

Impact Of Climate Change And Global Warming On Deterioration Of Human Health: A Study On Knowledge And Perceptions Of Medical Students

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Abstract:

Background: Environmental changes lead to shifts in temperatures and atmospheric conditions. It is the biggest global health threat and also the greatest health opportunity of the 21st century. Lack of knowledge and practice regarding climate change among health professionals, especially in India, was the drive for this study.

Materials and Methods: A cross-sectional study was conducted among medical students at Government Medical College, Saharanpur, for a period of three months. A total of 500 medical students participated in the survey. Data was collected using semi structured questionnaire and analyzed using appropriate statistical tests.

Results: Among 386 undergraduate medical students, despite knowing very little about SDG targets (19.9%) or government initiatives (10.1%), the majority demonstrated strong awareness of climate change, including its causes (81.3%), consequences (95.3%), and preventative measures (89.4%). Deforestation (78.9%) and the burning of fossil fuels (67.3%) were frequently mentioned causes, and infectious illnesses (91.2%) and natural catastrophes (95.5%) were the primary health effects. Tree planting (95.5%) and gadget shut-off (97.2%) were the two most eco-friendly behaviours, with 67% highlighting mitigation as the primary method of health protection.

Conclusion: Medical students showed good knowledge of climate change causes and effects, but limited awareness of climate action policies and inconsistent eco-friendly practices. Integrating climate change education into medical training can help translate knowledge into sustainable action.

Key Word: Climate change, Global warming, Medical students, Knowledge, Perceptions

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I. Introduction

Many people agree that the biggest public health concern of the twenty-first century is climate change, which has profound effects on ecosystems, disease trends, and human health. Malnutrition, mental health issues, vector-borne infections, and worsening air quality are just a few of the direct and indirect health implications of rising global temperatures, harsh weather, and altered rainfall patterns [1]. The largest danger to health, according to the World Health Organization (WHO), is climate change, which also presents a chance to improve health systems by implementing adaptation and mitigation measures [2]. In tackling these issues, medical practitioners are in a unique position. They are in charge of teaching patients and communities about preventative measures in addition to identifying and treating the negative health effects of environmental changes. Therefore, adequate knowledge and awareness among medical students—the future healthcare providers—is critical in preparing societies to face climate-related health risks [3]. Evidence from global studies highlights variable awareness among medical students. In a qualitative study, medical students reported understanding climate change but expressed uncertainty regarding its specific health consequences and the role of physicians in mitigation [1]. Similarly, a cross-sectional survey in India found that while the majority of students had heard of climate change, only a smaller proportion translated that awareness into consistent eco-friendly practices [3]. Studies in Afghanistan and Pakistan have also emphasized gaps in practical engagement despite moderate levels of awareness [4,5]. Given India's enormous population, fast urbanization, and high susceptibility to catastrophic weather events, the country is particularly concerned about climate change. Although national policies acknowledge the health implications of climate change, there is still little incorporation of these aspects into medical curriculum. Medical graduates' readiness to address new health issues linked to global warming may be hampered by this educational disparity [6]. The study intends to offer ideas for curriculum creation and health education interventions that can better prepare aspiring healthcare professionals to address climate change as a public health concern by identifying awareness and behavior gaps.

II. Material And Methods

Study Design: Cross sectional study

Study Location: This was a medical college-based study done in Department of Community Medicine, at S.M.M.H. Medical College, Saharanpur, Uttar Pradesh.

Study Duration: February 2024 to April 2025.

Sample size: 386 participants.

Sample size calculation: All undergraduate medical students of all professional years were included in the study.

Inclusion criteria:

1. All undergraduate medical students of SMMH Medical College.
2. Those students who gave consent to participate in the study.
3. Those students who were present at the time of the survey.

Exclusion criteria:

1. Students who showed hostile behaviour and not present at the time of survey.

Procedure methodology

After Institutional Ethics Committee approval and permission from college authorities, participants were briefed about the study procedure and consent was taken. A pre-tested semi-structured questionnaire was administered among students under supervision; average completion time was 30 minutes. The questionnaire consisted of various sections such as:

Section I: Included questions on basic details of participants (age, gender and batch)

Section II: Included questions on knowledge, perceptions regarding climate change and global warming.

Statistical analysis

Data collected was entered and analysed using IBM SPSS statistics v26 software. Data management tools were utilized to avoid duplication and entry error. Categorical data presented as frequencies and percentages. Normally distributed data presented as means and standard deviations.

III. Result

Table 1 shows a total of 386 undergraduate medical students' majority of participants were from the 1st professional year (20.0%), followed by 3rd professional year Part I (19.2%) and 2nd professional year (19.0%) as well as 3rd professional year Part II (19.0%). The gender distribution was nearly equal, with 198 males (51.3%) and 188 females (48.7%).

As per Table 2 the majority of the 386 participants had a decent understanding of global warming and climate change. While 93.0% thought it could be reversed, the majority were aware of its causes (81.3%), consequences (95.3%), and preventative methods (89.4%). Nonetheless, just 19.9% of respondents were aware of the SDG objective, 10.1% of respondents were aware of government actions, and 6.2% were aware of the MoHFW's climate action plan.

Perception-wise, the majority of participants supported sustainable activities (95.6%) and saw climate change as a public health issue (82.9%). Many said that natural disasters are lessons from nature (89.4%) and that existing initiatives are insufficient (78.2%). Only 32.4% of respondents were willing to participate in relevant activities, despite 64.8% holding India accountable for its role in causing global climate change.

Fig. 1 presents the perceived reasons for climate change and global warming, the majority of participants (78.9%) attributed it to deforestation, farming, and fishing practices, followed by the burning of fossil fuels producing harmful gases (67.3%) and industrialization and urbanization (62.2%). More than half (54.3%) considered the increased use of private transport as a contributing factor, while 42.8% identified increased consumption of clothing, electronics, and plastics. Fewer participants reported modern industrialized agricultural practices (24.9%) and rearing livestock for meat and dairy production (21.6%) as causes of climate change and global warming.

Fig. 2 shows knowledge of study participants regarding impacts of climate change on human health, the majority of participants (95.5%) identified a rise in natural disasters and extreme weather events as major consequences, followed by infectious diseases such as water-borne and vector-borne illnesses (91.2%). Mental health effects were recognized by 79.9% of participants, and deaths and injuries by 74.2%. Chronic illnesses like

cardiovascular and respiratory conditions (69.9%) and decreased availability of food and water (65.7%) were also commonly acknowledged. Malnutrition (58.9%) and migration or conflicts (52.6%) were reported by more than half of the participants, while 20% of respondents stated that they did not know about the health impacts of climate change.

Fig. 3 emphasized on practices of study participants at reducing the effects of climate change, the majority of participants reported turning off lights, fans, and devices when not in use (97.2%) and preventing deforestation by planting trees (95.5%). Walking, biking, using public transport, or carpooling were practiced by 92.1%, while 86.2% adopted the “reduce, reuse, recycle” approach for plastics. Buying environmentally friendly products was reported by 82.5%, and preventing wastage of food, water, and clothes by 78.9%. The use of solar heaters and cookers was the least reported practice, followed by 65.8% of participants.

Fig. 4 shows the health protection measures adopted against climate change, most participants (67%) emphasized mitigation of climatic change as the primary strategy. Adaptation and health education were each reported by 7% of participants. Strengthening the surveillance system was highlighted by 14%, while health action during emergencies was mentioned by only 5% of participants.

Table no 1: Sociodemographic profile of study participants (N=386)

Sociodemographic factors	Number (n)	Percent (%)
Batch		
MBBS 1 st professional year	100	20.0
MBBS 2 nd professional year	95	19.0
MBBS 3 rd professional year Part I	96	19.2
MBBS 3 rd professional year Part II	95	19.0
Gender		
Male	198	51.3
Female	188	48.7

Table no 2: Distribution of study participants as per their knowledge and perceptions regarding climate change and global warming (N=386)

Knowledge regarding climate change and global warming		
S.No	Questions	Positive response
1	Knows about causes of climate change.	314 (81.3%)
2	Knows about ill effects of climate change and global warming on environment.	368 (95.3%)
3	Knows how to protect oneself from global warming.	345 (89.4%)
4	Is reversing global warming possible.	359 (93.0%)
5	Knows about goal and target of SDG for climate change.	77 (19.9%)
6	Knows about government initiatives to tackle impact of global warming.	39 (10.1%)
7	Knows about air pollution monitoring and action plan.	30 (7.8%)
8	Knows that climate action plan developed by MoHFW.	24 (6.2%)
9	Knows about green hospital initiative.	48 (12.4%)
10	Knows about greenhouse effect.	302 (78.2%)
Perceptions regarding climate change and global warming		
1	Climate change and global warming are issues of public health concern.	320 (82.9%)
2	People should implement environmentally sustainable energy efficient practices at their home and work place.	369 (95.6%)
3	Do you think despite high concern actions taken by government and people are insufficient in this field?	302 (78.2%)
4	Do you think that natural calamities around world is a lesson to humans by nature?	345 (89.4%)
5	India is also responsible for world's increase in climate change.	250 (64.8%)
6	You wish to attend an event or be a part of group related to climate health.	125 (32.4%)
7	Medical students should learn about impact of climate change.	162 (42.0%)
8	Rapid changes in climate will badly affect future generation.	295 (76.4%)
9	Climate change and global warming issues should be included in medical curriculum.	172 (44.6%)
10	General public needs to be aware about climate change, it's causes and impact via awareness camps.	359 (93.0%)

Fig 1: Distribution of study participants as per their reasons for climate change and increased global warming (N=386)

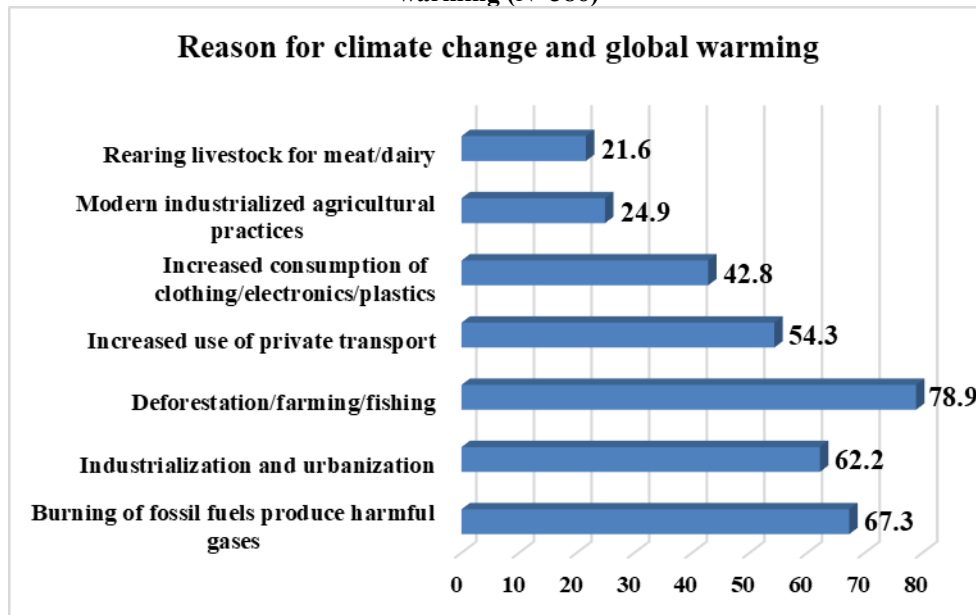


Fig 2: Distribution of study participants as per their knowledge regarding impact of climate change and global warming on human health (N=386).

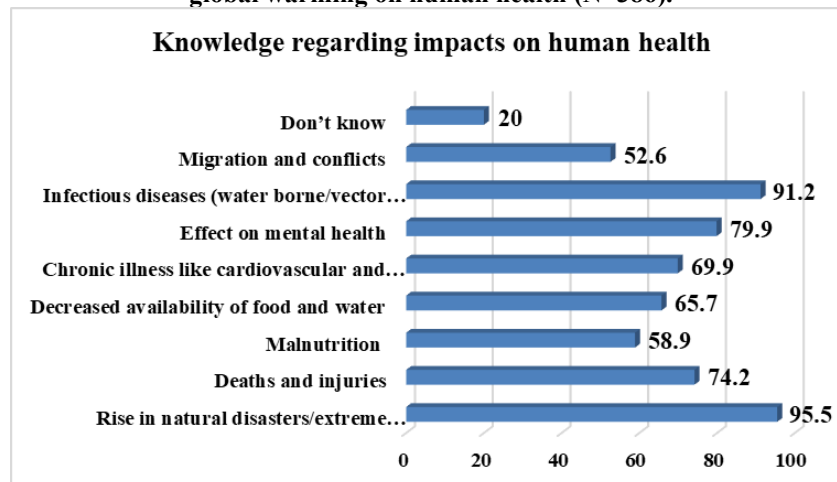


Fig 3: Distribution of study participants as per their practices to reduce the effects of climate change (N=386).

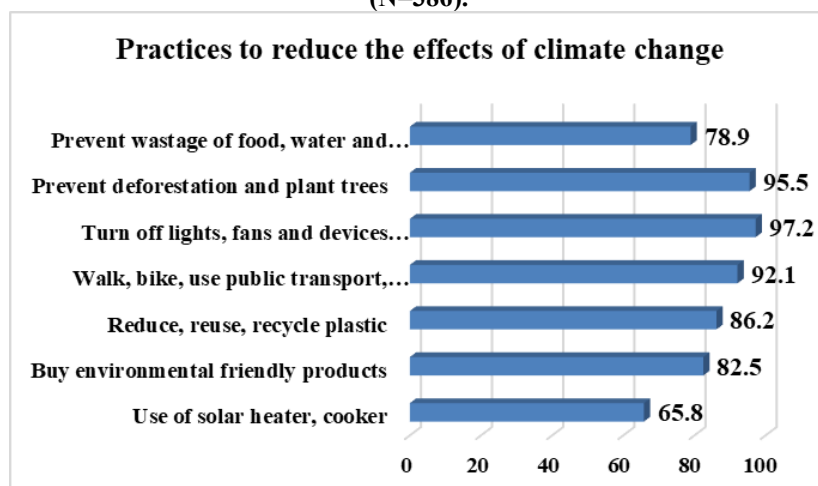
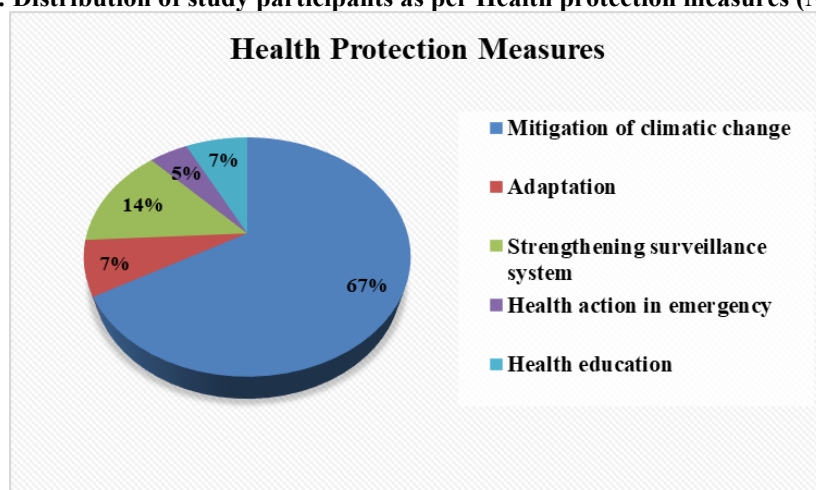


Fig 4: Distribution of study participants as per Health protection measures (N=386).



IV. Discussion

The present study assessed knowledge, perception, and practices regarding climate change among 108 participants. The findings highlight an overall high level of awareness about climate change causes and consequences, but gaps persist in perceptions and in the adoption of protective practices.

Most participants recognized the causes (96.3%) and environmental impacts (92.6%) of climate change, aligning with studies from India and other low- and middle-income countries where awareness of climate threats has steadily increased over the past decade (7,8). Awareness of the Sustainable Development Goal (SDG 13: Climate Action) was comparatively lower (75%), suggesting that while individuals understand the problem, familiarity with international policy frameworks remains limited—a trend also observed in global surveys (9).

Perceptions reflected partial acknowledgment of climate responsibility and human causation. While 58% agreed that climatic extremes such as floods are linked to climate change, only 50% accepted human activity as an important driver. This is lower than figures reported in surveys from high-income countries, where over two-thirds attribute climate change primarily to anthropogenic causes (10,11). Additionally, only 38% believed that India shares equal responsibility with other countries in driving global warming, possibly reflecting a perception that industrialized nations bear greater accountability—a finding consistent with earlier Indian public opinion studies (12).

Adoption of climate-protective practices was relatively modest. Only a small proportion reported adaptation strategies (5–7%), whereas two-thirds engaged in some form of mitigation-related activity. This gap between knowledge and practice has been consistently documented in environmental health research (13,14). Strengthening surveillance systems and emergency health actions were identified by some participants as necessary strategies, reflecting an awareness of health system preparedness.

When asked about major human actions contributing to climate change, participants identified population growth, urbanization, industrialization, deforestation, and carbon-based energy usage as key drivers. These perceptions are consistent with the scientific consensus regarding leading contributors to greenhouse gas emissions (15,16). However, international trade and travel were less frequently reported, suggesting under-recognition of globally interconnected sources of emissions.

Health-related impacts of climate change were also prominently noted. Participants emphasized ozone depletion and its effects on skin, eyes, and immunity, followed by physical impacts from extreme weather events. While ozone layer depletion has somewhat receded as a global concern since the Montreal Protocol, its persistent highlighting here might indicate overlaps in community understanding of climate change versus stratospheric ozone-related health risks (17). Nevertheless, recognition of diseases associated with heat, vector-borne infections, and respiratory problems aligns with the actual health burden projections for India under climate stress (18,19).

Overall, these findings suggest a high baseline knowledge but limited depth of understanding in certain areas, particularly policy responsibility, adaptation capacity, and nuanced environmental-health linkages. Public health interventions must therefore focus not only on awareness generation but also on behavioral change strategies, reinforcing adaptation practices, and clarifying misconceptions. Integrating climate literacy campaigns into school curricula, workplace initiatives, and community-level health programs may enhance climate resilience in vulnerable populations.

V. Conclusion

The present study concludes that although medical students demonstrated a high level of knowledge regarding the causes and environmental consequences of climate change, significant gaps remained in their perceptions and adoption of protective practices. While most participants were aware of health impacts, fewer recognised India's shared global responsibility or engaged in systematic adaptation measures. This mismatch between awareness and practice underscores the need for targeted interventions. Integrating structured modules on climate change and health into the medical curriculum, along with training on surveillance, preparedness, and eco-friendly practices, would help bridge these gaps. Furthermore, increasing awareness of global and national climate policies and encouraging active participation in research, advocacy, and community education can empower medical students to become effective agents of change. Strengthening climate literacy within medical education is therefore essential to enhance resilience and prepare future healthcare professionals to address climate change as a pressing public health challenge.

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