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Attitudes and Behaviour of School Students towards Global Warming – A Cross Sectional Observational Study

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Abstract:
Background: *Climate change due to global warming can negatively impact the health of humans. Climate change is the biggest health threat of the 21st century. The attitudes pertaining to global warming in India is not researched well. Objectives: The objectives of this study are to explore the attitudes and behaviour of school students in Tamil Nadu about global warming and to assess the change in attitude after a simple climate education intervention. Methods: Two schools in Kancheepuram district were sampled randomly. The baseline data regarding the attitudes and behaviour was collected and then the climate education program was conducted. Fifteen days after the intervention the attitudes of the students were measured again. Results: Less than 50% of the students thought that there is a personal harm from global warming and 44.3% of them felt that global warming affects plants and animals. Majority of them (85%) used public transportation for travelling and 76% of them carried their own bags while going to shop. Paired 't' test showed that there was a significant change in attitude following the climate education program. [Mean difference = 14.328, p< 0.001 with 95% C.I [12.573-16.083]. Conclusion: While a majority of the students perceived personal harm from global warming, their attitude about the role of humans in its causation and solution were not encouraging. A simple participative climate education intervention can significantly influence their attitudes. This model can be replicated in all schools effectively to create awareness about global warming and its various impacts.*
Keywords: *global warming, climate change, attitudes, school students, behaviors*

I. Introduction

Global warming is the average increase in the temperature of the earth which can be defined as "the changes observed in the temperature of the air and ocean, melting ice caps in the Arctic and Antarctic regions (polar ice caps) and increase in the average sea level." It results in climatic, environmental, seasonal and ecological changes. It has effects on diffusion, distribution and incubation of numerous diseases that are dependent on environmental factors as global warming will cause changes to the environment. The Intergovernmental Panel on Climate Change (IPCC) concluded that warming the climate is explicit as is now evidenced from observations mentioned above in the definition.[1;2]

It occurs as a consequence of unevenness between the incoming and outgoing radiation from the earth's atmosphere especially the re-emission of infra red rays. The green house gases (GHG's) play a dominant and a potent role in this process.[3;4] There is emerging and convincing evidence that most of the global warming is due to anthropological causes.[5;6] Climate change has important consequences for health such as increased incidence of malaria, vector borne diseases, food insecurity and malnutrition, heat related diseases such as heat strokes, water borne diseases and diarrhea outbreaks and major disasters such as floods, tsunamis etc.[7-11]

A recent report published in the Lancet has suggested that "Climate change is the biggest global health threat of the 21st century".[12] In 2000 AD, World Health Organization (WHO) estimated that 5.5 million DALY's and 1,50,000 deaths were contributed due increased cardiovascular diseases, diarrhea, malaria, injuries from flooding and malnutrition which are due to the consequences of climate changes despite this excluded the problem of pollution and changes in food production.[13;14] Therefore there is an urgent need to intervene and reduce the anthropological contributors to global warming. This needs significant behavior change.

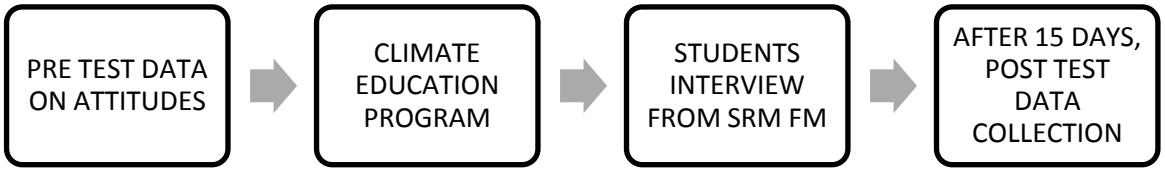
In a survey of public attitude towards energy and environment conducted in the United Kingdom, 13 percent of respondents ranked the environment as one of the top three concerns. Environment ranked eighth out of the 25 issues. Almost half of the UK respondents listed global warming as a major worry. Thirty-five percent of respondents chose global warming as their most important concern, the only selection with more than 20 percent of the first choice responses[15]. In a study conducted among Malaysian teachers, it was found that the teachers have a concern towards environment. But the practice of environmentally responsible behaviour was not in concert with the level of knowledge and concern among the teachers.[16] In another study regarding Virginians' attitude towards global warming, 75% of them believed that earth is warming and one in four cited personal experience as the top reason.[17] There is scarce data about attitudes about global warming in the developing country context like India.

This research study was conducted to assess the attitudes and behaviour of higher secondary school students (9^{th} – 12^{th} standard) towards global warming and to assess the effectiveness of a simple climate education program on change in attitudes.

II. Methodology

The study was conducted using a cross sectional observational design. The sample size was determined as 384 assuming 50% prevalence of good attitudes for a 95% confidence limit and a 10% absolute precision. With 10% oversampling accounting for non response and incomplete answers, 424 was calculated as the final sample size. Out of a total 47 government run school in Kancheepuram district of Tamil Nadu in southern India, 2 were selected using simple random sampling. The questionnaire was prepared after a literature review. The questionnaire regarding the attitude and behaviour towards global warming was translated into regional language Tamil. All the students from class nine, eleven and twelve in the two schools were included and the questionnaire was administered to a total of 433 students. After this, the students attended the simple climate education programme regarding global warming which included information about causes, consequences, do's and don'ts to reduce global warming.

PROCESS OF CLIMATE EDUCATION PROGRAM



Fifteen days after the climate education program, the schools were revisited and the same questionnaire was administered to reassess their attitudes. Behavior change was not assessed at this time, as the time period was too short to have led to any significant change in behavior. It was ensured that all the 433 students also gave their post test data by repeated checking and revisits. The data was entered and statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 17. Simple descriptive statistics were performed and the scores of the pre and post test were compared using the paired 't' test.

S.No	Topics	Contents
1.	Global Warming	Introduction, Meaning
2.	Causes	Natural causes, Manmade causes - deforestation, pollution, plastics etc
3.	Effects	Natural calamities, Disease patterns, Agricultural impacts, Polar ice melt, Draught etc
4.	Solutions: Do's	Pollution control for vehicles, Plant trees, Carry own bags, Use cycle, Water conservation, Renewable energy etc
5.	Solutions: Don'ts	Don't use plastics, Do not cut trees, Don't keep bike in idling etc
6.	Conclusion and Discussion	Pledge by students that they will protect the environment and will make it sustainable

III. Results

Table 1: Characteristics of the study participants

Characteristics	Categories	Percentage
Sex	Male	63
	Female	37
Age	13-15 years	35
	16-19 years	65
Education	Class 9	19.6
	Class 11	41.3
	Class 12	39.1

Table 1 show the characteristics of the students who participated in the study. There were more boys than girls and majority of them were between the age group of14-16years. The representation of eleventh and twelfth standard alone was about 80%.

Table 2: Attitude about Harm from global warming, N=433

	A GREAT DEAL	A MODERATE DEAL	ONLY A LITTLE	NOT AT ALL	DON'T KNOW
Harm personally	41.8%	29.3%	14.1%	1.8%	12.9%
Harm Plants and animals	44.3%	21.0%	7.2%	11.8%	15.7%

Table 2 depicts the attitude of the school students towards the harm from global warming. About 70% of the students felt that global warming will lead to moderate to great harm to them personally and about 65% of the

students felt that it can harm plants and animals also. This reflects a strong attitude towards the harms of global warming.

Table 3: Causes of Global Warming

Causes of Global Warming	Percentage of Students who attributed to this cause
Human Causes	23.6%
Natural Changes	44.1%
Both human causes and Natural changes	27.55%
Neither	4.8%

Table 3 clearly show that less than 5% of the students felt that global warming is neither a natural process nor due to manmade causes. But only 23.6% have felt that it is purely due to manmade causes. About 44% thought that it is a natural process.

Table 4: Attitude towards reducing global warming

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
Action of individuals won't reduce global warming	27.9%	30.7%	13.2%	22.4%	5.85
New technologies can alone solve global warming	24%	34.9%	16.6%	20.6%	3.9%

About 60% of the students felt that global warming cannot be reduced by actions of individuals and also felt that newer technologies are required for solving the global warming problem. This is depicted in Table 4.

Table 5: Global Warming as a personal issue

The extent to which Global warming is a personal issue	Percentage of Students
Extremely important	57.7
Very important	23.3
Somewhat important	14.8
Not that much important	1.6
Not at all important	2.5

A majority of the students (57%) felt that global warming is an extremely important personal problem. This is shown in table 5.

Table 6: Behaviour towards global warming

S. No	Behaviour	Yes (%)
1.	Public transport	85
2.	Bike for short distance(100 – 200 meters)	37
3.	Burning of wastes	57
4.	Planting trees around house	86
5.	Carrying bags to shop	76
6.	Asking for plastic covers from shop	31

Table 6 shows some of the behaviors of the school students which could affect global warming. The environmentally favorable and unfavorable behaviors practiced by them are depicted in the table.

Paired 't' test was applied to the pre and post test scores after checking for normality using Kolmogorov-Smirnov's test. The simple health education programme towards global warming had made a significant change in the attitude of the school students.

Table 7: Changes in attitudes following educational intervention

	PRE TEST (%)	POST TEST (%)
New Technologies alone could solve Global Warming (Strongly Disagreed)	3.9	19.4
Action of individuals won't reduce Global Warming (Strongly Disagreed)	5.8	23.1
Thought about Global Warming a lot before start of the day	28.4	40.9
Personal Harm from Global Warming (Strongly Agreed)	41.8	62.1
Harm to Plants & Animals (Strongly Agreed)	44.3	63.7
Humans as cause of Global Warming	23.6	31.6

Table 7 shows the change in attitude of students towards global warming after a simple climate education programme. There were changes in the perception of seriousness of global warming personally and to other life forms. There were also changes in the attitudes regarding the role of humans in causation and solution of global warming.

The post test mean attitude score was 114.86 and the pre test mean score was 100.53 which shows a mean difference of 14.328 with a p value of 0.001 and a 95% confidence interval [C.I = 12.573-16.083, S.D=18.58].

IV. Discussion

This study has demonstrated that the baseline attitudes of school students towards global warming were not very positive. Despite the perception that global warming is a serious and personal issue, their attitudes towards the role of humans in the causation of global warming and solution to the same was negative. Over 44% of the sampled population thought that global warming happens only due to natural changes in the environment. As a consequence of poor attitudes about the role of humans in causing global warming, the students also had poor attitudes towards the role of humans in solving the problem. On the other hand, students did have a positive attitude towards the seriousness and the threat of the problem of global warming and they do consider it as a personal problem that can affect humans as well as other life forms. In this context it is important to note that the educational syllabus of the high and higher secondary schools contains a module on environmental science which covers the issues of GHG emissions, green house effect, global warming and its consequences. Given this exposure to the environmental science, it is noteworthy that students have a positive attitude regarding the seriousness of the problem but a general negative attitude towards the role of humans in causing it and solving the same. This indirectly speaks about the poor emphasis laid on the role of humans in their educational syllabus. This also emphasizes the need for attitude building in the syllabus, to prepare environmentally conscious students. It is not only essential to impart knowledge, but it is also important to make them realize their roles and responsibilities in preventing global warming and creating a sustainable environment. In some schools they have environmental clubs which organize tree planting, campaigns against burning of wastes, campaigns against use of plastics etc. this will build positive attitudes of students regarding their roles in reducing global warming.

The response to the questions on environmentally friendly behaviors shows some ambiguities. While the students did use public transport, planted trees near their houses and took their own bags when going to shops, significant numbers also have said that they demand plastic covers in shops and drove motor vehicles for short distances. This stimulates the question whether the environmentally favorable behaviors were conscious decisions or whether they were the behaviors which were forced.

For example, the lower socio economic status of the students studying in public schools could preclude them from using two wheelers and cars for travel and make them use public transport more. Similarly, the tree planting may be a part of their compulsory school activity. These behaviors need to be reassessed after few months of the educational intervention to actually study any changes in the environmentally favorable behaviors. The short time period available for the study did not allow such an assessment.

Following the intervention there were significant changes in the attitudes of the students. Especially to the statements of newer technologies could alone solve the problem of global warming and the action of individuals won't reduce global warming, a significant percentage of the students had strongly disagreed after the intervention. This shows that students have started to understand the role anthropological causes in promotion of global warming and also they have understood what can be done as humans apart from relying on the newer technologies and invention to fight the threat of global warming. This can again be cross checked with the response to the causes for global warming. This shows that students have felt the importance of individual roles and responsibilities in solving the issue of global warming. And also, after the climate education program, around 40% of the students had thought a lot about global warming before the start of the day.

The strengths of the educational programme were that it was designed and developed in the local language Tamil in order to cater to the needs of the school students who study in Tamil medium of instruction. Pictures and power point presentations were used in imparting the knowledge on global warming. The students were encouraged to actively participate in discussion sessions. This led to open thought flow. In the end a quiz competition was conducted and certificates of appreciation distributed to the students. The students were also encouraged to take a personal pledge to do all that is possible to reduce the man made causes of global warming and to protect the environment. The climate education program and interviews of some of the participants was broadcast in the local community radio so that it could also reach other members of the community. This module can be easily replicated in all settings across the country to impart education on the effects of global warming.

The study has its own limitations. The representation of the boys was more than that of girls. So, gender specific attitude and behaviour could not be assessed. Since there was no control group in the study (only intervention group), the change in attitudes could not be exactly attributed to the educational intervention regarding global warming. But this could be inferred to a reasonable extent as there was no other similar intervention or exposure at the same point of time.

V. Conclusion

School students are going to be the youngsters and productive population of tomorrow and the responsibility of stalling the escalating problem of global warming lies with them. They should be made aware and known about their roles and responsibilities in counteracting global warming. Therefore it is essential to target them for behaviour change interventions. This assessment of attitudes was eye opening. It showed that while students had positive attitudes about the importance of global warming, they did not have positive attitudes towards their own individual roles in causing it or reducing it. This study also highlights that this attitude can be easily changed by a simple climate education intervention. This model can replicated in similar settings and awareness can be created among school students to effectively stall the problem of climate change and global warming.

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