

Effect of Climate Change on Health and Critical Care Nurses Practice

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ABSTRACT

Background: Extreme weather events brought on by climate change have an impact on human health both directly and indirectly. Increased temperatures and heat domes can exacerbate heart, lung, and renal diseases as well as cause heat stress and heat stroke. Nurses are essential in assisting communities in adapting to climate change and in fighting for a more sustainable future on behalf of patients and the environment.

Objective: The current study aimed to explore the effect of climate change on health and critical care nurse's practice.

Subjects and methods: *Design:* Descriptive exploratory design was used. *Setting:* The study was conducted at the New Elkasr ElAini Teaching Hospital in Cairo, Egypt. *Sampling:* A convenient sample of 84 nurses working in ICUs and Emergency Unit was used for conduction of this study. *Tools:* Two tools, 1st one structured interview questionnaire, 2nd tool, observational guide about the effect of climate change on health and nursing practice.

Results: The majority of the studied nurses think that climate change causes harm for people and patients. Three quarters of the studied nurses think that climate change causes malnutrition or hunger due to rising food prices. About two-third of the studied nurses thinks that climate change causes violence, physical and mental harm respectively.

Conclusion: Nurses' awareness of climate change and how it relates to health and practice varied. The role of nursing in combating climate change remained unclear. The study made clear that critical nurses did not immediately understand their responsibility in combating climate change. Include climate change in nursing courses so that future nurses will have the right attitudes toward environmental sustainability.

Keywords: Climate change, Health, Nurses Practice.

INTRODUCTION

Climate change is the phrase used to describe the gradual rise in global temperatures that is mostly accelerated by human activities. At the moment, more than 90% of people on the planet breathe in harmful levels of air pollution brought on by the extensive combustion of fossil fuels, which emits greenhouse gas (GHG) emissions to the environment ⁽¹⁾. Other human activities including agriculture and land usage, as well as the use of fossil fuels in manufacturing, transportation, energy, and industry, also produce significant amounts of GHGs. These GHGs are the sole major cause of global warming and the current climate problem ⁽²⁾.

The essential underpinnings of human health and survival are under attack from climate change. In comparison to preindustrial levels, the earth has warmed by more than 1.2°C, resulting in severe and quickly deteriorating health impacts on every continent ⁽³⁾. At all points in a person's lifelong journey through the health care system, nurses believe in providing holistic care. Nurses support all aspects of wellbeing, including physical, mental, emotional, spiritual, and other types. Because of this, nurses are aware of how crucial it is to have a healthy lifestyle that benefits both the individual and the environment ⁽⁴⁾.

In the next years, nurses should expect to observe a rise in illnesses resulting from climate change. In addition to promoting and supporting health and wellbeing, nurses have a professional obligation to inform patients and clients about the effects health effects of climate change in addition to look into, promote, and put into practice sustainable policy and practice. By doing this, nurses may consider the past

and present effects of climate change, make plans for future requirements, and get patients ready for upcoming and prospective climate change disasters ⁽⁵⁾.

Climate change health hazards have frequently been addressed through the employment of either mitigation or adaptation initiatives, which aim to lessen the impact of fossil fuel consumption, the primary driver of global warming. The continuity of energy policy, global warming, and more immediate health threats from heat waves or climate-sensitive infectious illnesses should all be addressed. Additionally, the wider the potential benefit, as with any health issue, the further upstream the action ⁽⁶⁾.

Patients are informed by nurses on how environmental changes affect their health. Encourage sustainable lifestyle choices that lower greenhouse gas emissions. Evaluate the risks and make resources available to avoid or reduce environmental health problems. In tackling the health effects of climate change, nurses are on the front lines, according to the International Council of Nurses (ICN). Therefore, just as they are devoted to safeguarding and advancing their patients' health, registered nurses are required to address climate mitigation (reduce or avoid greenhouse gas emissions) and climate adaptation (lower sensitivity to detrimental consequences). ICN also asserts that nurses need to be knowledgeable of and equipped to deal with climate change ⁽⁷⁾.

Earth's climate is changing as a result of both natural temperature variation and direct human-caused global warming ⁽⁸⁾; these effects show the inextricable links between planetary health and public health. For instance, the decade from 2010 to 2019 was the warmest on record, which led to an increase in the

frequency and intensity of wildfires, droughts, heat waves, storms, and floods, all of which had a detrimental effect on people's health ⁽⁹⁾. In addition, people's physical, emotional, and social well-being is being significantly impacted by rising sea levels, increased infectious disease transmission, food and water shortages, mass migration, political turmoil, and economic loss for both individuals and governments ⁽¹⁰⁾. Climate change has an effect on the social and environmental factors that determine health, such as access to enough food, clean water, and shelter. An additional 250 000 deaths per year from malnutrition, malaria, diarrhea, and heat stress are expected as a result of climate change between 2030 and 2050; 38,000 of these deaths are anticipated to be related to elderly people overheating, 48,000 to diarrhea, 60,000 to malaria, and 95,000 to under nutrition in children ⁽¹¹⁾.

Between USD 2-4 billion/year in direct health damage expenses are projected by 2030 (i.e. ignoring expenditures in health-determining industries like agriculture and water and sanitation). The places with poor health infrastructure, which are mostly in developing countries, will be the least able to handle without assistance to prepare and respond. Better dietary, transportation, and energy choices can lower greenhouse gas emissions, which can enhance health, especially since it reduces air pollution ⁽¹²⁾.

The relatively limited amount of research on this topic suggests that the Arab region pays little attention to climate change. Despite the region's vulnerability due to low socio-ecological resilience, resource-related conflicts, and escalating refugee and migration crises, including deforestation, soil erosion, and the depletion and pollution of water resources, as well as weak socio-ecological resilience ⁽¹³⁾.

The current study aimed to explore the effect of climate change on health and critical care nurses practice.

SUBJECTS AND METHODS

Research Design: Descriptive exploratory research design.

Setting: The study was conducted at the New Elkasr ElAini Teaching Hospital in Cairo, Egypt.

Sampling: A convenient sample of (84) nurses, working in ICUs and Emergency unit was used for conduction of this study.

Tools for data collection: The Data was collected by using two tools.

1. Structured interview questionnaire:

Part I, demographic characteristics. This questionnaire was developed by the researchers to collect demographic data such as age, gender, marital status, level of education, and years of experience.

Part II, nurses' knowledge about climate change. It was developed by the researchers after related

literature review; it contains 14 yes or no questions related to nurses' knowledge about climate change

2. Tool two, observational guide about the effect of climate change on nursing practice. It was developed by the researchers after literature review; it contains 15 yes or no question related to nurses practice toward work environment and effect of climate change on health.

Pilot study:

Ten nurses out of the entire sample were used in a pilot study to assess study instruments for clarity, applicability, and turnaround time. The results showed that there had been only minor alterations. The pilot research sample was used in the analysis since there is no alteration.

Validity and Reliability:

A thorough examination of the literature and a pilot research validated the study instruments' face validity and content. The designed questionnaire, which comprises of a series of questions to collect the subject's knowledge of climate change effects, was used to conduct structured interviews. Five experts in the field of nursing education evaluated the validity, relevance, practicality, and clarity of the tools.

Field work:

Data collection took place between September and November 2022. The researchers spent two morning shifts a week in the previously indicated conditions (10AM – 2PM).

The following phases of the study's execution:

- 1. Assessment phase:** To win the participants' confidence and trust and get their agreement to participate in the study, the researchers first introduced themselves to each subject and discussed the purpose and objectives of the investigation. To gather personal information, nurses were each questioned separately using a questionnaire schedule. This was created by the researcher, who used straightforward Arabic language appropriate for nurses' educational levels.
- 2. Implementation phase:** Ask the nurse first about climate change, its definition, and how it affects the environment and human health. Second, in a session that lasted between 30 and 45 minutes, the practice guide was discussed and handed to each nurse separately. Individually responding to each inquiry was a nurse.

Ethical Consideration:

The following were some of the study's ethical considerations: Each nurse enrolled in the study is given a brief explanation of the study's goal and purpose by the researchers. The researchers provided assurances that the participant data would remain

anonymous and private. The right to participate in the study (or not), together the flexibility to leave it at any moment, were both made clear to the nurses. Data was exclusively gathered for research purposes.

Statistical analysis

The collected data were introduced and statistically analyzed by utilizing the Statistical Package for Social Sciences (SPSS) version 20 for windows. Qualitative data were defined as numbers and percentages. Quantitative data were tested for normality by Kolmogorov-Smirnov test. Normal distribution of variables was described as means and standard deviation (SD). Spearman's correlation was

utilized to examine the relationship between two variables. P value ≤ 0.05 was considered to be statistically significant.

RESULTS

Table (1): shows that the Mean \pm SD of nurses age was (1.45 \pm 0.546 years) with age range from 20 to ≤ 50 years. It also clarifies that 57.1% of the studied nurses age was ranged from 20 to less than 30 years. 59.5 % of them were females. Regarding the marital status 71.4% of them were married. Additionally, 57.1% of the studied nurses has technical institute of education and 71.4 % of them has years of experience from 1-5 years.

Table (1): Frequency and percentage of the sociodemographic characteristics of the studied nurses (n= 84).

Variable	No	%
Age		
20 \leq 30	48	57.1
31 \leq 40	34	40.5
41 \leq 50	2	2.4
Mean \pm SD: 1.45 \pm 0.546		
Gender		
Male	34	40.5
Female	50	59.5
Marital Status		
Single	24	28.6
Married	60	71.4
Level of education		
Diploma	10	11.9
Technical institute	48	57.1
Bachelor	26	31
Years of experience		
1-5 years	60	71.4
6-10 years	19	22.6
11-20 years	5	6

Table (2) illustrates that, 69% of the studied nurses know the meaning of climate change and it causes worry to them respectively. All of the studied nurses think that climate change is happening and it will affects the future generations? 58.3% of the studied nurses think that climate change caused by nature not by humans .Regarding the effect of climate change on nursing practice, 66.7% think that it affects the nursing practice and causes illness due to reduced outdoor air respectively. 85.7% of the studied nurses think that climate change causes harm for people and patients. 75% of the studied nurses think that climate change causes malnutrition or hunger due to rising food prices.64.3% of the studied nurses think that climate change causes violence and physical and mental harm respectively.

Table (2): Frequency and percentage of the studied nurses' information toward climate change (n= 84).

Response	Yes		No	
	No	%	No	%
1. What is the meaning of climate change?	58	69	26	31
2. Do you think climate change is happening?	84	100	-	-
3. Is climate change caused by humans?	35	41.7	49	58.3
4. Is climate change affects nursing practice?	56	66.7	28	33.3
5. Is climate change causes worry to you?	58	69	26	31
6. Is Climate change causes harm for people and patients?	72	85.7	12	14.3
7. Is climate change will affect the future generations?	84	100	-	-
8. Is climate change causes illness due to reduced outdoor air?	56	66.7	28	33.3
9. Is climate change causes mental harm like depression or anxiety?	26	31	58	69
10. Is climate change increases poverty due to economic hardship?	42	50	42	50
11. Is climate change causes malnutrition or hunger due to rising food prices?	63	75	21	25
12. Is climate change causes heat related illness and vector born infectious diseases?	35	41.7	49	58.3
13. Is climate change causes violence, conflicts, or dislocations or all?	54	64.3	30	35.7
14. Is climate change causes physical and mental harm from droughts?	54	64.3	30	35.7

Table (3) reveals that 59.5% of the studied nurses think that they do not have responsibility toward climate change, 71.4% of the studied nurses think that all health organizations should advocate with national leaders for increase investments in health, 69% of them think that climate change increases the burden of nursing practice, 70.2% of them think that environment and climate change has an impact on health, 81% of them think that breathing issues like COPD or asthma affected by climate change like warmer or drier climate areas. 75% of the studied nurses think that there is a relationship between nursing and climate change. 63.1% think environmentally responsible practice (ERP) is very important in nursing practice, 60.7% of them think that disposal of hospital waste related to pollution, 53.6% of them do not turn lights off in empty rooms and not taking an excess supplies into patient rooms respectively. 73.8% of them think that there is a need to educate nurses about climate change adaptation.

Table (3): Frequency and percentage of nurses' practice towards observational guide of climate change (n= 84).

Response	Yes		No	
	No	%	No	%
1. Do you think nurses have a responsibility toward climate change?	34	40.5	50	59.5
2. Do you think that all health professionals should actively encourage their nations' and world leaders to achieve the goal of Paris agreement about climate change?	54	64.3	30	35.7
3. Do you think that all health organizations should advocate with national leaders for increase investments in health?	60	71.4	24	28.6
4. Does climate change increase the burden of nursing practice?	58	69	26	31
5. Is nurses had their responsibility in working toward sustainability to reverse the effect of climate change?	33	39.3	51	60.7
6. Do you think environmentally responsible practice (ERP) is very important in nursing practice?	53	63.1	31	36.9
7. Do you think the use of fossil fuels contributes to climate change?	57	67.9	27	32.1
8. Is your work produces significant amount of waste?	52	61.9	32	38.1
9. Is disposal of hospital waste related to pollution?	51	60.7	33	39.3
10. Do you think that environment and climate change have an impact on health?	59	70.2	25	29.8
11. Do you think breathing issues like COPD or asthma affected by climate change like warmer or drier climate areas?	68	81	16	19
12. Is there relationship between nursing and climate change?	63	75	21	25
13. Do you turn lights off in empty rooms?	39	46.4	45	53.6
14. Do you not taking an excess supplies into patient rooms?	45	53.6	39	46.5
15. Do you think there is a need to educate nurses about climate change adaptation?	62	73.8	22	26.2

Table 4 explained that total nurses' knowledge had a significant correlation with nurses' gender, and total nursing practice. It also revealed significant correlation between total nurses' practice and nurses' marital status and years of experience, and had highly significant correlation with nurses' age, educational level and total nurses' knowledge.

Table (4): Correlation between total nurses' knowledge, total nurses' practice and demographic data of the studied nurses.

Variable	Age	Gender	Marital status	Years of experience	educational Level	Total nurses' knowledge	Total nurses practice
Age	-	0.016*	0.166	0.045	0.578	0.940	0.000**
Gender	0.016*	-	0.340	0.583	0.000**	0.037*	0.860
Marital status	0.0166	0.340	-.	0.009**	0.080	0.716	0.037*
Years of experience	0.045*	0.583	0.009**	-	0.189	0.309	0.015*
Educational level	0.578	0.000**	0.080	0.189	-	0.146	0.005**
Total nurses knowledge	0.0940	0.037*	0.716	0.309	0.146	-	0.005**
Total nurses practice	0.000**	0.860	0.037*	0.015*	0.005**	0.005**	.-

*Correlation is significant at the 0.05 level (2-tailed). ** Correlation is highly significant at the 0.01 level (2-tailed).

DISCUSSION

Health professionals are advised to address climate change as one of the biggest dangers to world health in the twenty-first century. As a crucial component of the healthcare system, nurses are seen to be the first line of defiance against the harmful consequences of climate change ⁽¹⁴⁾. According to the Inter-Governmental Panel on Climate Change, global climate change poses a hazard to biological and ecological systems vital to the survival and health of people and other species on our planet ⁽¹⁵⁾.

An international agreement on climate change that is legally binding is the Paris Agreement. At COP 21 in Paris, it was approved by 196 Parties on December 12, 2015, and it became effective on November 4, 2016. Its aim is to maintain pre-industrial levels of global warming far below 2 degrees Celsius, ideally below 1.5. To achieve this long-term temperature goal, nations desire to reach the peak of global greenhouse gas emissions as soon as is practical. This will allow them to create a climate-neutral planet by the middle of the century. As the first legally binding agreement that unifies all nations in the battle against climate change and in the endeavor to adapt to its impacts, the Paris Pact marks a turning point in the global climate change process ⁽¹⁶⁾.

The current study illustrated that more than half of the studied nurses were ranged from 20 to less than 30 years. More than half of them were females. Regarding marital status, more than two-third of participants were married. Additionally, more than half of the studied nurses had technical institute, and about three quarters of them had 1-5 years of experience.

This was disputed by **Cruz et al.** ⁽¹⁷⁾, who noted that all nurses under scrutiny were female in their research. 70% of them have a bachelor's degree in nursing, on average. 78% of the participants had a junior job, and almost 91% had less than five years of nursing experience.

As regard the nurses' information toward climate change, the study revealed that more than two thirds of the studied nurses knew the meaning of climate change and it causes worry to them respectively. All of the studied nurses thank that climate change is happening and it will affects the future generations. More than half of the studied nurses thank that climate change caused by nature not by humans. Greenhouse gases (GHGs) are released into the atmosphere through the burning of fossil fuels and changes in land use, such as deforestation, which increases the concentration of gases already in the atmosphere. This is inconsistent with **Law et al.** ⁽¹⁸⁾ assertion that these are the primary causes of climate change. The principal GHGs, which account for 80,14.6% of the total GHG emission, are carbon dioxide, methane, and nitrous oxide, according to the South African Confederation of Agricultural Unions (2009).

As a result of continuous climate change, heat waves are predicted to happen more frequently and last longer. Heat waves are linked to higher fatality rates, and in hotter regions of the world, heat stroke risk is prevalent even on days with 'average' heat exposure. Although the rise in heat stroke is partly to blame for the higher mortality rate, people with pre-existing medical issues are also dying at higher rates than usual. According to **De Blois et al.** ⁽¹⁹⁾, a kind of

hyperthermia accompanied with a systemic inflammatory response that causes a syndrome of multi-organ failure with encephalopathy as the predominant organ can be referred to as a heat stroke.

Regarding to the effect of climate change on nursing practice, about two thirds of the studied nurses believed that it affects the nursing practice and causes illness due to reduced outdoor air respectively. The majority of the studied nurses believed that climate change causes harm for people and patients. Three quarters of the studied nurses knew that climate change causes malnutrition or hunger due to rising food prices. About two-third of the studied nurses viewed that climate change causes violence and physical and mental harm respectively. This is consistent with the findings of **Xiao et al.** ⁽²⁰⁾, who found that climate change poses threats to human health and wellbeing. The environment and other creatures have an impact on crucial human body functions. Health risks associated with climate change include trauma, the development of infectious illnesses, and a lack of natural resources, such as food and water. The fundamental reason why health sectors are raising health professionals' understanding of sustainable development and climate change is because of the influence on human health.

Regarding the nursing practice toward climate change, the current study revealed that more than half of the studied nurses saw that they do not have responsibility toward climate change, more than two thirds viewed that all health organizations should advocate with national leaders for increase investments in health, about two thirds of the studied nurses think that climate change increase the burden of nursing practice, less than three quarters of them viewed that environment and climate change has an impact on health ,the majority of them think breathing issues like COPD or asthma affected by climate change like warmer or drier climate areas ,three quarters of the studied nurses think that there is a relationship between nursing and climate change , more than half of them do not turn lights off in empty rooms and not taking an excess supplies into patient rooms respectively. Less than three quarters of them think that there is a need to educate nurses about climate change adaptation.

Primary, secondary, or tertiary effects of climate change on mental health are possible. Climate change has been demonstrated to cause stress in people, and climate change's impact on agriculture has been related to depression. In addition, climate change-related natural catastrophes, forced migration, or wars might result in mental health issues **Abdulrahman and ElSayed** ⁽²¹⁾. Nurses must be aware about the phenomena and ways to lessen its negative consequences in order to be effective in their efforts to address the health implications of climate change.

As a key segment of the healthcare industry, nursing offers a chance to considerably minimize the

environmental impact of healthcare practice, including active participation in public health programmes to slow climate change ⁽²²⁾. One crucial step in creating awareness is to incorporate sustainable healthcare within the curricula for healthcare professions. One of the social tipping points needed to stabilize the planet's climate by 2050 is education, according to research ⁽²³⁾. Despite **Orme et al.** ⁽²⁴⁾ documentation of higher education's "enormous potential to impact positively on health and sustainability," the importance of teaching sustainability in healthcare education has been slow to be recognized, and it still depends on the educators to incorporate the competencies into their curricula ⁽²⁵⁾.

Less than two thirds of the studied nurses in the current study believed that Environmentally Responsible Practice (**ERP**) is very important in nursing practice. This runs counter to the assertion made by **Kalogirou et al.** ⁽²⁶⁾ in their study that participants' understanding of ERP was lacking. It was difficult to imagine what ecologically conscious nursing may entail because it was rarely promoted in their practice. Any workplace environmental responsibility was frequently linked to cost and waste reduction.

In relation to correlation between the study variables, total nurses knowledge had a significant correlation with nurses gender, and total nursing practice, it also revealed the significant correlation between total nurses practice and nurses, marital status, years of experience and had highly significant correlation with nurses age, educational level and total nurses knowledge .This is in line with the assertions made by **Lefferset et al.** ⁽²⁷⁾, who claim that nurses must speak out for patients' health. They also included the viewpoint of the younger generation of nurses to the research and said that climate change education is essential for both practice and academic nurses. Some academics contend that it is the ethical responsibility of nurses to comprehend how their actions as professionals affect the environment and ecosystems.

CONCLUSION

The results of this study suggested a strong relationship between nurses' knowledge, demographic traits, and nursing practice. The understanding of nurses on climate change and its impact on health or practice varied. The role of nursing in combating climate change remained unclear. The study made clear that critical nurses did not immediately understand their responsibility in combating climate change. Clarifying this position and integrating it into routine nursing practice will need more effort.

RECOMMENDATIONS

1. Include climate change in nursing courses so that future nurses will have the right attitudes toward environmental sustainability.

2. Continuous education of critical care nurses on the effects of climate change on health and the role of nursing in resolving the issue.
3. Providing clinical nurses with chances to discuss climate change, health, and nursing practice.
4. Encourage nurses in their place of employment to contribute to the development of strong environmentally responsible nursing practices and to improve the connection between nurses and climate change.

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REFERENCES

1. **World Health Organization (WHO) (2022):** Climate Action: Fact Facts on Climate and Health. <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>
2. **Bush E, Lemmen D (2019):** Government of Canada. 'Canada's Changing Climate Report, (2019). pp. 194-260. <https://changingclimate.ca/CCCR2019/about/>
3. **Watts N, Amann M, Arnell N et al. (2021):** Countdown on health and climate change: responding to converging crises. *Lancet*, 397:129-70.
4. **Wanda M, Lindsey V (2019):** Climate Change and Health: It's Time for Nurses to Act. Canadian Federation of Nurses Unions (CFNU). pp. 1-52. <https://www.readkong.com/page/climate-change-and-health-2817805>
5. **Leffers J, McDermott L, Ruth Net al. (2017):** Mandate for the nursing profession to address climate change through nursing education. *Journal of Nursing Scholarship*, 49(6):679-87.
6. **Chaudhury M (2018):** Strategies for reducing vulnerability and building resilience to environmental and natural disasters in developing countries. DC: World Resources Institute. Pp. 1-10. https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2017/04/Moushumi-Chaudhury-Strategies-to-Reduce-Vulnerability-Paper_WRI_Final.pdf
7. **International Council of Nurses (ICN) Nurses (2019):** Climate change and health. Position statement. Pp. 1-6. <https://www.icn.ch/sites/default/files/inline-files/ICN%20PS%20Nurses%252c%20climate%20change%20and%20health%20FINAL%20pdf>
8. **Masson-Delmotte V, Zhai P, Pirani A et al. (2021):** Climate Change 2021 The Physical Science Basis. Cambridge University Press. Pp. 1-40. <https://search.informit.org/doi/abs/10.3316/informit.315096509383738>
9. **United Nations Statistics Division (2020):** Take urgent action to combat climate change and its impacts. <https://unstats.un.org/sdgs/report/2020/goal-13/>.
10. **Paavola J (2017):** Health impacts of climate change and health and social inequalities in the UK. *Environ Health*, 16(1):61-76.
11. **World Health Organization (WHO) (2018):** Climate Action: Fact Facts on Climate and Health. https://www.who.int/health-topics/climate-change#tab=tab_1
12. **Iira T, Ruth M, Hannele T et al. (2020):** Finnish nurses' perceptions of the health impacts of climate change and their preparation to address those impacts. *Journal of Nursing Scholarship*, 56:365-71.
13. **Eskjaer M (2016):** Climate change communication in Middle East and Arab countries. *Oxford Research Encyclopedia of Science*. <http://climatescience.oxfordre.com/view/10.1093/acrefore/9780190228620.001.0001/acrefore9780190228620-e-484>.
14. **Goodman B(2013):** Role of the nurse in addressing the health effects of climate change. *Nurse Stand.*, 27(35):49-56.
15. **Fahey D, Doherty S, Hibbard K et al. (2017):** Physical drivers of climate change. In: *Climate science special report: Fourth national climate assessment*. U.S. Global Change Research Program, Washington, DC, pp. 80. doi: 10.7930/J0513WCR
16. **Anåker A, Spante M, Dalarna M (2021):** Nursing students' perception of climate change and sustainability actions – A mismatched discourse: A qualitative, descriptive exploratory study. *Nurse Educ Today*, 105:105028. doi: 10.1016/j.nedt.2021.105028.
17. **Cruz J, Felicilda-Reynaldo R, Alshammari F et al. (2018):** Factors Influencing Arab Nursing Students' Attitudes toward Climate Change and Environmental Sustainability and their Inclusion in Nursing Curricula. *Public Health Nurs.*, 35(6):598-605.
18. **Law J, Kalogirou M, Dahlke S (2021):** Nurses as Boundary Actors in Sustainable Health Care: A Discussion Paper. *Witness: The Canadian Journal of Critical Nursing Discourse*, 3(2):36-46.
19. **De Blois J, Kjellstrom T, Agewall S et al. (2015):** The Effects of Climate Change on Cardiac Health. *Cardiology*, 131(4):209-17.
20. **Xiao J, Fan W, Deng Y et al. (2016):** Nurses' knowledge and attitudes regarding potential impacts of climate change on public health in central of China. *International Journal of Nursing Sciences*, 3(2):158-61.
21. **Abdulrahman M, ElSayed S (2015):** Climate Change and Population Mental Health. In: Luber G, Lemery J, eds. *Global Climate Change and Human Health – From Science to Practice*. San Francisco, California: Jossey Bass; pp. 311- 32. <https://www.wiley.com/en-us/Global+Climate+Change+and+Human+Health:+From+Science+to+Practice,+2nd+Edition-p-9781119667957>
22. **Cook C, Demorest S, Schenk E (2019):** Nurses and climate action: opportunities to lead national efforts. *Am J Nurs.*, 119(4):54-60.
23. **Otto I, Donges J, Cremades Ret al. (2020):** Social tipping dynamics for stabilizing Earth's climate by 2050. *Proc Natl Acad Sci USA.*, 117(5):2354-65.
24. **Orme J, Dooris M (2010):** Integrating health and sustainability: the higher education sector as a timely catalyst. *Health Educ Res.*, 25(3):425-37.
25. **Lopez-Medina I, Alvarez-Nieto C, Grose J et al. (2019):** Competencies on environmental health and pedagogical approaches in the nursing curriculum: a systematic review of the literature. *Nurse Educ Pract.*, 37:1-8.
26. **Kalogirou M, Dahlke S, Davidsonj S et al. (2020):** Nurses' perspectives on climate change, health and nursing practice. *Journal of Clinical*, 20:1-10.
27. **Leffers J, McDermott-Levy R, Nicholas P et al. (2017):** Mandate for the nursing profession to address climate change through nursing education. *Journal of Nursing Scholarship*, 49(6):679-87.