

Original Research Article

Knowledge, attitude and practices towards climate change and global warming among medical students of Trivandrum district: a cross-sectional study

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ABSTRACT

Background: Climate change is the biggest global health threat. Temperatures in India have risen by 0.7°C between 1901 and 2018, indicating a shift in climate. Global warming, leads to various consequences like rising temperatures, melting of ice caps, changes in precipitation patterns, ocean acidification. To achieve SDG-13 “to take urgent action to combat climate change and its impacts”, the role of public health functionaries will be of paramount importance who are actively guide people to adopt healthy, environment friendly practices.

Methods: Cross sectional study was done on 389 MBBS students from four medical colleges of Trivandrum from April to December 2024 using simple random sampling. A semi structured questionnaire containing sociodemographic and knowledge, attitude and practice questionnaire prepared in Kobo toolbox were used to collect data and analysed using SPSS software 29.

Results: 70% (271) were having good knowledge, 52% (203) were having good attitude and 61% (238) were having good practice on climate change and global warming. The 18% (72) of students from final year had good knowledge on UN federation and climate change (UNFCC) and 16% (61) intergovernmental panel on climate change (IPCC). 96% (375) were having good awareness on the impact of climate change on health. Diseases related to air quality was the most common consequence addressed by medical students. The students of fourth year had maximum knowledge on UNFCC 18% (72) and IPCC 16% (61).

Conclusions: Integrating climate change and global warming to medical curriculum can help in achieving a climate resilient ecosystem.

Keywords: Climate change, Global warming, Medical students, Trivandrum

INTRODUCTION

Climate change is the biggest global health threat of 21st century.¹ Human activity is mostly responsible for the pollution of environment through urbanization, industrialization and other activities. Emission of greenhouse gases into the atmosphere have been

increasing since the beginning of industrial revolution. Temperatures have risen by 0.7 °C (1.3 °F) between 1901 and 2018, thereby changing the climate in India.² As of May 2024, India is experiencing one of its most intense heatwaves in recent memory.

Global warming, driven primarily by human activities such as the burning of fossil fuels and deforestation, leads

to consequences that affect both natural ecosystems and human societies. It leads to various consequences like rising temperatures, melting of ice caps, changes in precipitation patterns, ocean acidification, increased frequency of extreme weather events, loss of biodiversity.³

Addressing global warming requires concerted efforts at both individual and collective levels to reduce greenhouse gas emissions, transition to renewable energy sources, protect and restore ecosystems, and adapt to the changes that is already underway. Failure to act swiftly and decisively risks causes irreversible damage to both the planet and its inhabitants.

The WHO in 2015, have asked all the health professionals of the world to be on the forefront in protecting the people from the harmful health impacts of the climate crisis. To achieve the United Nation's sustainable developmental goal-13 (SDG-13) i.e., "to take urgent action to combat climate change and its impacts".⁴ The role of medical fraternity will be of paramount importance as primary care physicians, in actively guiding the people to adopt healthy, environmentally friendly practices and as health administrators, to unequivocally push for more sustainable health policies.

While the scientific consensus on these issues is unequivocal, the extent to which medical students perceive and understand the complexities of climate change remains relatively unexplored. Understanding the knowledge perception of medical students in this regard is crucial, as they represent future healthcare providers whose actions and decisions will significantly impact public health outcomes.

Aim

This research aims to investigate the knowledge, attitude and perception of medical students concerning climate change and global warming. This helps to uncover potential gaps in education and opportunities for intervention. By empowering future healthcare professionals with the knowledge and awareness necessary to address climate-related health challenges, we can foster a more resilient and sustainable healthcare workforce equipped to mitigate the impacts of climate change on public health. The objectives of this study are to assess knowledge, perception and practice towards climate change and global warming among MBBS students of Trivandrum district.

METHODS

It was a cross-sectional study done among MBBS students in four medical colleges of Trivandrum district. The study was conducted from April to November 2024. Sample size is calculated using the formula-

$$N = Z(1-\alpha/2)^2 pq / d^2$$

p=53% (proportion of knowledge about climate change among medical students in China). $\alpha=0.05$ (significant level) $q=100-p=47$. d=relative precision, taken as 10% of the prevalence; d=5.3.

The estimated sample size was 355. The Sampling technique followed was Simple random sampling. Medical students of 18 to 30 years and those who gave consent to participate in the study were included. A semi structured questionnaire was prepared via Kobo toolbox for humanitarian response. Questionnaire consists of sociodemographic details and questionnaire taken from Telangana and Iraq.^{6,10} The data obtained was coded and entered in Microsoft excel worksheet and analysis performed using the statistical software statistical package for social sciences (SPSS version -23) each question on knowledge, attitude and practice questionnaire were gives a score of 1, the total score was calculated and mean score were analysed. Those participants who score below the mean were considered to have poor knowledge, poor attitude and poor practice.

Ethical consideration

Study was conducted after obtaining institutional ethical clearance number 131/IEC/SUTAMS/2025. Also, after obtaining informed consent from the study participants. Involvement was voluntary. Data collected was totally anonymous and no identifying features were incorporated. No expenses were incurred from the study participants.

RESULTS

The data was collected from 389 medical students of government and private medical colleges of Trivandrum district. The socio demographic profile of study participants is shown in Table 1. Among 389 study participants, 149 (38%) were from the age group 21-22 years, 58% (227) were females 77% (301) of the study participants were from private medical colleges and 64% (251) were staying in the hostel.

Figure 1 shows the most common source of learning about climate change and global warming Among six options the most common source of learning were newspapers (262) and internet (255).

Figure 2 shows about awareness on consequences of climate change and global warming, the two most common consequences were diseases related to water availability (255) and vector borne diseases (251).

Table 2 shows distribution of students' knowledge about various protocol and association on climate change and global warming. Among 389 study participants only 74% (64) have heard about Kyoto protocol and UNFCCC from first year 73% (63) from second year, only 63% (72) from fourth year, 54% (41) from third year. Only 68% (51) from second year, 54% (61) from fourth year, 44% (33)

from third year, and 34% (30) from first year have heard about IPCC.

Table 3 shows the distribution of knowledge on climate change and global warming among medical students. 95% of students are aware that climate change and global warming is affecting Kerala and are aware of the ways to reduce climate change.

The mean score was 14. Those study participants who scored above 14 were considered to have good knowledge and those with scored below 13 were considered to have poor knowledge. Hence 70% (271) study participants were having good knowledge on climate change and 30% (118) were having poor knowledge on climate change

Table 4 shows the attitude of medical students towards climate change and global warming. Among 389 study participants 72% (281) believes cardiovascular and respiratory disease are the major health impacts of climate change, 82% (320) believes increased infections, vector borne disease transmission are the major health impacts of climate change, 38% (148) believes malnutrition is the major health impact of climate change, 42% (165) believes food migration and civil conflicts are the major health impacts of climate change, and 20% (78) believes obesity is the major health impact of climate change.

The mean score was 5. Those study participants who scored above 6 were considered to have good attitude and those with scored below 5 were considered to have poor attitude. Hence 70% (271) study participants were having good attitude on climate change and 30% (118) were having poor attitude on climate change and global warming.

Table 5 shows distribution of practices adopted to reduce the effects of climate change and global warming. The most common practice followed were usage of public transport to save fuel (76%) and reducing the usage of plastic and recycle if necessary (72%).

The mean score was 5. Those study participants who scored above 5 were considered to have good practices and those with scored below 4 were considered to have poor practices. Hence 70% (271) study participants were having good practice to reduce climate change and global warming and 30% (118) were having poor practice on climate change and global warming.

Table 6 shows the association between the level of knowledge, attitude and practice with the contributing factors of climate change and global warming. There was a significant association with socioeconomic status of medical students with the level of knowledge ($p<0.045$). Similarly, the association with age and place of residence had a significant association with the level of attitude towards climate change and global warming ($p<0.002$,

0.01 respectively). Age, year of education and socioeconomic status had a significant association with the level of practice towards climate change and global warming ($p<0.003$, $p<0.000$, $p<0.001$ respectively).

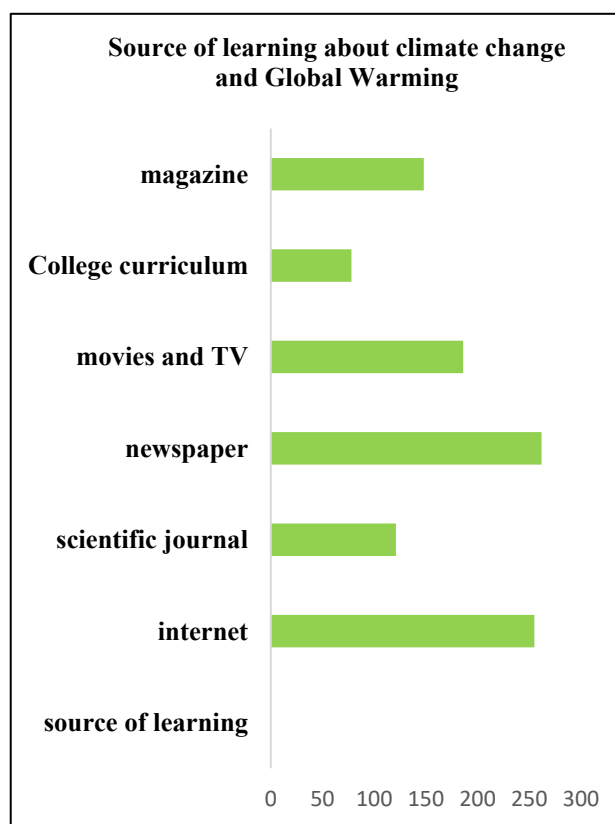


Figure 1: Distribution of source of learning about climate change and global warming (multiple options).

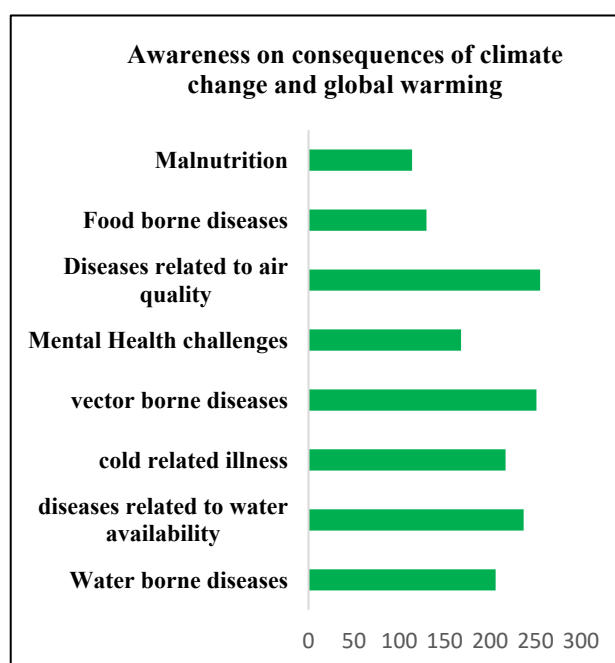


Figure 2: Distribution of awareness on consequences of climate change and global warming.

Table 1: Sociodemographic profile of study participants.

Variables	N (%)
Age (in years)	
18-20	84 (21)
21-22	149 (38)
23-24	120 (30)
25-27	36 (9)
Gender	
Male	162 (42)
Female	227 (58)
College	
Government	88 (23)
Private	301 (77)
Year of study	
First year	94 (24)
Second year	100 (25)
Third year	91 (23)
Fourth year	104 (26)
place of residence	
Hosteller	251 (64)
Day scholars	138 (36)
Socio economic status	
APL	320 (82)
BPL	69 (18)

Table 2: Distribution of students' knowledge about various protocol and association on climate change and global warming.

Variables	1 st year		2 nd year		3 rd year		4 th year	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Have you heard about Kyoto protocol and UNFCC	64 (74)	23 (26)	63 (73)	23 (27)	41 (54)	34 (46)	72 (63)	42 (37)
Have you heard about IPCC	30 (34)	57 (66)	51 (68)	35 (32)	33 (44)	42 (56)	61 (54)	53 (46)

Table 3: Distribution of knowledge regarding climate change and global warming.

Questions	Yes (%)	No (%)
Do you know the causes of climate change?	360 (92)	29 (8)
Do you know the environmental factors of climate change?	358 (92)	31 (8)
Do you know the sustainable developmental goal for climate change?	325 (84)	64 (16)
Is reversing of global warming possible?	318 (82)	71 (18)
Do you know any organisations dealing with climate change in India?	296 (76)	93 (24)
Is government taking actions to reduce global warming?	324 (83)	65 (17)
Do you know the ways to reduce climate change?	352 (90)	37 (10)
Do you know ways to protect yourself from climate change?	335 (86)	54 (14)
Are human actions also a cause for global warming and climate change?	368 (95)	21 (5)
Is climate change affecting the state of Kerala?	370 (95)	19 (5)
Is India responsible for global climate change?	361 (93)	28 (7)
Do you think we are too small to do anything about climate change?	203 (52)	186 (48)
Do people need more information about climate change?	361 (93)	28 (7)
Should children be taught more about climate change in school?	371 (95)	18 (5)
Is global warming a current and future problem?	361 (93)	28 (7)
Do you think both individual citizens and government are responsible in tackling global warming and climate change?	361 (93)	28 (7)

Table 4: Distribution of attitude towards climate change and global warming.

Variables		Yes (%)	No (%)
Health impacts	Cardiovascular and respiratory diseases	281 (72)	108 (28)
	Increased infections, vector borne disease transmission	320 (82)	69 (18)
	Malnutrition	148 (38)	241 (62)
	Food migration and civil conflicts	165 (42)	224 (58)
	Obesity	78 (20)	311 (80)
Causes	Deforestation	330 (85)	59 (41)
	Air pollution due to industries and automobiles	312 (80)	77 (20)
	Overfishing and livestock production	165 (42)	224 (58)
	Greenhouse effect	279 (72)	110 (28)
	Land clearing for agriculture	199 (51)	190 (49)

Table 5: Distribution of practices adopted to reduce the effects of climate change and global warming.

Variables		Yes (%)	No (%)
Practices	Use public transportation to save fuel	297 (76)	92 (24)
	Quit non veg diet	102 (26)	287 (74)
	Use solar water heater/cooker	257 (66)	132 (34)
	Use energy saving appliances	253 (65)	136 (45)
	Reducing use of plastic and recycle if necessary	281 (72)	108 (28)
	Carpool/travel with friends	175 (45)	214 (55)
	Turn off lights or devices when not in use	257 (66)	132 (34)
	Buy environment friendly products	260 (67)	129 (33)
	Defrost refrigerator/ freezer often	167 (43)	222 (57)

Table 6: Association between the level of knowledge, attitude and practice with the contributing factors of climate change and global warming.

Variables	Level of knowledge		P value	Level of attitude		P value	Level of practice		P value
	Good (%)	Poor (%)		Good (%)	Poor (%)		Good (%)	Poor (%)	
Age (in years)									
18-20	54 (64)	30 (36)	0.486	42 (50)	42 (50)	0.002	57 (68)	27 (32)	0.003
21-22	106 (71)	43 (29)		64 (43)	85 (57)		76 (51)	73 (49)	
23-24	3 (69)	37 (31)		70 (58)	50 (42)		76 (63)	44 (37)	
25-27	28 (78)	8 (22)		27 (75)	9 (25)		29 (80)	7 (20)	
Gender									
Male	109 (67)	53 (33)	0.388	82 (51)	80 (49)	0.601	103 (64)	59 (36)	0.412
Female	162 (71)	65 (29)		121 (53)	106 (47)		135 (60)	92 (40)	
Year of education									
1 st year	62 (66)	32 (34)	0.804	35 (37)	59 (63)	0.804	49 (52)	45 (48)	0.000
2 nd year	72 (72)	28 (28)		29 (29)	71 (71)		37 (37)	63 (63)	
3 rd years	63 (69)	28 (31)		50 (55)	41 (45)		66 (73)	25 (27)	
4 th years	74 (71)	30 (29)		89 (86)	15 (14)		86 (83)	18 (17)	
Place of residence									
Hostler	160 (64)	91 (36)	0.236	143 (57)	108 (43)	0.011	161 (64)	90 (36)	0.106
Day scholar	91 (66)	47 (34)		60 (43)	78 (57)		77 (56)	61 (44)	
SES									
APL	216 (68)	104 (32)	0.045	166 (52)	154 (48)	0.793	184 (58)	136 (42)	0.001
BPL	55 (80)	14 (20)		37 (54)	32 (45)		54 (78)	15 (22)	

DISCUSSION

This research aimed to explore the level of knowledge, perceptions, and practices of MBBS students in Trivandrum regarding climate change and the global

warming. 70% (271) study participants have a good knowledge on climate change and global warming. Our findings are consistent with the results of a studies done in China and Spain where 83% and 76% respectively had good knowledge.^{5,8} The high level of knowledge could be

because of inclusion of environmental health topics in college curriculum or through personal interest which is supported from the findings of our study. But there is limited incorporation of climate change content in the curriculum (only 20% of students reported learning about it in their courses) which stands out as a critical gap. The most common source of learning was internet (72%). Our findings are consistent with a study done in Jaipur among medical students.¹⁰

Another significant finding of this study is that a majority of the students perceived climate change as a major public health threat. The students identified respiratory and cardiovascular diseases, as well as vector-borne diseases like malaria and dengue, as the most significant health impacts of climate change. Our findings are consistent with the study done in Jaipur, China and Indonesia.⁸⁻¹⁰ This understanding is reflective of current medical and public health research, which connects climate change to a wide range of health problems, including heat-related illnesses, infectious diseases, malnutrition, and mental health issues. Only 67% (260) opted for buying environmentally friendly products, 65% (253) use energy saving appliances. Our study supports a gap between awareness and action which could be because of busy schedules, the stress of their academic environment and lack of institutional encouragement which may be inhibiting them from adopting greener practices. This points to the need for more structured, supportive interventions that can bridge this gap such as institutional sustainability policies, targeted campaigns within medical school settings.

Our study offers valuable insight into the role of primary care physicians within the medical fraternity to take greater strides in both encouraging others and adopting environmentally friendly practices. Our study identified a need to convert the knowledge into everyday practice for achievement of SDG 13 by 2030. Limitation of our study is limited exploration of factors influencing behavior change. From our study we recommend that it is the need of the hour to encourage student-led initiatives like campaigns, and projects, Hands-on activities, project-based learning and organize field trips to reinforce learning on climate change and global warming.

CONCLUSION

Our study demonstrates that among the MBBS students in Trivandrum district 70% of study population has good knowledge, 52% have good attitude and 61% have good practices towards climate change and global warming. The most common consequence of climate change and global warming identified were diseases related to air quality, vector borne diseases and water borne diseases. The most common source of learning on climate change and global warming are newspaper and internet. The findings also highlight the importance of integrating more climate

change consequences into the medical curriculum, which can help in achieving climate resilient ecosystem.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. The Lancet. A Commission on climate change. The Lancet. 2009;373(9676):1659.
2. Press Release: Press Information Bureau. Available at: <https://pib.gov.in/PressReleasePage.aspx?PRID=1809123>. Accessed on 4 January 2025.
3. Friedlingstein P, O'sullivan M, Jones MW, Andrew RM, Gregor L, Hauck J, et al. Global Carbon Budget 2022. *Earth Syst Sci Data*. 2022;14(11):4811-900.
4. Goal 13: Climate action-The Global Goals. Available at: <https://www.globalgoals.org/goals/13-climate-action/>. Accessed on 4 January 2025.
5. Heydari A, Partovi P, Zarezadeh Y, Yari A. Exploring medical students' perceptions and understanding of the health impacts of climate change: a qualitative content analysis. *BMC Med Educ*. 2025;23(1):774.
6. Ratinen I. Students' knowledge of climate change, mitigation and adaptation in the context of constructive hope. *Educ Sci (Basel)*. 2021;11(3):1-14.
7. Reddy GP, Rajamouli J, Arora KD, Jothula KY, Amaravadi S, Boda A. Knowledge, perceptions and practices of medical students towards climate change and global warming: A cross sectional study. *J Family Med Prim Care*. 2022;11(6):2557-64.
8. Yang L, Liao W, Liu C, Zhang N, Zhong S, Huang C. 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. *Int J Environ Res Public Health*. 2025;15(12):2650.
9. Sulistyawati S, Mulasari SA, Sukesu TW. Assessment of Knowledge regarding Climate Change and Health among Adolescents in Yogyakarta, Indonesia. *J Environ Public Health*. 2018;2018:9716831.
10. Rajamouli J, Arora KD, Jothula KY, Amaravadi S, Boda A. Knowledge, perceptions and practices of medical students towards climate change and global warming: A cross sectional study. *J Family Med Prim Care*. 2022;11(6):2557-64.

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