- *Basic Research*

Empowering Nursing Students to Face Climate Changes and Its Effects on Health

[1]Wafaa Gameel Mohammed Ali, [2]Hanan Abo Baker Mohamed, [3]Dalia Masoud Elsaid Hafez

[1]Professor in Medical Surgical Nursing Department, Faculty of Nursing, Mansoura University, Egypt
[2]Assistant professor in Medical Surgical Nursing Department, Faculty of Nursing, Mansoura University, Egypt.
[3]Lecturer in Medical Surgical Nursing Department, Faculty of Nursing, Mansoura University, Egypt.

Abstract

Background: Climate change presents a significant and urgent challenge for humanity. Its negative impacts are already apparent and will likely worsen exponentially over time if nothing is done. **The aim of the study** was to empower nursing students to face climate change and its effects on health **Subjects and Method***:* A quasi-experimental design was used, with a convenient sample of 289 nursing students. Data was collected using a tool divided into three sections: demographic information, student knowledge about climate change, and student attitudes towards climate change. **Results** showed a significant improvement in students' knowledge scores from 7.3% satisfactory level before to 75.1% post and their attitude improved from 6.6% positive before to 85.8% after implementing empowering educational sessions. **Conclusion**: these sessions effectively improved nursing students' knowledge and attitudes regarding climate change. **Recommendation:** continuous providing these empowering educational sessions to further enhance nursing students' understanding and perspective on climate change and its impact on health and improve their readiness to confront it.

Keywords: Climate Changes, Health effect, Nursing Students

Introduction:

Climate change (CC) refers to the long-term shifts in temperature and weather patterns. These changes may result from natural occurrences like variations in the sun's cycle. But since the 1800s, human activity has been found to be the primary cause of CC more specifically, the burning of fossil fuels like coal, oil, and gas **(United Nations, 2023)**. This issue has become one of the most critical concerns impacting the environment, society, and the economy in the 21st century **(Vinuesa, Mucova, Azeiterio, Cartea, & Pereira, 2020)**

It is also anticipated that this phenomenon will persist throughout this century and beyond, leading to increasingly severe crises such as shortages in energy, water, and food, as well as environmental degradation (**Khojasteh, Davani, Shamsipour, Haghani, & Glamore, 2022**). Egypt is one of the countries grappling with CC and the associated threats concerning environmental assets, economic, and social, alongside water, energy, and food security (**United Nations Development Programme, 2020**).

The CC impacts both the societal and environmental factors that determine one's health, such as access to clean air, safe drinking water, adequate food, and secure shelter. It is predicted that by the years 2030-2050, CC will lead to approximately 250,000 more deaths annually due to malnutrition, malaria, diarrhea, and heat-related stress. Furthermore, as we move towards the end of the twenty-first century, CC is expected to result in more frequent and severe droughts on a global scale. This rise in temperature and inconsistent rainfall patterns will decrease food production and escalate the prevalence of malnutrition and undernourishment. Additionally, CC also contributes to respiratory disorders and the spread of infectious diseases (**World Health Organization, 2021**). Also it causes gastrointestinal disorders, and mental health disorders (**United Nations, 2021**).

Education is the initial line of defense in influencing people's behaviors and attitudes towards the environment, as well as increasing their awareness (**Ayeni, 2017**). The CC has been integrated into science education, that allowing young individuals to develop an interest in the environment, motivation, and a sense of responsibility (**Deshiana, Sriyanti, & Ismet, 2022**).

In the healthcare sector, nurses play a crucial role in mitigating the impact of CC; therefore, nursing students must receive comprehensive education, possess essential skills, and be prepared for a professional role that promotes environmentally friendly care.

Furthermore, understanding how nursing students perceive CC and sustainability is important for the development of future curricula in this field (**Anaker, Spante, & Elf, 2021**). Hence,

Study Significance;

The study focusing on empowering nursing students to face CC and its effects on health holds immense significance in today's world. The CC is a pressing global issue that poses a direct threat to human health and well-being. As frontline healthcare providers, nurses play a crucial role in understanding and addressing the health impacts of CC. Moreover, empowering nursing students in this area allows them to advocate for policy changes and sustainable healthcare practices. Nurses can raise awareness and drive changes to reduce the carbon footprint of healthcare facilities, promote renewable energy sources, and integrate climate resilience measures into healthcare systems. By addressing climate-related health concerns at the individual, community, and global levels, nursing students can contribute significantly to mitigating the harmful effects of CC on public health. This research aims to empower nursing students to confront CC and their effects on health.

The study aim was to:

Evaluate the empowering nursing students to face climate changes and its effects on health, through;

- Assess nursing student's knowledge and attitude related to CC.
- Applied empowering educational sessions based on findings of pre – intervention data
- Evaluate the effect of empowering educational sessions on nursing students' knowledge and attitude.

Research Hypothesis:

H1: Nursing students' knowledge about CC had been improved after implementing empowering educational sessions.

H2: Nursing students' attitude toward CC had been changed after implementing empowering educational sessions.

Method:

3.1 Study Design: A quasi experimental research design has been applied in this study.

3.2 Setting: This study has been conducted at Faculty of Nursing –Mansoura University, and Technical Institute of Nursing, Egypt.

3.3 Sample size: The required sample size is 298 students after adding 10% for drop off when assuming that poor level of daily life practice was observed among 80% of target population before implementing the experiment that reduced to 65% after implementing the experiment. This assumption is based on confidence level 95% with power of 80%.

Participant: Nursing students at any educational level, who agree to participate in this study. A Convenient sample has been used for this study during second semester 2023, with total number 298 students from previous mentioned sitting.

3.4 Tools: This study employed a single tool to gather the required data and accomplish its goal, which is as follows:

Tool I: Descriptive Structure Questionnaire:

This tool was developed by the researchers after reviewing recent relevant literature **(Gautam, Mandal, & Yangden, 2021)** to get the necessary baseline data and assess students' knowledge and attitude regarding CC and its effects on health. It has divided into three parts.

Part I: Demographic data

It has been used for collection of personal data such as age, study location, residence, family size, previous knowledge about CC, sources of knowledge, and student opinion about expected health impact related to CC.

Part II: Student's knowledge about climate changes.

Aimed to evaluate student's knowledge about CC and its effect on health, researchers running through recent relevant literature **(Reddy, Rajamouli, Arora, Jothula, Amaravadi, & Boda, 2022),** this part involved 20 questions about basic facts about CC and its occurrence, factors contributing to CC, green-house gases effect & energy resources

of pollution, effects of CC on environment and humans and ways of reducing CC & sources of alternative energy, it was used pre and post test; each question was given a score. Correct answer taken one mark, and a zero for incorrect answer. Then the scores were summed up, the total score in this part was 20 marks (100%). Then score was transferred into categories as 60% or above was considering satisfactory knowledge, while less than 60% was unsatisfactory **(Ghazy, & Fathy, 2023)**.

Part III: Student's attitude toward climate changes:

It was used pre / post empowering educational sessions to assess students' attitude regarding CC. Researchers was developed after reviewing related literature **(Nieto, Garcia, Anguita, Martos, & Medina, 2022)** to determine student's attitude toward CC and its effects on health. This part consisted of 13 statements, Likert scale was used (disagree and agree).Total attitude was calculated and converted into percentage as positive attitude was 60% or above, and negative attitude was less than 60% **(Ghazy, & Fathy, 2023)**.

Validity and reliability: Used tools tested for content validity by a jury of 5 experts from both field of Medicine and Nursing Faculty Staff and any required modifications had been made accordingly. Cronbach's alpha was used to check the internal consistency of the tool and indicated that tool I part II had reliability (0.865), and part III had (0.883).

A pilot study: A pilot study was carried out on 10% of subjects before starting the data collection to test the tool for its relevance, feasibility, applicability, reliability, clarity. The tool was modified according to results of pilot study that was not included into the study sample.

Ethical consideration: Ethical approval to conduct the study from Research Ethics Committee of Faculty of Nursing was obtained with reference No (p.0450). Consent was obtained from each student by informing them online.

Filed work: was passed in four phases.

Assessment phase:

- Starting with interviewing students in pre-determined setting for collecting data after explaining the aim of the study. Electronic questionnaire was designed on Google Form then online sharing for collecting data.

Planning phase:

- Based on pre-test results, empowering educational sessions were conducted by researchers. These sessions were designed to improve students' knowledge and attitude regarding term of CC, CC related health impact, greenhouse gases, use of solar energy, global warming, danger of increase carbon dioxide (CO2), and ways to eliminate CC. These items were discussed through using numerous teaching methods such as Power Point Presentation, brain storming, group discussion, in additional to share videos, pictures, and posters during sessions.

Implementation phase:

- The three months that the fieldwork for this study was conducted were from the beginning of March 2023 to the end of May 2023. It took place over 5 sessions, one hour per each session over a month. These sessions covered the fundamental knowledge about CC. Additionally, how students view CC-related issues, how optimistic they are about CC, and how committed and responsible they are about CC.

Evaluation phase:

- Each student was evaluated after applying empowering educational sessions for doing post test by using study tool (part II, and part III). Comparison was done between pre & post to determine effect of empowering educational sessions on student's knowledge and attitude related to CC.

Data analysis:

SPSS for windows version 25.0 (SPSS, Chicago, IL) was used for all statistical tests. Mean ±standard deviation (SD) was used to distribute and express continuous data normally. Categorical data were expressed in frequency and percentage. Chi-square test was used for comparison of variables with categorical data. Pearson correlation analysis was used for assessment of the inter-relationships among quantitative variables. Statistical significance was set at $p<0.05$.

Results

Table (1): Demographic characteristics of the study sample (N=289):

Regarding the data presented in this table approximately (64.7%) of students was from the faculty of nursing. Furthermore, a majority of students (73.7%) were younger than 20 years old. Around 76.8% of the students come from rural areas, and about 62.6% of them belonged to families with more than 4 members. More than two-thirds (69.9%) of

the students had previous knowledge about CC, with the majority (66.8%) acquiring this knowledge from their university education.

Figure (1): Distribution of student's Opinion about expected health impact that already increase related to climate changes (N= 289):

This figure revealed the most expected health outcomes that already increase related to CC was cold related disease (83%), and increase respiratory disease (82.4%) according to student's opinions.

Figure (2): Difference between student's knowledge pre, post implementing empowering educational sessions regarding climate changes (N= 289):

This figure illustrated that students' satisfactory understanding of CC was only (7.3%) before they attended empowering educational sessions. However, after these sessions were implemented, this percentage increased significantly to (75.1%). The improvement in students' knowledge regarding CC was found to be statistically significant with (X^2=274.400 and P= 0.000).

Figure (3): Difference between student's attitude pre, post implementing empowering educational sessions regarding climate changes (N= 289):

The findings presented in this figure demonstrated that prior to the implementation of empowering educational sessions, only 6.6% of students had a positive attitude towards CC. However, following the implementation, this percentage significantly increased to 85.8%. This indicates a significant difference in student attitudes towards CC before and after the sessions, as evidenced by the (X^2=365.029 and p-value =0.000).

Table (2): Correlation between pre/ post total student's knowledge and their attitude (N=289):

As observed from this table, there is a noticeable positive correlation between students' knowledge and attitude in the post-test (P value was 0.000). Additionally, there is a significant correlation between students' attitudes before and after the test (P value was 0.000). However, there was no significant correlation observed between student knowledge and attitude during the pre-test phase (P value was 0.691).

Table (1): Demographic characteristics of the study participants (N=289).

Items	No	%
Study location		
• Technical institute of Nursing	102	35.3
• Faculty of Nursing	187	64.7
Age group		
• Less 20 years	213	73.7
• More 20 years	76	26.3
Residence		
• Rural	222	76.8
• Urban	67	23.2
Family size		
• 2- 4 persons	108	37.4
• > 4 persons	181	62.6
Previous knowledge about climate change		
• Yes	202	69.9
• No	87	30.1
If yes source (N=202)		
• Internet	17	8.4
• Friends	44	21.8
• University education	135	66.8
• Others	6	3

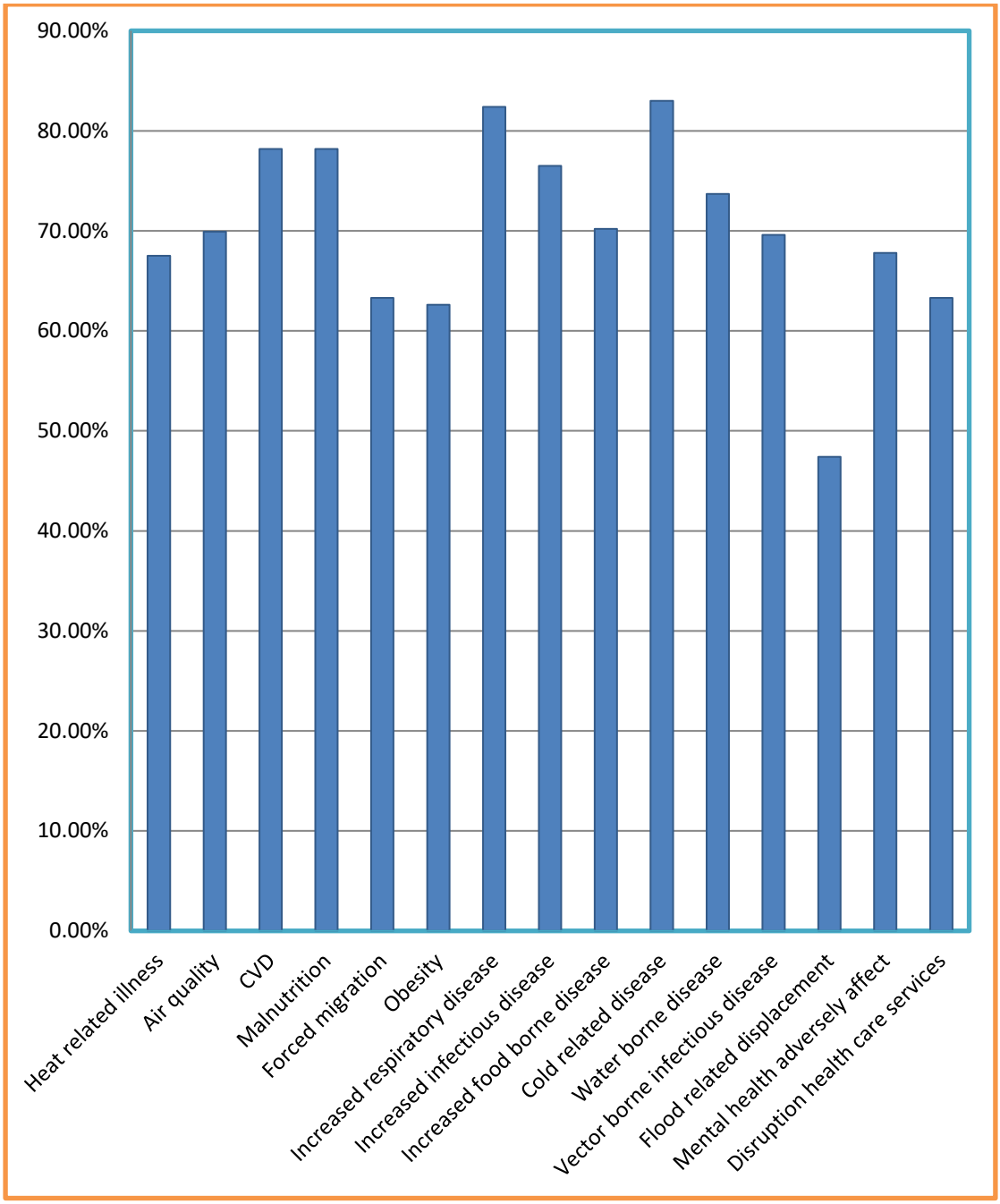

Figure (1): Distribution of student's Opinion about expected health impact that already increase related to climate changes (N= 289):

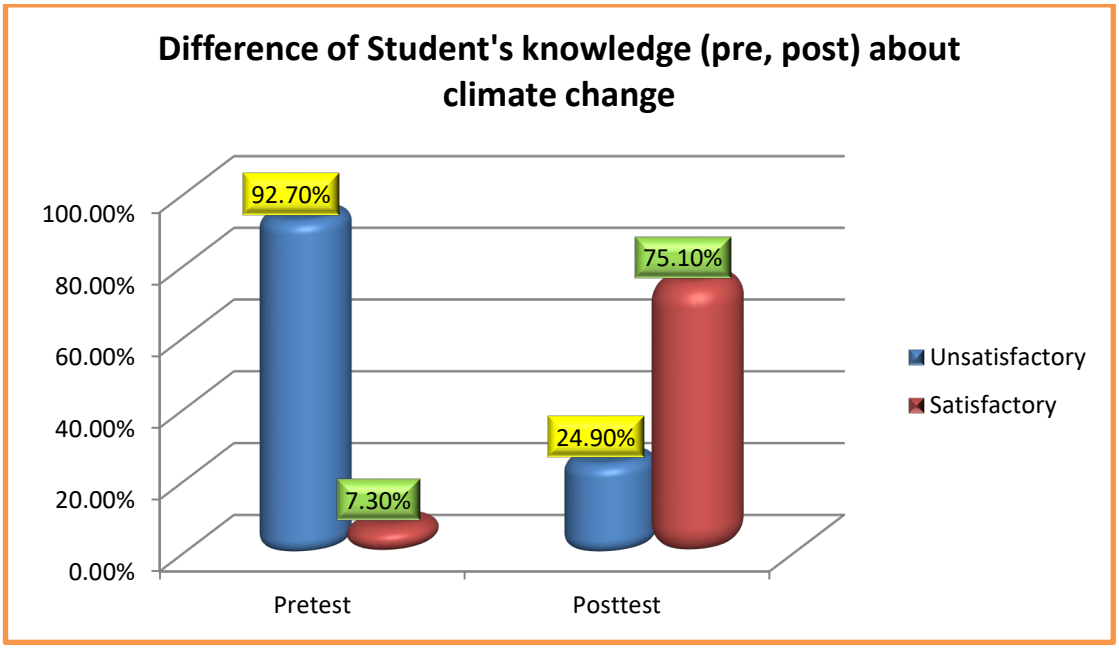

Figure (2): Difference between student's knowledge pre, post implementing empowering educational sessions regarding climate changes (N= 289):

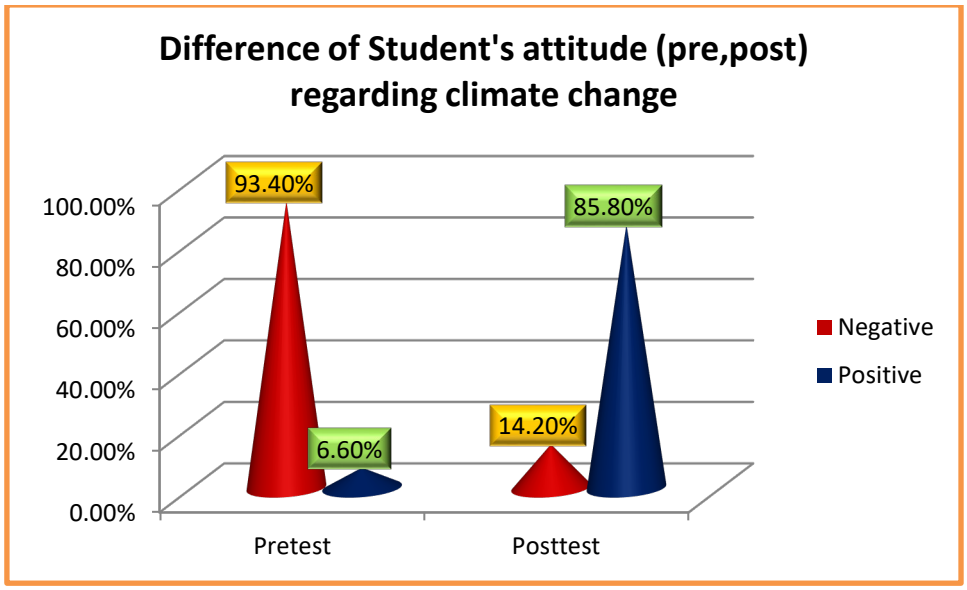

Figure (3): Difference between student's attitude pre, post implementing empowering educational sessions regarding climate changes (N= 289):

Table (2): Correlation between pre/ post total student's knowledge and their attitude (N=289):

Knowledge Attitude		Knowledge Post test	Attitude pre test	Attitude post test
Knowledge pre test	R	-.035	.024	.030
	p	.553	.691	.614
Knowledge post test	R		.008	.260
	p		.890	0.000
Attitude pre test	R			-.363
	P			0.000

Discussion:

Today CC is one of the most important challenges that the world facing it. It had a calamitous effect and a potential threat on human existence. So that it's important for everyone in scientific community to understand the problem and create solutions to initiate the necessary changes into behavior, economy, and using resources **(Yang, Liao, Liu, Zhang, Zhong, & Huang, 2018)**. By empowering nursing students with knowledge and attitude, this will equip them to tackle the challenges posed by CC. These challenges include the spread of infectious diseases, extreme weather events, mental health issues, and the displacement of populations due to natural disasters.

Nurses need to be prepared to identify, prevent, and manage these health risks efficiently. Furthermore, empowering nursing students to face CC and its effects on health aligns with the principles of preventative care and patient advocacy. By understanding the direct and indirect health impacts of CC, nurses can be proactive in providing anticipatory guidance and precautionary measures to vulnerable populations. This includes educating patients on heat stroke prevention, advising them on pollution reduction strategies, and helping communities respond to environmental disasters.

Regarding results of the current study, more than half of students has been enrolled from faculty of nursing, more than two third of students aged less than 20 years. This is in contrast with **(Abdallah, & Farag, 2022)** who found that more than three quarter aged

from 20 year to 22 year, also **(Gazzaz, & Aldeseet, 2021)** who proved that less than half were aged between 21-25 years.

Students came from rural area represented more than three quarter in the present study; this is in line with the nature of the Dakahlia region and perhaps due to rural beliefs and traditions. Also **(Ibrahim, Fahmy, & Mahmoud, 2018)** proved that more than half of students came from rural areas. As regard to family size, more than half of student's family consisted of 4 members this is in consistency with **(Ghazy, & Fathy, 2023)** who reported that more than half of student's family involved 2 to 4 members.

More than two third of students had previous knowledge about CC, and they acquired their knowledge from higher education, this may due to effort of the university to increase student's awareness about CC. While (**Reddy, Rajamouli, Arora, Jothula, Amaravadi, & Boda, 2022**) proved that less than three quarter of subjects obtained knowledge about CC from internet sources.

As regard to, expected health problem related to effect of CC, the majority of students expected that cold related disease and respiratory disease are the most common health effect related to it. In the same line **(Tuna, Tuna, Molu, & Keskin, 2022)** highlighted that more health effect of CC was increase air quality related disease. Additionally (**Reddy, Rajamouli, Arora, Jothula, Amaravadi, & Boda, 2022**) found that major health impact of CC was respiratory and cardiovascular diseases.

In the current study, there was a significant improvement in student's knowledge about CC after implementing empowering educational sessions. This is in agreement with **(Ghazy, & Fathy, 2023)** who cleared that there was a statistically significant change into student's knowledge post awareness program. Also **(Abdallah, & Farag, 2022)** found that total knowledge score of nursing students has been increase after implementing educational program. This proved that increasing awareness of CC and engagement into suitable actions will help communities to facing CC challenge.

In relation to student's attitude, there was a significant change into student's attitude after accomplished empowering educational sessions. This results supported by **(Ghazy, & Fathy, 2023)** who noticed that student's attitude regarding CC has been changed after educational program. In consistency with **(Ibrahim, Fahmy, & Mahmoud, 2018)** who illustrated that the largest proportion of study sample had positive attitude regarding CC.

Concerning correlation between student's knowledge and attitude, there is a significant correlation between students' knowledge and attitude during post test. Also a significant correlation among student's attitude pre and post test was found. In same way **(Ghazy, & Fathy, 2023)** who clarified that there was a significant correlation between total knowledge and total attitude score (pre& post).

Conclusion:

In conclusion, the study on empowering nursing students to face CC and its effects on health is profound significance. It equips future nurses with the knowledge, and attitudes necessary to address the health challenges arising from CC. By taking a proactive role in preventing, mitigating, and managing the health impacts of CC, nursing students can contribute to safeguarding the well-being of individuals, communities, and the planet as a whole.

The results of the current study revealed that, there was a significant improvement into students' knowledge and attitude regarding CC and its effect on health after implementing empowering educational sessions.

Recommendation:

- Integration of CC concept into university curriculum.
- Enrollment of nursing student into research projects related to CC and its effect on health.
- Continuous awareness program for university students regarding CC.

Acknowledgments: Researchers thanks both nursing students, and Mansoura University's Faculty of Nursing's Research Ethics Committee for their cooperation.

References:

1. Abdallah Z., & Farag A., (2022): Impact of Awareness Program Regarding Health Consequences of Climate Change on Knowledge, Perception and Daily Life practices among Nursing Students. Egyptian Journal of Nursing & Health Sciences.3 (1): 367-390. ISSN 2682-2563.
2. **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.105.105028. doi: 10.1016/j.nedt.2021.105028.

3. **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. The International Journal of Science in Society. ISSN 1836- 6236. DOI: http://doi.org/10.18848/1836-6236/CGP.
4. Deshiana A., Sriyanti I., & Ismet I., (2022): High School Students Awareness and Attitudes toward Climate Change. Berkala Ilmiah Pendidikan Fisika 10 (3): 320-330. DOI:10.20527/bipf.v10i3.14001.
5. Gautam B, Mandal P, & Yangden N, (2021): Students' Awareness towards Climate Change: A Study of Climate Change Effects on Human Health in Nepal. Prithvi Academic Journal. 4: 18-26. DOI: https://doi.org/10.3126/paj.v4i0.37006.
6. Gazzaz N., & Aldeseet B., (2021): Assessment of the Level of Knowledge of Climate Change of Undergraduate Science and Agriculture Students. World Journal of Education. 11(5):41-60.
7. Ghazy H., & Fathy D., (2023): Effect of Awareness Program Regarding Climate Change on Knowledge, Attitudes and Practices of University Students. International Egyptian Journal of Nursing Sciences and Research. 3(2):186-203.
8. Ibrahim A., Fahmy H., & Mahmoud S., (2018): Knowledge and Attitude regarding Global Warming Phenomenon among Assiut University Students. Assiut Scientific Nursing Journal. 6 (14):1-10.
9. Khojasteh D., Davani E., Shamsipour A., Haghani M., Glamore W., (2022): Climate Change and COVID-19: Interdisciplinary Perspectives from Two Global Crises. Science of the Total Environment. 844 (20) : 157142. doi: 10.1016/j.scitotenv.2022.157142.
10. Nieto C, Garcia C, Anguita L, Martos S, & Medina I, (2022): Effectiveness of scenario-based learning and augmented reality for nursing students' attitudes and awareness toward climate change and sustainability. BMC Nursing. 21(1):245. doi: 10.1186/s12912-022-01023-9.
11. Reddy GP., Rajamouli J., Arora KD., Jothula KY., Amaravadi S., & Boda A., (2022): Knowledge, perceptions and practices of medical students towards climate change and global warming: A cross sectional study. Journal of family medicine and primary care. 11(6):2557-2564. DOI: 10.4103/jfmpc.jfmpc_1782_21.
12. Tuna H., Tuna P., Molu B., & Keskin A., (2022): Determination of Nursing Students' Awareness of the Health Effects of Climate Change. International Journal of Caring Sciences. 15(2): 1149-1155.
13. United Nation (2023): What Is Climate Change? Available online at: https://www.un.or/en/climatechange/what-is-clmate-change. Accessed at 7-2-2023.

14. United Nations (2021): Climate Change, Glasgow Climate Change Conference – October-November 2021 https://unfccc.int/conference/glasgow-climate-change-conference-october-november-2021. Accessed at 20-2-223.
15. United Nations Development Programme (UNDP Egypt, 2020): Enhancing Climate Change Adaptation in North Coast and Nile Delta in Egypt (GCF). https://www.eg.undp.org/content/egypt/en/home/projects/enhancing-climate-changeadaptation-in-north-coast-and-nile-delt.html. Accessed at 25-3-2023.
16. Vinuesa A., Mucova S., Azeiterio U., Cartea P., & Pereira M., (2020): Mozambican students' knowledge and perceptions about climate change: an exploratory study in Pemba City. International Research in Geographical and Environmental Education. 31(1):5 – 21
17. World Health Organization (2021): Climate change - the biggest health threat facing humanity.Avaliable at https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health.Accessed at 23-8-2023.
18. Yang L., Liao W., Liu Ch., Zhang Na., Zhong Sh., & 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 of Environmental Research and Public Health.15(12): 1-14.doi:10.3390/ijerph15122650.

الملخص العربي

تمكين طلاب التمريض لمواجهة التغيرات المناخية وتأثيراتها على الصحة

الخلفية يمثل تغير المناخ تحديا كبيرا وعاجلا للبشرية, فاثارها السلبية واضحة بالفعل ومن المرجح أن تتفاقم بشكل كبير بمرور الوقت إذا لم يتم القيام بأي شيء.

الهدف من الدراسة: هو تمكين طلاب التمريض لمواجهة تغيرالمناخ وآثاره على الصحة
تصميم البحث: تم استخدام تصميم شبه تجريبي لإجراء الدراسة

عينه البحث: تكونت العينة من 289 طالب من طلاب كلية التمريض ومعهد فنى التمريض.
أدوات الدراسة: تم جمع البيانات باستخدام أداة مقسمة إلى ثلاثة اجزاء: الجزء الاول لاخذ المعلومات الديموغرافية، الجزء الثانى لتقييم معلومات الطلاب عن التغيرات المناخية،الجزء الثالث لتقييم اتجاهات الطلاب نحو التغيرات المناخية.

النتائج: أظهرت النتائج تحسنا ملحوظا في درجات معرفة الطلاب من 7.3% مستوى مرضي قبل إلى 75.1% بعد، وتحسن اتجاهاتهم من 6.6% إيجابية قبل إلى 85.8% بعد تنفيذ الدورات التعليمية التمكينية.

الخلاصة: أدت هذه الجلسات إلى تحسين معرفة طلاب التمريض ومواقفهم فيما يتعلق بتغير المناخ بشكل فعال

التوصيات: يوصى بمواصلة تقديم هذه الجلسات التعليمية التمكينية لزيادة تعزيز فهم طلاب التمريض ومنظورهم حول تغير المناخ وتأثيره على الصحة وتحسين استعدادهم لمواجهته.