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# Climate Change and Health Hazards: Where Pharmacy Students in Iraq Stand on the Way of Sustainability?

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## ABSTRACT

**Background:** Climate change is one of our most significant global health threats. In 2019, the United Nations Environment Program ranked Iraq as the fifth most vulnerable country to climate change and desertification. Climate change is already having a significant impact on human health. Understanding the level of awareness among Iraqi pharmacy students about climate change and its relationship with health issues can help to address this critical implication. **Objectives:** This study aims to assess the awareness of pharmacy students in Iraq regarding climate change and its associated health hazards. **Methods:** An online questionnaire consisting of dichotomous and five-point Likert-scale questions was designed. The questionnaire was distributed among various official Telegram groups of pharmacy students. The collected data was analyzed using SPSS software. **Results:** A total of 106 participants participated in the study, with the majority (63.2%) female. While 93.4% of the participants were aware of climate change, most of them learned about it through the Internet (77.4%) and television (61.3%). Despite the high awareness level, only 47.2% consider acting against climate change important. Regarding health, participants suggested that respiratory diseases and skin and infectious diseases are most likely to escalate due to climate change. **Conclusion:** The results of this study indicate that pharmacy students in Iraq have excellent theoretical awareness of climate change and its associated health hazards; however, such awareness is not being translated into action. This issue could be addressed through national campaigns and some changes to the academic curriculum.

## INTRODUCTION

One of the most urgent challenges of our time is climate change, which poses serious risks to the health of the world's population, the stability of the economy and the sustainability of the environment. The effects of climate change on health are extensive and could result in higher incidences of infectious diseases, malnutrition, mental health problems and mortality. While the effects of climate change are being seen on a worldwide scale, low- and middle-income countries' vulnerable populations are particularly in danger because of a lack of resources, inadequate health systems, and issues related to awareness and sustainable practices (Organization, 2021). Many prevalent human diseases are linked to climate fluctuations, including cardiovascular mortality, and respiratory illnesses due to heatwaves, the altered transmission of infectious diseases, and malnutrition from crop failures. Uncertainty remains attributing to the expansion or resurgence of diseases to climate change, owing to a lack of long-term, high-quality data sets as well as the large influence of socio-economic factors, changes in immunity and drug resistance (Patz, Campbell-Lendrum, Holloway, & Foley, 2005). Table (1) illustrates, based on literatures, the most common diseases that are expected to have a significantly increased rate due to climate change globally.

**Table (1): The most common diseases that are expected to have a significantly increased rate due to climate change globally.**

| Disease | Affected System | Majority affected | Reference |
|---|---|---|---|
| Asthma | Respiratory system | Children, adults (females) | (Chowdhury, Guntur, Newcomb, & Wechsler, 2021; Rice, Thurston, Balmes, & Pinkerton, 2014) |
| Ischemic heart disease | Cardiovascular system | Both genders | (Majidi, Eslami, Ghorbani, & Foroughi, 2021; McMichael, Powles, Butler, & Uauy, 2007) |
| Anthrax | Integumentary system, Respiratory system, Gastrointestinal tract | Male | (Turnbull, 2008) |
| Diabetes mellitus | Circulatory system, Cardiac system, Urinary system and digestive system | Children, and young adults (male) | (Reisch & Gwozdz, 2011; Zilbermint, 2020) |
| Obesity | All organs in the body | Children | (Koch et al., 2021; Webb & Egger, 2014) |
| Denge disease | Liver, spleen, and lymph node | Both genders | (Rocklöv & Tozan, 2019) |
| Leishmaniasis | Cutaneous, mucocutaneous, nose, mouth, throat, visceral and internal organs leishmaniasis | Males more than females | (Charrahy et al., 2022; Snider, Lezama-Davila, Alexander, & Satoskar, 2009) |
| Hyperthermia | Heart, lungs, kidney, and liver | Infants and the elderly | (Lovegrove et al., 2014; Mitchell et al., 2018) |
| Pneumoconiosis | Respiratory system | Both genders, more in male | (Joshi & Varkey, 2020; Li et al., 2022) |
| Electrolyte abnormalities | Kidney and liver | Infants, children, and older adults | (Johnson et al., 2019; Milani, 2022) |

According to a 2022 report by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Iraq is among the nations grappling with serious health and environmental issues caused by climate change. Rising temperatures,

severe weather and water scarcity contribute to various health issues, including respiratory infections, water-borne illnesses and heat-related diseases. These challenges are exacerbated by environmental degradation, such as soil erosion and deforestation ((OCHA), 2022). Understanding the links between climate change, health, and sustainability in Iraq is crucial for addressing these dilemmas. In such regard, the 2021 health and climate change country profile for Iraq, which was published by the World Health Organization (WHO) and the United Nations Framework Convention on Climate Change (UNFCCC), focuses on (Organization, 2022):

1. Increase awareness of climate change's impact on health.
2. Support evidence-based decision-making to strengthen the resilience of health systems.

On the other hand, according to the United Nations for Education, sciences and Culture Organization (UNESCO), education as a medium is one of the essential tools for raising environmental awareness among people, particularly in developing countries (Chan et al., 2022). Furthermore, human behaviour has been recognized to have an impact on the sustainability (Abou Assi, Ng, Tang, Hassan, & Chan, 2021), while awareness assessment is the first step toward creating an understanding of society's challenges and addressing them appropriately (Bengtsson & Ågerfalk, 2011; Perron, Côté, & Duffy, 2006). Moreover, pharmacy students play a crucial role in addressing the impact of climate change on human health as they are future healthcare providers. By being more conscious about climate change awareness and the link between climate fluctuations and health, pharmacy students can learn to identify and respond better to the health effects of environmental degradation. Additionally, they can advocate for laws and policies that promote resilience and sustainability in healthcare, such as reducing waste and using renewable energy sources(Dupraz & Burnand, 2021). The current work presents the first report of insights on understanding pharmacy students' awareness related to climate change and health issues linked to climate fluctuations in one of the Iraqi private universities.

## METHODS

A questionnaire was designed that included questions on awareness and possible diseases related to climate change and was distributed to pharmacy students from all years at Al-Kitab University using official students' Telegram groups. Both dichotomous and five-point Likert-scale questions were used. Collected data were analysed via Cross-Tabulation analysis and Chi-Square Tests using SPSS software, Chicago, USA, version 27.

## RESULTS

The demographic of this work is presented in the table (2). Surprisingly, most students' responses were from females (63.2%). Out of the 106 responses, the highest responses were from the fourth-stage pharmacy students, followed by the third then the fifth, respectively.

**Table (2): The percentage and frequently of gender and stage.**

| Variable | Description | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 39 | 36.8 |
| | Female | 67 | 63.2 |
| | Total | 106 | 100 |
| Stage | 2 | 9 | 8.5 |
| | 3 | 30 | 28.3 |
| | 4 | 34 | 32.1 |
| | 5 | 28 | 26.4 |
| | Graduate | 5 | 4.7 |
| | Total | 106 | 100 |

Statistically, the Chi-square test of independence is a statistical hypothesis test used to determine whether two categorical or nominal variables are likely to be related or not. When observing the awareness level of the students regarding the climate change phenomena, there was no significant correlation ($p > 0.05$) between the stage of academic study at the College of Pharmacy and gender. Students at all participating stages from both genders revealed a high awareness percentage of climate change ( > 90%).

**Table (3): Summary of association of gender and stage in climate change awareness.**

| Variables | | Have you heard of the term "Climate Change"? | | $X^2$ value | P-value |
|---|---|---|---|---|---|
| | | Yes n (%) | No n (%) | | |
| Gender | Male | 37 (94.9) | 2 (5.1) | - | 1.00 |
| | Female | 62 (92.5) | 5 (7.5) | | |
| Stage | 2 | 9 (100) | 0 (0) | 1.223 | 0.890 |
| | 3 | 28 (93.3%) | 2 (6.7) | | |
| | 4 | 32 (94.1) | 2 (5.9) | | |
| | 5 | 25 (89.3) | 3 (10.7) | | |
| | Graduate | 5 (100) | 0 (0) | | |

Changes cannot be sparked by determining awareness alone; action is required. But acting without sufficient information can result in useless or dangerous solutions. Finding a balance between having awareness and being ready to act (Sinatra, Kardash, Taasoobshirazi, & Lombardi, 2012). Thus, we can have a good environmental effect when awareness and action are harmonious. In this regard, as illustrated in Figure 1, a rate of 47.2% of the participants considered that it is important to take action against climate change, whereas females showed higher eagerness to take action.

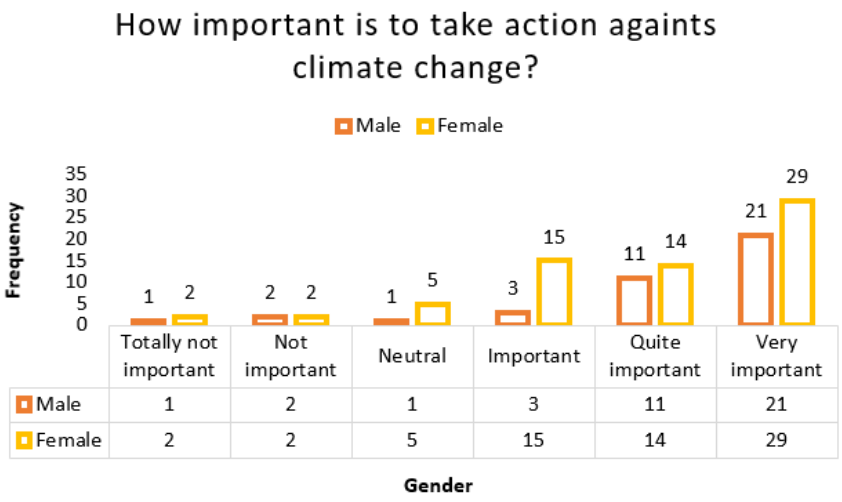


**Figure (1): Bar chart showing the responses of importance to take action against climate change**

In the context of the main information source about climate change as well as related health concerns, including the Internet, TV, newspapers, academic institutions, government foundations, families and friends all play a critical role. These resources offer a wide range of information, from the most recent scientific findings to helpful tips on improving our health and reducing our carbon footprint (Maran & Begotti, 2021). Precisely, TV and the internet can be used to spread awareness and provide news updates on the most recent climate change events because they can reach a large audience (Arlt, Hoppe, & Wolling, 2011). In this study (figure 2), it was found that the Internet is the primary source of information on the studied topic among the explored samples (77.4%), followed by TV (61.3%).

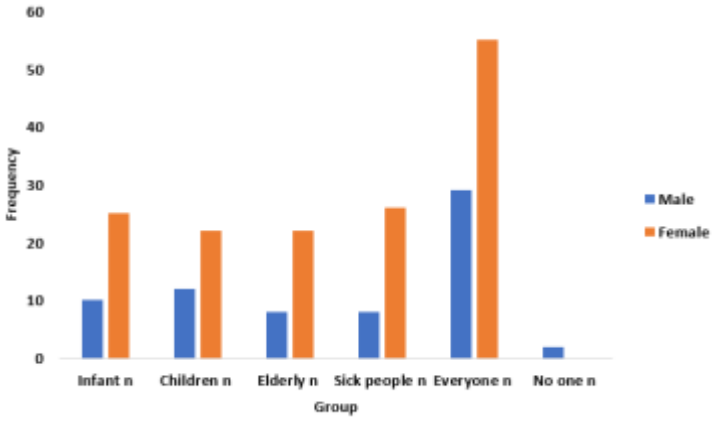


**Figure (2):** Sources of utilized information about climate change by the studied group.

In the frame of healthcare and disease related to climate change, there was a clear awareness of climate change consequences on health, where participants believed that everyone's health could be impacted by the conditions and outcomes of climate change. Interestingly, female participants had higher awareness in such regard, as shown in Figure (3).

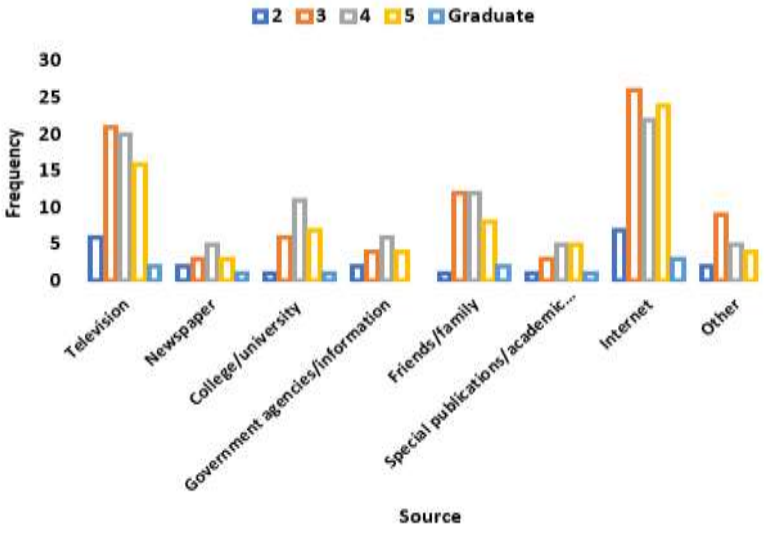


**Figure (3):** Participants' responses to the most affected health by category in society due to climate change

Moreover, as Figure 4 showed, participants had a strong awareness of the suggested diseases that are expected to be escalating due to the conditions and crises related to climate change. Mainly, responses included respiratory system, skin-related diseases, and different types of cancers.

**Figure (4): A word cloud illustrating diseases anticipated by participants to be escalating due to climate change.**

## DISCUSSION

For a number of reasons, it is crucial to have a high level of understanding of climate change and related health risks such as those reported in this study. First, it empowers people to make wise choices about their routines and actions, like cutting back on their carbon footprint and adopting eco-friendly practices. This, in turn, can improve people's access to healthy food, lower air pollution and promote environmental-friendly transportation options, all of which can improve the health of individuals and communities. Second, increased political activism and lobbying may result from high levels of public awareness, spurring citizens to call on elected authorities and decision-makers to take action on climate change and health-related issues. Third, better public awareness may encourage more funding for scientific research that can identify and lessen the effects of climate change on human health while also creating successful adaptation and resilience measures. In general, the studied sample of pharmacy students in this study had a high awareness of climate change and associated health challenges, which is essential for encouraging sustainable lifestyles are key to public support of mitigation and adaptation policies (Luís, Vauclair, & Lima, 2018). Parallel to this, people are more inclined to take preventative measures to safeguard their health when they are aware of how climate change could affect health, such as limiting their exposure to pollution or increasing their physical activity. However, it is worth mentioning that awareness alone is insufficient, while action without awareness can be unproductive or erroneous. A strong association between the two is necessary to bring about real changes. Such challenges to translating human behaviour into action were reported to be critical via introducing new methodologies and policies that are precise to every society (Naustdalslid, 2011). The studied sample showed much lower consideration to take action in slowing climate change despite the fact of their high awareness. In fact, due to the low percentage of the will to take action against climate change by the studied sample, incorporating climate change studies into their pharmacy curriculum is suggested as one of the possible solutions to empower students to take action. Thus, students can bring about positive changes and help create a more sustainable future for everyone. On the other hand, regarding information sources, this study reflects the high tendency of pharmacy students in Iraq to use the Internet as an information source. Prioritizing the internet as a source of information can have several positive impacts as a green resource. First and foremost, accessing information online eliminates the need for physical resources such as books and paper, which can have a significant environmental impact in terms of resource extraction, transportation and waste. In addition, the internet allows for easy access to a vast array of information, including up-to-date research and news articles, which can aid in making informed decisions about environmentally conscious practices (Maksimovic, 2017). However, awareness must be raised to properly select information from reliable e-resources. On health-related matters, pharmacy students showed good awareness of the impact of climate change on everyone’s health equally, where the disease that was shared by the participants was in line with the reported diseases in the literature, as mentioned in Table (1).

## CONCLUSION

The present study reported high awareness towards climate change and related health diseases among pharmacy students in Iraq at a private university. However, to translate this awareness to actions in society, pharmacy students will take action should match such awareness high percentage. Furthermore, students believe climate change affects everyone's health, including the respiratory system, skin diseases, and cancers, as the main anticipated health risks.


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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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