample lacks the knowledge required to engage in climate change initiatives. For example, Reynaldo et al. (2018) found that the studied sample has a greater awareness of climate change due to media coverage, political channels, and firsthand experience with natural disasters both locally and globally. Additionally, the study sample grew increasingly receptive to the idea that nurses might play a bigger part in community environmental health issues.

Kurup P. et al. (2021) have done a study in the United Kingdom using an inquiry intervention methodology. Their study's findings indicated that the students had developed a strong awareness of the causes and impacts of climate change and global warming. Additionally, students at Bahrain University were found to be more knowledgeable than other students regarding the origins, effects, and various remedies for climate change, according to Freije et al.'s (2016) primary survey study assessing students' awareness of global warming.

The current study's findings showed that there was a highly statistically significant increase in the total satisfying knowledge score level of the patients about climate change, from twenty-two percent in the pre-training program implementation to eighty-eight percent in the post-training program implementation. From the perspective of the researchers, it verified the beneficial outcomes of the training program given to the patients under study.

The application of educational programs decreased the death rate of injured individuals after disasters, according to research by Ganbari et al. Through these programs, staff members become more knowledgeable about current disaster relief plans, participate more actively in planning, solve difficulties, and develop their task-related abilities (Ghanbari et al., 2019).

Preparedness for natural disasters and disaster response will be facilitated by the integration of organizational units for human resource training, the development of the relationship between nursing staff and disaster response organizations, the creative content of education, and efficient economic systems for nursing education (Zarea et al., 2019). Knowledge and practice domains had increases in scores in the current study; however, the practice domain saw a smaller gain than the knowledge domain, with a statistically significant difference. In the knowledge test, participants again received great scores.

Regarding the practices that the patients reported reducing climate change, the current study showed that the practices of the patients were better after the training program was implemented than they were before. Between all items of the self-reported practice before and after a month of training program execution, a very statistically significant change was discovered. According to the researchers, this indicates that the training program had a positive influence. The researchers also believe that the appropriate level of practice will help them mitigate the health implications of climate change and minimize its hazards.

Regarding the post-test patients' reported practice level about climate change, the results of this study made clear that there was an improvement in the patient's total adequate practice score level about climate change from less than one-fifth in the pre-training program implementation to the majority in the post-training program implementation, with a highly statistically significant difference. Additionally, the majority of the study sample noticed an improvement in practices and activities with a highly statistically significant difference between the pre and post program phases. This improvement in the patient's reported practices could be attributed to their increased awareness of climate change, which has helped them adapt their behavior towards environmental activities and recognize environmental issues.

The current study's results regarding the studied patients' awareness of climate change demonstrated improvement in all areas, with a highly statistically significant difference between the training program's implementation before and after the test. According to the researchers, it validated the implementation of the training program's efficacy and success. These results were marginally comparable to those of Almulhim A., (2021), who carried out research to determine the degree of knowledge of climate change, its causes, and its effects among residents of Dammam, Saudi Arabia. The study conducted by Almulhim et al. (2021) revealed that a third of the participants exhibited an inadequate understanding of climate change. Additionally, slightly more than twenty-five percent of study participants had a high degree of comprehension, awareness, and knowledge regarding climate change. Additionally, a primary survey study conducted in 2016 by Freije et al. in Bahrain revealed that fourth-year science students knew more about the causes, effects, and various solutions for climate change than other students did.

The mean knowledge and practice scores between the pre-test and post-test of the training program execution showed a significant difference, based on the average total scores of disaster preparedness. Together with the practice score, the average patient knowledge score also rose. Additionally, statistically significant was the rise in the average preparedness score. The results of this study corroborate those of

studies on disaster preparedness training conducted by Wang et al., (2018), Bartley et al., (2020), and Idrose et al., (2021) which found that educational programs were successful in increasing the examined sample's preparedness for disasters (Amerion et al., 2020).

The current study's findings showed that there was a difference between the patients' pre- and post-training program mean scores for knowledge, practices, and overall preparedness. The study's findings demonstrated a statistically significant increase in the post-test mean preparedness score. Researchers found that the introduction of training programs had a positive impact on patients' readiness by facilitating the acquisition of knowledge and best practices.

In addition to a good correlation between post-test total patient knowledge, practices & preparedness, and gender, the current study results indicated a positive correlation between the post-training program implementation total patients' knowledge and their residence. It demonstrated that females had a stronger commitment to climate change activities and perceptions. The significance of including environmental issues and climate change in patient education may also have been identified by these outcomes.

According to the results of this study, there was a significant increase in patients' knowledge score level, overall practices, and preparedness following the execution of the post-training program. This study's findings are consistent with those of Sah et al. (2018), whose investigation in India produced findings comparable to those of the current investigation. According to researchers, it demonstrated the positive effects of learning about best practices and how well-prepared patients were to handle the problem of climate change.

Workplace culture has a major impact on how patient safety is handled in the caregiving unit. A happy workplace is essential to patient safety. Enhancements in working conditions are necessary to increase patient safety since hospital unit characteristics are closely linked to the safety climate scores of the unit (Brubakk et al. 2021). Furthermore, it is commonly known that extreme weather events raise the rates of admission and length of stay (Wondmagegn et al. 2021). These factors would negatively impact psycho-social working conditions for healthcare professionals by increasing their workload, decreasing the amount of supervision provided, negatively affecting the workplace, increasing the risk of burnout and medical errors (Bari et al., 2016), and ultimately worsening the climate for patient safety.

It is also important to mention that there could be detrimental effects on sleep due to climate change. According to a systematic review that examined the relationship between global warming and sleep, which included papers from numerous databases like PubMed, Cochrane, and Scopus, climate change posed a serious risk to human sleep for the years 1980 to 2017. Stress from disasters can cause insomnia, and poor air quality can cause breathing problems when you're trying to fall asleep (Rifkin et al. 2018). This will surely bring up additional risks to people's health and well-being in general and to the health of medical professionals, employees, and patients in particular. Additionally, this may impair medical staff members' ability to focus and unwind, which could result in subpar treatment and increased risks of avoiding.

New disease emergence: There is a correlation between certain newly developing diseases and climate disasters. According to a recent study, persistent dehydration brought on by heat stress has been related to an outbreak of Mesoamerican Nephropathy, a chronic kidney disease with unclear etiology, throughout Central America (Correa-Rotter et al. 2019). The advent of such novel, unidentified diseases would therefore provide a significant challenge and gravely endanger the safety and lives of numerous patients since medical staff lack the knowledge and best practices necessary to handle and provide patients with urgent care and support.

It is usually advised to store drugs in an appropriate environment. Drugs may spoil from the heat during intense heat waves, especially those in unpowered care facilities. Patients put themselves at risk when they use certain medications, either because they are less successful in treating their conditions or because they have unanticipatedly substantial side effects and consequences (Salas, 2020). There are numerous other complex and little-known problems associated with how extreme weather events affect the medications that may be prescribed to patients. For example, a recent study found that bacteria become more resistant to antibiotics when temperatures rise (MacFadden et al. 2018).

Given that climate change can have detrimental consequences on both physical and mental health (WHO, 2022), many patients may find it more difficult to remember to take their prescribed, essential drugs regularly. As a result, this may impair their health, exacerbate their diseases, occasionally result in early death, and compromise the safety of the patients (Kumar et al. 2021). Heat waves appear to raise the risk of heat-related illnesses (Hopp et al. 2018). Severe heat waves could pose a serious risk to certain individuals, particularly those with comorbid disorders and chronic illnesses that require medication management.

Certain drugs, including diuretics and antipsychotics, have the potential to interfere with thermoregulation. This can occur when they reduce sweating or increase urine production, which can affect the balance of fluids and electrolytes in the blood. Patients become more vulnerable as a result, are less able to tolerate heat waves, and are more likely to require hospitalization due to heat-related illnesses (Layton et al. 2020).

Conclusion

Based on the findings of the current study, the results of this study concluded that the training program increased the patients' awareness containing their knowledge, practice, and preparedness in responding to climate change-related disasters. The training program has a significant positive effect on improving awareness regarding climate change-related disasters among the studied patients. There was a positive correlation between the post-training program patients ' total knowledge, practices, and preparedness.

Recommendation

The following suggestions are made in light of the findings of the current study:

- Continuous education programs on disaster management are necessary. The patients are also recommended to participate in these programs to increase their awareness related to climate change and their preparedness.
- For results, it is advised to repeat the current study with a bigger probability sample to be generalized.

References

Abbas, E. (2019): Climate change awareness and ecological public health. Nurs Stand. vol 29 no (24): p-p 37–41.

Al Ahram Center for Political & Strategic Studies (ACPSS 2021): the fourth edition of its annual report, 40 Egyptian and Arab experts and researchers who offer their predictions for the future of the world, the Middle East, and Egypt.

Almulhim, A. (2021): Public knowledge and perception of climate change and global warming in the context of environmental challenges and policies in Dammam Saudi Arabia. Conference Paper· December 2021. DOI: 10.2495/SC210471

Álvarez, C., Richardson, J., Parra, G., Abad, M., Huss, N., Grande, M., &López, I. (2022): Developing digital educational materials for nursing and sustainability: The results of an observational study. *Nurse Education Today*, vol 60 no (1), p-p 139– 146.

Amerion, A., Delaavari, A., &Teymourzadeh, E. (2020): Rate of preparedness in confronting crisis in three selected border hospitals. *Journal Mil Med*; vol 12 no (1): p-p 19-22.

Anåker, A., Spante, M., & Elf, M. (2021): Nursing students' perception of climate change and sustainability actions - A mismatched discourse: A qualitative, descriptive exploratory study. *Nurse Education Today* published. https://doi.org/10.1016/j.nedt.2021.105028

Aronsson, J., Clarke, D., Grose, J., & Richardson, J. (2020): Student nurses exposed to sustainability education can challenge practice: a cohort study. *Nurse Health Science Journal*, vol 22 no (3), p-p 803-811 View PDF CrossRefView- Record in Scopus- Google Scholar https://doi. org/10.1111/nhs.12734

Ayeni, O. (2017): The influence of socio-demographic factors on environmental education. Awareness of first year students at the Cape Peninsula University of Technology, South Africa. South Africa. *Int. J. Sci.* Soc. 5, www.science-society.com, ISSN 1836- 6236.

Bari, A., Khan, R., & Rathore, A. (2016) Medical errors causes, consequences, emotional response, and resulting behavioral change. *Pak J Med Sci* 32:523. https://doi.org/10.12669/pjms.323.9701

Bartley, B., Fisher, J., & Stella, J. (2020): Video of a disaster drill is effective in educating registrars on the hospital disaster plan. Emergency Medicine Australasia; vol 19 no (1):p-p 39-44.

Bein, T., Karagiannidis, C., & Quintel, M. (2020): Climate change, global warming, and intensive care. *Intensive Care Med* 46: p-p 485–487. https://doi.org/10.1007/ s00134-019-05888-4

Bojovic D. & Dooel A., (2018): Climate change perception and awareness level: an online survey the citizens of the Republic of Macedonia. Ministry of development and physical planning. United Nations Development Program.

Brubakk, K., Svendsen, M., Deilkås, E., Hofoss, D., Barach, P., & Tjomsland, O. (2021): Hospital work environments afect the patient safety climate: a longitudinal follow-up using a logistic regression analysis model. *PLoS ONE* 16:e0258471. https://doi.org/10.1371/journal.pone.0258471

Buloshi, A. & Ramadan, E. (2017): Climate Change Awareness and Perception amongst the Inhabitants of Muscat Governorate, Oman. *American Journal of Climate Change*, 4, p-p 330-336. doi: 10.4236/ajcc.2015.44026.

Centers for sickness management and interference (CDC), 2020). Gillespie E, Schramm P, Hsu J. "U.S. public health response to climate change for allergists-immunologists external icon." *ANNALS OF ALLERGY, ASTHMA &IMMUNOLOGY*,2020.https://www.climatehubs.usda.gov/hubs/southwest/topic/climate-hubs-presentations-2021- annual-conference-soil-and-waterconservation

Correa-Rotter, R., Wesseling, C., & Johnson, R. (2019): CKD of unknown origin in Central America: the case for a Mesoamerican nephropathy. *Am J Kidney Dis* 63: p-p 506–520. https://doi.org/10.1053/j.ajkd.2013.10.062

Enterprise, V. (2022): economy, and reporting frameworks and guidelines climate Change, Carbon and Natural Resources Management.

Freije, A. Hussain, T. & Salman, E. (2016): Global warming awareness among the University of Bahrain science students. University of Bahrain. *Journal of the Association of Arab Universities for Basic and Applied sciences*. www.elsevier.com/locate/jaaubas. www.sciencedirect.com

Ghanbari, V., Maddah, S., Khankeh, H., & Karimloo, M. (2019): The effect of a disaster nursing education program on nurses' preparedness for responding to probable natural disasters. *Iran Journal of Nursing*. 2019; vol 24 no (73): p-p 72-80.

Global Study on Homicide. Homicide trends, patterns, and criminal justice response. United Nations Office on Drugs Crime; 2019.

Hopp, S., Dominici, F., & Bobb, JF. (2018): Medical diagnoses of heat wave-related hospital admissions in older adults. Prev Med 110:81–85. https://doi.org/10.1016/j.ypmed.2018.02.001

Ibrahim, S. Mohamed, W. & Samir, S. (2022): The Effectiveness of Educational Interventions about Sustainability Development among Nursing Students Egyptian Journal of Health Care, EJHC Vol. 13 no (1).

Idrose, A., Adnan, W., Villa, G., & Abdullah, A. (2021): The use of classroom training and simulation in the training of medical responders for airport disaster. Emergency medicine journal; 24(1):7-11.

International Council of Nurses, (2018): Nurses, climate change and health. Retrieved from https://www.icn.ch/sites/default/files/inline-files/PS_E_Nurses_climate%20change

International Journal of Environmental Studies, (2019): Population growth, electricity demand and environmental sustainability in Nigeria: insights from a

vector auto- regressive approach. *International Journal of Environmental Studies*, Volume 79, Issue 1.

Kumar, A., Mohammadnezhad, M., & May, W. (2021): Patients' perception of factors infuencing noncompliance with medication among cardiac patients in Fiji: a qualitative study. Patient Preference Adherence. https://doi.org/10. 2147/PPA.S322731

Kurup, P., Levinson, R. & Li, X. (2021): Informed-Decision Regarding Global Warming and Climate Change Among High School Students in the United Kingdom. *Can. J. Sci. Math. Techn. Educ.* 21:166–185.https://doi.org/10.1007/s42330-020-00123-5

Layton, J., Li, W., Yuan, J., Gilman, J., Horton, D., & Setoguchi, S. (2020): Heatwaves, medications, and heat-related hospitalization in older Medicare benef- ciaries with chronic conditions. *PLoS ONE* 15:e0243665. https://doi.org/ 10.1371/journal.pone.0243665

Li, Z., Liu, M., Wu, Z., Liu, Y., Li, W., & Lv, S. (2022): Association between ambient air pollution and hospital admissions, length of hospital stay and hospital cost for patients with Cardiovascular Diseases and comorbid Diabetes Mellitus: base on 1,969,755 cases in Beijing, China, 2014–2019. Environ Int.; 165:107301.

Liu, C., Yang, D., Liu, Y., Piao, H., Zhang, T., & Li, X. (2022): The effect of ambient PM (2.5) exposure on survival of Lung cancer patients after lobectomy. Environ Health: Global Access Sci Source. Vol 22 no (1):23.

MacFadden, D., McGough, S., Fisman, D., Santillana, M., & Brownstein, J. (2018): Antibiotic resistance increases with local temperature. Nat Clim Change 8:510–514. https://doi.org/10.1038/s41558-018-0161-6

Meara, J., Leather, A., Hagander, L., Alkire, B., Alonso, N., & Ameh, E. (2020): Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *The Lancet*; vol 386 no (9993): p-p 569–624.

Monteiro, A., Carvalho, V., Oliveira, T., & Sousa, C. (2019): Excess mortality and morbid- ity during the July 2006 heat wave in Porto, Portugal. *Int J Biometeorol* 57:155–167. https://doi.org/10.1007/s00484-012-0543-9

National Centers for Environmental Information (NOAA) (2022): January 13) 2021 was world's 6th-warmest year on record. Accessed January 13, 2022.

Reynaldo, E., Jonas, P., Farhan. A., Khamees, B., Ebrahim, H., Mohammad, Q., Alquwez, A. & Paolo, C. (2018): Knowledge of and attitudes toward climate change and its effects on health among nursing students: A multi-Arab country study; Wiley Periodicals, Inc; vol 1 no (6);179-189. DOI: 10.1111/nuf.12240

Rifkin, D., Long, M., & Perry, M. (2018): Climate change and sleep: a systematic review of the literature and conceptual framework. *Sleep Med Rev* 42: p-p 3–9. https://doi.org/10.1016/j.smrv.2018.07.007

Sah, J. Bellad, A. & Angolkar, M. (2018): Assessment of the knowledge and attitude regarding global warming among high school students of Ramnagar, Belagavi city: A cross-sectional study, *Journal of dental and medical sciences*, vol 14 no (4), p-p374-320.

Sahtoe, A., Duraku, L., van, d., Oest, M., Hundepool, C., de Kraker, M., & Bode, L. (2021): Warm Weather and Surgical Site Infections: a Meta-analysis. Plast Reconstr Surg Global open; vol 9 no (7):e3705.

Salas, R. (2020): The climate crisis and clinical practice. *N Engl J Med* 382:589–591. https://doi.org/10.1056/NEJMp2000331

Sambatha, V. Narayan, S, Kumarb, S. Kumara, P. & Pradyumna, A. (2022): Knowledge, attitudes and practices related to climate change and its health aspects among the healthcare workforce in India – A cross-sectional study; vol 6 no (1) https://doi.org/10.1016/j.joclim.2022.100147

Sherman, J., MacNeill, A., & Thiel, C. (2019): Reducing Pollution from the Health Care Industry. JAMA; 322(11):1043–4.

Shirley H, Grifferty G, Yates EF, Raykar N, Wamai R, & McClain CD. (2022): The connection between Climate Change, Surgical Care and Neglected Tropical Diseases. Annals of Global Health; vol 88 no (1):68.

Southerland, V., Brauer, M., Mohegh, A., Hammer, M., Van Donkelaar, A., Martin, R., Apte, J., & Anenberg, S. (2022): Global urban temporal trends in fne particulate matter (PM2· 5) and attributable health burdens: estimates from global datasets. *Lancet Planet Health* 6:e139–e146. https://doi.org/ 10.1016/S2542-5196(21)00350-8

Tiitta, I. McDermott-Levy, R. Turunen, H. Jaakkola, J. & Kuosmanen, L. (2021): Finnish nurses' perceptions of the health impacts of climate change and their preparation to address those impacts Nurs. Forum, vol 56 no (2).

Torre, L. Baer, A. Sestili, C. Cocchiara, R. Barbato, D. Mannocci, A. & Cimmuto, A. (2020): Knowledge and perception about climate change among healthcare professionals and students: A cross-sectional study Giuseppe. *CHN J.* 4119/ -3347.

Turner, M., Andersen, Z., Baccarelli, A., Diver, W., Gapstur, S., & Pope, C. (2020): Outdoor air pollution and cancer: an overview of the current evidence and public health recommendations. Cancer J Clin; vol 70 no (6): p-p 460–79.

United Nations (2021): Climate Change, Glasgow Climate Change Conference – October-November 2021 https://unfccc.int/conference/glasgow-climatechange-conference-october-november-2021

Wang, C., Wei, S., Xiang, H., Xu, Y., Han, S., & Mkangara, O. (2018): Evaluating the effectiveness of an emergency preparedness training programme for public health staff in China. Public health; vol 22 no (5):p-p 471-7.

Wondmagegn BY, Xiang J, Dear K, Williams S, Hansen A, Pisaniello D, Nitschke M, Nairn J, Scalley B, & Xiao A (2021): Increasing impacts of temperature on hospital admissions, length of stay, and related healthcare costs in the context of climate change in Adelaide South Australia. Sci Total Environ Ent 773:145656.https://doi.org/10.1016/j.scitotenv.2021.145656

World Health Organization (WHO), (2022). WHO Health and Climate Change Survey Report, 2021.

Xu R, Huang S, Shi C, Wang R, Liu T, & Li Y. (2022): Extreme temperature events, fine particulate matter, and Myocardial Infarction mortality. Circulation.; vol 148 no (4): p-p 312–23.

Yang, L. Liao, W. Liu, W. Zhang, N. Zhong, S. & Huang, C. (2018): Associations between Knowledge of the Causes and Perceived Impacts of Climate Change: A Cross-Sectional Survey of Medical, Public Health and Nursing Students in Universities in China, *International Journal Environ Research Public Health* 3390/ijerph15122650

Zarea, K, Beiranvand, S., Sheini-Jaberi, P., & Nikbakht- Nasrabadi, A. (2019): Disaster nursing in Iran: Challenges and opportunities. *Australasian emergency nursing journal.*; vol 17 no (4): p-p 190-6.

Zhao, Q., Guo, Y., Ye, T., Gasparrini, A., Tong, S., Overcenco, A., Urban A, Schneider A, Entezari A, & Vicedo-Cabrera AM (2021): Global, regional, and national burden of mortality associated with non-optimal ambient temperatures from 2000 to 2019: a three-stage modeling study. *Lancet Planetary Health* 5:e415–e425. https://doi.org/10.1016/S25425196(21)00081-4