KNOWLEDGE, PRECEPTION and PRACTICES REGARDING IMPACT of CLIMATE CHANGE On PUBLIC HEALTH AMONG MEDICAL STUDENTS of SANA'A UNIVERSITY

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ABSTRACT

Background: Climate change affects the social and environmental determinants of health, clean air, safe drinking water, sufficient food and secure shelter. Between 2030 and 2050, climate change is expected to cause approximately 250000 additional deaths per year, from malnutrition, malaria, diarrhea and heat stress. While Yemen's contribution to global anthropogenic GHG emissions is very low, its vulnerability to climate change-related impacts on fragile sectors, systems, and populations is acute and there is limited information regarding the knowledge and practices towards climate change in Yemen. The study aims to assess knowledge, perception and practice regarding climate change impact on public health among medical students of Sana'a university.

Methods: A cross-sectional study was conducted in faculty of medicine, Sana'a university involving first, second and third year students as study participants. 236 undergraduate medical students who consented for the study were included. A structured questionnaire was used. Data is presented in frequencies and proportions with 95% confidence interval and Chi-square test is used as test of significance.

Results: moderate knowledge regarding impact of climate change on public health (68.6%),and good practice with percentage of (71.6%). Respiratory diseases such as asthma and allergies (95.4%) were answered as the major health impacts of climate change. participants have poor knowledge about of global policies and initiatives to mitigate climate change and they have little knowledge about their role as a future doctors to minimizing the impact of climate changes on public health. Major source of learning about climate change was internet. majority of respondents indicated that they would like to join the actual efforts to mitigate climate change.

Key words: Knowledge, practice, students, climate change, Impact.

Background: Climate change affects the social and environmental determinants of health, clean air, safe drinking water, sufficient food and secure shelter. Between 2030 and 2050, climate change is expected to cause approximately 250000 additional deaths per year, from malnutrition, malaria, diarrhea and heat stress (WHO,2021). While Yemen's contribution to global anthropogenic GHG emissions is very low, its vulnerability to climate change-related impacts on fragile sectors, systems, and populations is acute (Yemen Third National Communication, 2018).

For years, Yemen has been the poorest country in the Middle East and North Africa, and it is now also suffering the worst humanitarian crisis in the world. Yemen is a food-insecure nation that is highly dependent on staple food imports. Water resources are scarce and rapid groundwater depletion as well as inadequate infrastructure, pose challenges to sustainable development in the country, along with the expected impacts of climate change. A range of other socioeconomic and institutional factors hamper Yemen's ability to respond to current and projected changes in climate (world bank, 2022).

Climate change is expected to intensify hazards that threaten public health through the onset of higher temperatures, more frequent and longer heat waves, more frequent extreme storms and associated floods, increased potential for landslides, rising sea levels with accompanying higher storm surges, and recurrent drought. Exposure to these climate-related hazards will severely exacerbate health problems and may lead to vector borne and waterborne diseases which may extend their range into areas that are presently unaffected. Moreover, chronic diseases such as cardiac, respiratory and renal diseases may be aggravated by atmospheric conditions (i.e., temperature, humidity) that exceed historical variability. Human health is sensitive to shifts in weather patterns and hence all populations are vulnerable climate change. The largest risks to public health will occur mainly in areas and communities where conditions of poor nutrition, food insecurity, and poverty prevail. Therefore, the impact of climate change is expected to be more severe in children, poor people, women (particularly pregnant women), elderly people, people with chronic medical conditions and disabilities, and internally displaced people (IDPs) (Yemen Third National Communication, 2018).

There is limited information regarding the knowledge and practices towards climate change in Yemen. The study aims to assess knowledge, perception and

practice regarding climate change impact on public health among medical students of Sana'a university.

The study findings and recommendations can contribute to give decision makers a picture of climate change knowledge and the need to integrate it into plans and strategies. Also, there is lack of studies on climate change and its impact on public health.

Understanding current medical students' perception and capacity in response to climate change is of great significant in educational planning. Yet, to date there is little literature to rely on and there is no research in Yemen for evaluation awareness level of medical students about climate change and its impacts and also there is no appropriate educational innovations regarding climate change.

Methods: A cross-sectional study was conducted in faculty of medicine, Sana'a university involving first, second and third year students as study participants. 236 undergraduate medical students who consented for the study were included. A structured questionnaire was used. Data is presented in frequencies and proportions with 95% confidence interval and Chi-square test is used as test of significance.

Results: First: characteristics of the study sample according to demographic variables.

1- Gender

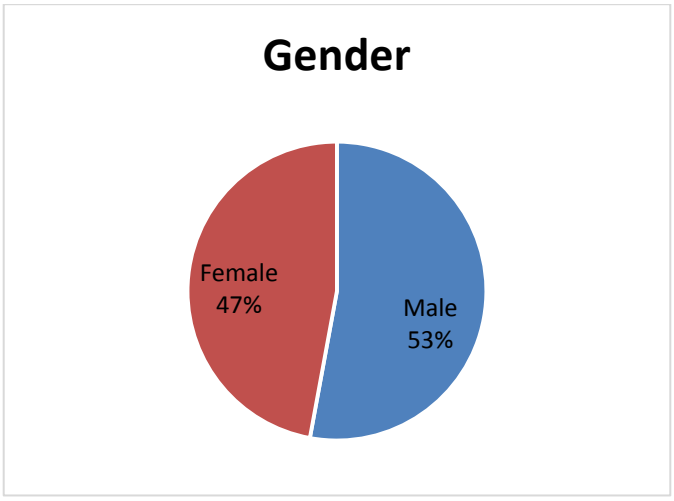


Figure No. (1) shows the characteristics of the study sample according to Gender

2-Age

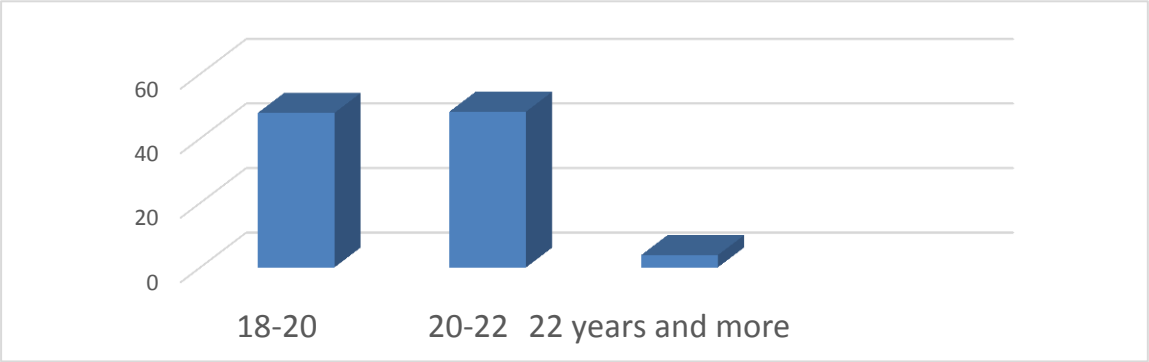


Figure No. (2) shows the characteristics of the study sample according to age

3-Educational Level

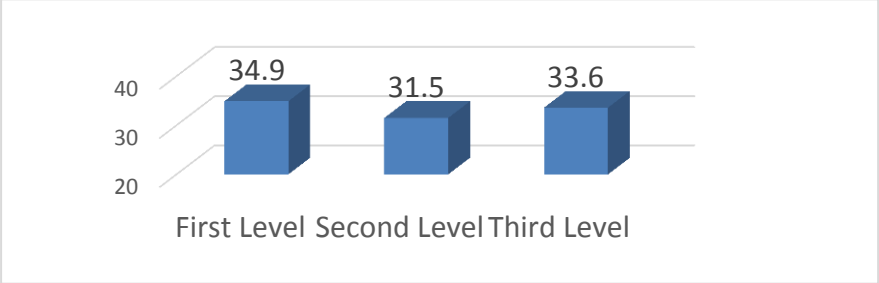
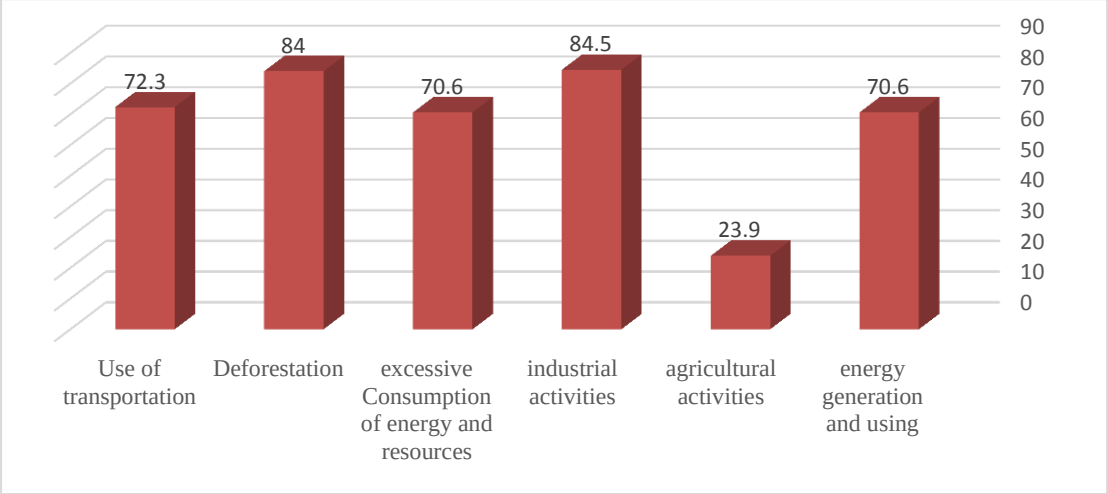


Figure No. (3) shows the characteristics of the study sample according to the Educational level

Second: knowledge and perception of the causes of climate change

it is clear that against 70.6% of the sample they answer yes with regard to the generation and use of energy leading to climate changes, there are 29.4% who do not believe that the generation and use of energy leads to climate changes, as well as with the rest of the options, we find that there is agreement and opposition in front of each statement which gives us the impression that awareness still takes a disparity among the respondents about who causes climate changes, which requires work to improve awareness regarding climate changes to address the cognitive imbalances that the study showed exist in the study community, which is also a sensitive society and it is important to be fully aware of the causes of climate changes, since a community is a medical and health community and is considered the main guide for health information and climatic factors related to human health.

Figure No. (4) shows the percentage of answer about activities that contribute to climate change?



Third: knowledge of the impact of climate change on public health

Table No.(1) knowledge of the impact of climate change on public health:

Statement	Answer	Frequency	Percentage
Climate changes affect public health	No	1	0.4
	I don't know	4	1.7
	Yes	233	97.9
increase mortality rate from heart and blood vessels Diseases	No	29	12.2
	I don't know	64	26.9
	Yes	145	60.9
increase incidence rate of respiratory diseases such as asthma and allergies	No	5	2.1
	I don't know	6	2.5
	Yes	227	95.4
increases the incidence rate of waterborne diseases	No	50	21.0
	I don't know	67	28.2
	Yes	121	50.8
increases the incidence rate of foodborne diseases	No	58	24.4
	I don't know	63	26.5
	Yes	117	49.2
increases the incidence rate of infectious diseases transmitted through vectors such as dengue fever and malaria.	No	23	9.7
	I don't know	44	18.5
	Yes	171	71.8
impact on mental health	No	29	12.2
	I don't know	26	10.9
	Yes	183	76.9
Malnutrition	No	69	29.0
	I don't know	65	27.3
	Yes	104	43.7
affect the determinants of social and environmental health (water - adequate food -	No	24	10.1
	I don't know	29	12.2

safe shelter)	Yes	185	77.7
increase morbidity and mortality	No	34	14.3
	I don't know	29	12.2
	Yes	175	73.5
All of society are vulnerable to the effects of climate change	No	30	12.6
	I don't know	13	5.5
	Yes	195	81.9
Climate change more severely effect on the most vulnerable groups (children, women and elderly and those who suffer from chronic diseases and the displaced)	No	19	8.0
	I don't know	12	5.0
	Yes	207	87.0
Are you aware of global policies and initiatives to mitigate climate change? Such as the Kyoto Agreement, the United Nations Framework Convention on Climate Change.	No	99	41.6
	I don't know	80	33.6
	Yes	59	24.8

we find that most of the statements tend to answer yes, with the exception of the last statement, in which most of the sample tended to answer "I don't know," which state that (Are you aware of global policies and initiatives to mitigate climate change? Such as the Kyoto Agreement, the United Nations Framework Convention on Climate Change).

Thus, we can assert that, on average, the study population has acceptable knowledge, and it was almost completely among all the study sample in relation to the first statement (climate changes affect public health)with a percentage (97.9). Therefore, we can conclude that the study community is fully aware that climate changes affect public health, but the rest of the statements have differences. For example, it is important to consider the knowledge of the study community in the second statement, which state (Climate changes increase mortality rate from heart and blood vessels Diseases) as it was at percentage of (60.9%), but the most important thing is to pay attention to the fourth and fifth statements, which state (Climate change increases the incidence rate of waterborne diseases and foodborne diseases) have percentages of (50.8%) and (49.2) respectively.

Care must also be given to enlightening the study community more about many other cognitive issues identified in this part such as that Climate change may cause malnutrition, as the answers of the study sample show that these aspects are not well known by the study sample where it come with the lower percentage (43.7) and require more work to clarify the impact of climate change on the nutritional aspects.

Thus, for this part, we find ourselves facing a number of points that must be given recommendations, mainly that awareness of global policies and initiatives to limit climate change should be communicated at the level of effective media.

Forth: knowledge and perception of ways to reduce and prevent the impact of climate change on public health

Table No.(2) knowledge and perception of ways to reduce and prevent the impact of climate change on public health

Statement	average	standard deviation	Verbal appreciation	Percentage %	significance level	Statistical judgment
Each of us can reduce the effects of climate change	2.5195	0.65163	I agree	59.7	0.000	Sig.
Doctors can contribute to minimizing climate changes and their impact on public health	2.1681	0.77416	I agree	39.5	0.000	Sig.
Legislate environmental protection laws.	2.8369	0.43452	I agree	84.9	0.000	Sig.
The use of alternative or renewable energy such as (solar energy - wind energy).	2.7617	0.54166	I agree	81.1	0.000	Sig.
Combating desertification and encouraging afforestation	2.8405	0.43194	I agree	85.3	0.000	Sig.
Raising public awareness	2.7692	0.52220	I agree	80.7	0.000	Sig.
Changing some individual habits, such as reducing consumption.	2.5127	0.65546	I agree	59.7	0.000	Sig.
Develop disaster management plans	2.7881	0.48557	I agree	81.5	0.000	Sig.
Sustainable management of land, water and waste	2.7203	0.51174	I agree	74.4	0.000	Sig.

Developing the transportation sector in a sustainable way	2.5641	0.63360	I agree	63.4	0.000	Sig.

it is clear that the sample answers in the most of the statements of this part tending to answer (I agree), and it was at the top in this statement (Combating desertification and encouraging afforestation helps reduce and prevent the impact of climate change on health) as it came with percentage of 85.3% .(Changing some individual habits, such as reducing consumption helps reduce and prevent the impact of climate change on health) came at percentage of 59.7% , which is the lowest mean for the answer with "I agree".

As for the statements that were less than that, they were according to the answers (I agree), and they were in one statement, which states (Doctors can contribute to minimizing or limiting climate changes and their impact on public health), as it came at percentage of 39.5%.

this indicates the need to pay more attention to these aspects, whether through raising awareness or establishing training programs or even volunteer activities or scientific conferences and seminars related to raising the knowledge aspects that help increase awareness of ways to reduce and prevent the impact of climate change on the public health.

As for the respondents' answer to the question, which states (Who do you think is mainly responsible for addressing or confronting the problem of climate change in Yemen?), the answers resulted in the following table:

Table No.(3) the respondents' answer to the question, Who do you think is mainly responsible for addressing or confronting the problem of climate change in Yemen?

Answer	average	standard deviation	Verbal appreciation
The government	0.6471	0.47889	Yes
Industrial companies	0.5420	0.49928	Yes
Civil society organizations	0.2773	0.44861	No
Citizens	0.3109	0.46385	No
United nations	0.1639	0.37093	No

Industrial countries	0.4664	0.49992	No
Everybody	0.4118	0.49319	No
I don't know I'm not sure	0.0504	0.21927	No

Fifth: Participants' practices regarding climate change

Table (4) shows the average answers of the study sample on the participants' practices regarding climate change with the application difference test with the average level (2)

Statement	average	standard deviation	Verbal appreciation	significance level	Statistical judgment
Turn off lights/appliances when not in use	2.6568	0.52673	Always	0.000	Sig.
Use of energy saving devices	2.3686	0.63557	Always	0.000	Sig.
Using public transportation to reduce fuel burn	2.2179	0.77483	sometimes	0.000	Sig.
Quit the non-vegetarian diet	1.6581	0.65725	never	0.000	Sig.
Reliance on renewable energy sources	2.2707	0.65966	sometimes	0.000	Sig.
Reducing plastic use and recycling whenever possible	1.9399	0.76327	sometimes	0.231	Not Sig.
Buy environmentally friendly products	2.1073	0.70196	sometimes	0.020	Sig.
Planting trees and plants	2.2881	0.73342	Sometimes	0.000	Sig.

Sixth: sources of information on climate change and its impact on health

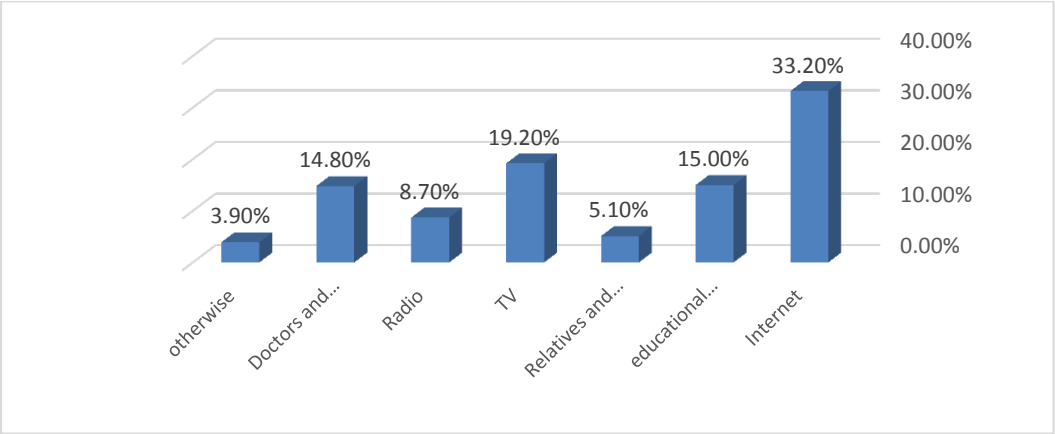


Figure No. (5) shows the source of information for the study sample in receiving information about climate changes and its impact on health

it is clear that the Internet is the first source of information with a percentage of 33.2%, followed by television with a percentage of 15% and comes in the third place in terms of sources of information are doctors and health workers with a percentage of 14.8% and a very close rate with the second source (TV).

Therefore, it is necessary to take care of these three sources and benefit from them in transferring knowledge related to climate change and its impact on health.

Seventh: the willingness to engage in activities related to the reduction and prevention of climate change and its effects

Table no. (5) show the average answers of the study sample, which indicate a relative tendency to engage in activities related to the reduction and prevention of climate changes and their effects

Statement	Average	standard deviation	Verbal appreciation
Are you willing to do everything you can to help reducing and preventing climate change and its effects?	2.4522	0.71470	I agree
Would you agree if you were invited to any specific climate change activities?	2.2851	0.71012	To some extent

The above table shows the average answers of the study sample, which indicate a relative tendency to engage in activities related to the reduction and prevention of climate changes and their effects, as there is a tendency to agree regard to the willingness to work in a manner that serves the reduction and prevention of climate changes, as well as there is a willingness to some extent to participate in certain activities that contribute to prevent climate change.

As for the reasons that prevent taking steps to take action to reduce or prevent the effects of climate change on public health, the respondents listed them in the following order in following table:

Table no.(6) shows the reasons that prevent taking steps to take action to reduce or prevent the effects of climate change on public health

The reasons	Frequency	Percentage
I do not have enough information about climate change and its impact.	110	31.1%
I do not have knowledge of the actions that I should or could take to reduce or prevent the impact of climate change.	105	29.7%
Climate change has no interest in my community.	83	23.4%
I am not responsible for taking or doing any action to reduce or prevent the impact of climate change.	42	11.9%
I am not interested	14	4%

Conclusion

Medical students in Sana'a university have moderate knowledge of the causes of climate change, impact of climate change on public health, and the ways to reduce the climate change; but, it is evident that they have poor knowledge about of global policies and initiatives to mitigate climate change and they have poor knowledge that agriculture activities are contributing to cause of climate change. The students are able to recognize the direct links between climate change and health; but, they are less likely to be able to understand the consequences of climate change involving complicated pathways and they have little knowledge about their role as a future doctors to minimize the impact of climate changes on public health. study found that proportion of the study participants doesn't adopt environment friendly practices. Therefore, there is a need to motivate them in translating the knowledge into a deliberate practice. Although a good understanding on the causes of climate change by itself is important, but it is not enough to get health professionals prepared to cope with climate change consequences. Training and research into the underlying mechanisms of health impacts of climate change needs to be strengthened. The study also shows that majority of students had gained information on climate change from Internet than from the university. This indicates the need for relevant courses on the climate change/human health interface be included in the curriculum. Moreover, The results of this study of climate change related health impacts in Sana'a provides

baseline data and may serve as a model for future studies at other faculties of Sana'a University and other universities in Yemen.

Recommendations

At academic level:

1. Improve education and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.
2. Strength research into the underlying mechanisms of health impacts of climate change. There is also a need to change the culture of professional practices where health professionals need to see themselves as an integral part of the global action on climate change.
3. Future studies to explore the effective ways of incorporating climate change contents into medical curricula.
4. Special focus should be applied for raising awareness of global policies and initiatives for mitigation and adaptation of climate change and should be communicated at the level of universities.

At governmental level:

1. National government should encourage research and compile reports on climate change in a participatory manner, involving different groups of stakeholders. These communications therefore have the potential to initiate the mainstreaming of climate change adaptation into development planning at the National, State and local levels.
2. Integrate climate change measures into national policies, strategies and planning.
3. Establish National Prevention Program on Climate Change and it can be through establishing training programs or even volunteer activities or scientific conferences and seminars related to raising the knowledge aspects that help increase awareness of ways to reduce and prevent the impact of climate change on health of the public.
4. Investment in health adaptation to climate change with a focus on climate-resistant health systems and climate smart health care facilities, as well as engage with health society, civil society and

health professionals to help them collectively mobilize to promote climate action and shared health benefits.

5. Enhance the media coverage on environmental issues and global warming. Government also needs to focus its efforts on programs aimed at educating the public on global warming issues.

At the students level:

1. establish climate change awareness club for university students in Yemen to mobilize the students who are future leaders on the importance of bracing up to the challenges of climate change. This will also help in building the necessary awareness and capacity at the local level in a participatory development processes.

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