



The knowledge, perception and awareness of urban population in India towards climate change- An observational cross-sectional study

Prashanth Kumar Vishwakarma¹, Sanjay V. Vaghmare², Satyabrat Banerjee^{3*}, Alka Waghmare⁴, Aruna P Vishwakarma⁵, Anoli Sandeep Agarwal⁶

¹Professor, Department of Public Health Dentistry, JMF ACPM Dental College, Dhule, Maharashtra

²Associate Professor, Department of Ophthalmology, JMF ACPM Medical College, Dhule, Maharashtra

³Associate Professor, Department of Conservative & Endodontics, JMF ACPM Dental College, Dhule, Maharashtra

⁴Professor and Head, Department of Periodontology, JMF ACPM Dental College, Dhule, Maharashtra

⁵Associate Professor, Department of Pedodontics, JMF ACPM Dental College, Dhule, Maharashtra

⁶Assistant Professor, Department of Public Health Dentistry, JMF ACPM Dental College, Dhule, Maharashtra

***Corresponding author:** Satyabrat Banerjee, Associate Professor, Department of Conservative & Endodontics, JMF ACPM Dental College, Dhule, Maharashtra, Email: doctorbanerjee@gmail.com

Submitted: 21 April 2023; Accepted: 17 May 2023; Published: 20 June 2023

ABSTRACT

Introduction: The Earth has undergone dramatic climate change in recent years, which has raised concerns and requires deep understanding and proper public awareness to address this issue. The objective of this study was to determine the association between the level of knowledge, perceptions, and awareness of the urban community in Delhi and climate change.

Materials and method: An observational, cross-sectional, analytical study was conducted on 1200 urban residents of Delhi (mean age of 39.8±15.5 years) who were provided with a structured questionnaire based on knowledge, perceptions, and awareness with regard to climatic change. The association between various factors affecting awareness and climate change was assessed by chi square test.

Results: The findings of the study revealed that most respondents were aware of the word 'Climate Change' and its effect on our lives; however, there were still many people who were completely ignorant of climate change or its effect. Younger generations were more aware of the influence of education and social media, which play a very important role in awareness. The other factors that influenced the respondents' awareness of climate change were the level of education, occupation, and financial resources, which were better for the upper class and upper middle class.

Conclusions: It was concluded from the study that most of the people were aware of the fact that their lifestyle was affected due to climate change, and therefore, felt the necessity to have a better understanding of the topic to effectively combat the effects of climate change.

Recommendations: It is recommended to promote public education on the effects of climate change and implement mitigating policies such as recycling methods and disease surveillance at national and community level. At the individual level, efforts are needed to educate oneself and participate in

fighting climate change must become a priority. The use of non-biodegradable items should be discouraged; instead investing in renewable energy sources such as solar panels and electric vehicles must be encouraged. Adopting climate friendly options should be implemented at every level.

Keywords: *Awareness, Urban population, Climate change, Questionnaire*

INTRODUCTION

Climate change is a global challenge, mainly due to human activities, and it is supported by well-established evidence-based research by relevant experts [1]. The increasing greenhouse gas effect leads to changes in temperature, glacier melting, and rising sea levels. Its impacts affect all areas of life, including human health, food supply, water supply, agriculture, and energy sources. Therefore, it is necessary to critically address these issues related to climate change. The current scenario approach is to identify the effects of climate change, formulate policies, and perform technological changes accordingly. Global warming has led to a significant increase in temperature over the past few years, leading to an increase in natural calamities such as hurricanes, floods, storms, lightning strikes, heat strokes, and rainstorms [2]. This imposes a significant cost on both the economy and society. The climate is involved in its destruction as a result of a global chain of events. In the past few years, due to dramatic changes in the weather, people have become more aware of climate change, which has resulted in many actions demanding social movements. The primary reason for the global rise in temperature is the combustion of fossil fuels, which provide up to 80% of all industrial energy utilized globally [3]. The physical environment, pathological system of each person, and human culture are all affected by climate change. Temperature variations caused by changes in the climate system affect human settlements and societies, as well as nature and wildlife.

The term "climate crisis" can apply to both the anticipated and actual detrimental effects of climate change. While adaptation is mostly based on the availability of information pertinent to climate change, voluntary mitigation is motivated by anticipated sensitivity to hazards and the severity of climate change or climatic variability impacts [4]. Basic information dramatically reduces climate change concerns and encourages environmentally friendly policies. It is very important to generate

awareness among people who have never heard of climate change. Even future generations should be taught in classes about climate change and its profound effects on us [5]. National and local programs aimed at increasing citizens' commitment to climate change must be subjective to the unique context of each country, especially in the developing world. Despite recent activities and efforts to create an overarching public awareness of climate change, this issue is not well understood. It is very important to understand the factors that affect people's awareness. This study aimed to determine the level of climate change awareness among the urban population of Delhi and its association with various sociodemographic factors affecting the awareness of the respondents. The null hypothesis of the study was that there would be no significant association between various sociodemographic factors affecting awareness and climate change awareness among the respondents.

MATERIALS AND METHOD

Study Method and design

The qualitative research methodology was chosen to investigate and collect the necessary data. The study design was a cross-sectional analytical study, where the data was collected from the study participants between March to July 2018.

Study Area

The targeted study population was Delhi territory. The population of Delhi was 11,007,835 (2011 census). Study area Latitude of New Delhi, Delhi, India is 28.644800, and the longitude is 77.216721. The research was conducted in various sectors within the local municipality.

Study Unit

Data was used to collect from heads of households (age \geq 18) through scheduled

interview on their knowledge and perceptions about climate change.

Sample size estimation

The sample size was calculated using the following formula, $n =$ required sample size, confidence interval of 95% and $Z=1.96$, $E =$ margin of error at 3%. The population proportion was kept at 50% [5]. Thus, the participants required were 1068. Total of 1200 participants from the Delhi capital region were included in the questionnaire survey. The household survey was carried based on Simple Random sampling to select respondents for the study.

Inclusion criteria

Participants should be ≥ 18 years old and living for a period of minimum one year in a residential house with basic and essential amenities as a resident of Delhi, India, and subjects who were voluntarily gave their consents to participate in the study were included.

Exclusion criteria

The participants less than 18 years of age and above 75 years and participants unable to communicate or comprehend the questionnaire in any age group were excluded.

Tools and Technique

A pilot test (pre-tested two-page paper based questionnaire) was conducted with 10% of the calculated sample size to assess the reliability of the questions.

Data Collection tool – A well-structured questionnaire was designed to achieve the research objectives based on content validity and previous literature reviews which was used as a research tool to collect data. The questionnaire was divided into two sections: Part A - Sociodemographic characteristics: age group, gender, education level, occupation, marital status. Part B – It consisted of closed questions related to climate change. Bilingual Questionnaire was analyzed by language experts who translated the questions into Hindi and then back-translated them into English by another two independent language experts.

Ethical approval and Consent Form

The study protocol was approved by the Human Research Ethics Committee Sam Higginbottom

University of Health Science and Research, (Prayagraj U.P) (IECBRHP/SHUATS/2017/B/02). Written

informed consents were obtained from all participants enrolled in the study. Data confidentiality was maintained throughout the study, and completed forms were accessed only by the investigators

Statistical Analysis

The questionnaire-coded data were entered into an Excel sheet as a database. Sociodemographic variables and participants' responses were summarized and presented using frequency distribution and frequency tables. Evidence of an association between the variables was explored using cross-tabulation. Chi-square or Fisher's exact tests (expected cell frequencies less than or equal to five) were used to test for significance between variables. Cramer's V or Phi was retested for strength of association.

RESULTS

Our study failed to accept the null hypothesis, and significant associations were found between the various factors affecting awareness and climatic change. A total of 1200 participants participated in the study, out of which 1094 participants provided completely filled questionnaires. Partially completed questionnaires were excluded from the study. According to the basic demographic information of our study population, the majority of respondents were between the ages of 20 and 39 (59%), almost equal numbers of male and female respondents, respondents were mainly from middle-class socioeconomic backgrounds, had a degree or higher education (61%), were primarily students (32%) and private employees (30%), and earned between 1-3 lakhs per year (42%) (Table 1). Cross-tabulation was performed to examine the association between sociodemographic variables and the participants' awareness of climate change. All sociodemographic variables, such as age, sex, education, occupation, and family income, showed a statistically significant association with climate change (Table 2). These percentages suggest that the younger (77 %) and retired (73 %) generations were more aware than the middle-aged group. Similarly, people in secured government jobs (84%) and the upper class

(92%) were more concerned about climate change than the rest of the respondents. Gender associations showed a similar level of awareness between male (73%) and female (72%). Regarding education level, 79% of the respondents had knowledge of climate change with a degree or higher. The association between awareness and climatic change increased with an increase in annual family income. 73% of study participants knew what the term "climate change" meant, compared to 11% who had never heard it

and 16% who did not respond. 90% of respondents said they were interested in learning more about climate change and its effects, and 88% of respondents said it was hurting their way of life (Table 3). Most of the respondents were strongly concerned (38%), and 52% were fairly concerned towards climate change. A small percentage of respondents were uncertain towards climate change (9%) and negligible percentage were fairly unconcerned (~1%) (Table 4).

TABLE 1: Frequency and percentage distribution of the demographic variables of the respondents.

Sociodemographic variables (n = 1094)	Frequency	Percentage from total population	Male	Male %	Female	Female%
Age (in years)						
Less Than 21	184	17%	141	77%	43	23%
21 – 40	642	59%	364	57%	278	43%
41 – 60	203	19%	131	65%	72	35%
More than 61	65	6%	54	83%	11	17%
Gender						
	1094	--	612	56%	482	44%
Socio-Economic Class						
Upper Class	327	30%	210	64%	117	36%
Upper Middle Class	532	49%	322	61%	210	39%
Lower Middle Class	177	16%	121	68%	56	32%
Lower Class	58	5%	34	59%	24	41%
Highest Education Qualification						
Illiterate	8	1%	3	38%	5	63%
Below 10th Standard	18	2%	11	61%	7	39%
10th Standard	83	8%	50	60%	33	40%
12th Standard	210	19%	134	64%	76	36%
Diploma	112	10%	67	60%	45	40%
Degree	663	61%	397	60%	266	40%
Occupation						
Employed For Daily Wages	86	8%	65	76%	21	24%
Government Employee	87	8%	55	63%	32	37%
Private Employee	329	30%	220	67%	109	33%
Self-Employed/ Business	82	7%	72	88%	10	12%
Home Maker	94	9%	5	5%	89	95%
Student	352	32%	222	63%	130	37%
Retired	48	4%	41	85%	7	15%
Unemployed	16	1%	13	81%	3	19%

Combined Household Annual Income (in INR)						
Below 50,000	46	4%	40	87%	6	13%
50,000 - 1 Lakh	273	25%	191	70%	82	30%
1- 3 Lakh	458	42%	272	59%	186	41%
3-5 Lakh	191	17%	102	53%	89	47%
Above 5 Lakh	126	12%	85	67%	41	33%

TABLE 2: Cross-tabulation association between socio-demographic variables and awareness of climate change using chi-square test.

Sociodemographic variables	Awareness of Climate change		Chi square test
	Yes %	No %	
Age (in years)			
Less Than 20	65	15	$\chi^2 = 12.105$ df = 6 p = 0.041
21 – 40	77	9	
41 – 60	68	12	
More than 61	73	11	
Gender			
Male	73	14	$\chi^2 = 24.180$ df = 2 p < 0.001
Female	72	8	
Socio-Economic Status			
Upper	92	4	$\chi^2 = 56.433$ df = 6 p < 0.001
Upper Middle	73	8	
Lower Middle	66	17	
Lower	49	32	
Qualification			
Illiterate	42	44	$\chi^2 = 91.613$ df = 10 p < 0.001
Below 10th Standard	58	36	
Metric School	61	29	
Secondary school	67	13	
Certification	57	14	
Graduate	79	7	
Employment			
Daily Wages	54	17	$\chi^2 = 41.890$ df = 14 p < 0.001
Government Job	84	7	
Private Job	77	6	
Self-Employed/ Business	68	21	
Home Maker	63	14	
Student	74	11	
Retired	81	8	
Unemployed	59	14	

Total Income (Annual)(in INR)			
Below 50,000	80	18	$\chi^2 = 62.364$ df = 8 p < 0.001
50,000 - 1 Lakh	65	16	
1- 3 Lakhs	68	11	
3-5 Lakhs	80	7	
Above 5 Lakhs	92	6	

TABLE 3: Percentage of responses of the participants on climate change awareness.

Questions	Yes	No
Are you aware of the term “climate change”	73%	11%
Climate Change Affecting Lifestyle Or Living Habits	88%	5%
Do you wish to know more about climate change impact towards health risk	90%	10%

TABLE 4: Percentage of respondents concerned about climatic change.

Concern Towards Climate Change	Percentage
Strongly Concerned	38%
Fairly Concerned	52%
Uncertain	9%
Fairly unconcerned	1%
Strongly unconcerned	1%

DISCUSSION

Knowledge and perception towards climate change

This study attempts to determine the knowledge, perceptions, and awareness of people in Delhi’s communities regarding climate change. These findings provide important insights into what people think and believe based on their experiences at the grassroots level. Household participants in urban cities are affected by climate change. Climate change is a relatively new and complex subject, usually surrounded by misinformation, and awareness creation is unavoidable in the fight against climate change [6].

Awareness of the term climate change and factors affecting awareness

This study assessed community members’ knowledge and awareness of climate change in Delhi. The results provide significant insights into the perceptions and beliefs of people, depending on their local experiences.

Participants in the urban household groups were affected by climate change. Raising awareness is essential in the fight against climate change because it is a recent and complicated topic that is sometimes shrouded by misinformation [6].

Our study found a significant association between knowledge of climatic change and age, gender, occupation, and family income. Our findings are consistent with previous research that reported that most respondents had a fair understanding of the topic [7,8]. The reason behind the increase in awareness among youth and retired people in our study might be the role of social media and newspapers. In recent years, due to social media and various campaigns, people have become aware of climate change and are willing to make changes in their lifestyle to combat the climatic crisis. It has also been suggested that there is a cultural barrier as a predictor of concern about climate change rather than knowledge gained from media outlets [9]. The people in secured jobs, upper class, and with a family income of more than five lakhs were

more aware of the topic than the rest. This may be due to better financial stability and the availability of resources.

Climate change and health are two issues that the WHO addresses in various ways. A comprehensive collection of policy briefs, guidelines, tools, and training manuals; participation in various activities to increase the prominence of health issues on the climate agenda; and advocacy campaigns and multimedia products targeting both policymakers and the general public are some of them [10]. Various national and regional programs that are specifically designed and unique to each country, depending on their needs, should be implemented. To modify behavior and obtain social support for the steps required to reduce greenhouse gas emissions, it is important to increase knowledge and understanding of the effects of climate change on health. Additionally, it may be useful to persuade medical practitioners to endorse initiatives for vulnerability reduction and health improvement, such as mitigation and adaptation.

Our study indicated that today's youth are very aware of the effects of climatic change on their lives, and the main reason for this is the change in our education policy. In recent years, with growing concern about climate change, it has been made mandatory in schools to teach students about the changes in our environment due to the greenhouse effect and its consequences on our health [11].

52% respondents in our study were fairly concerned toward the implications of climate change in their daily lives and on the environment. Similar findings were reported Davydov et al, who observed that 50% of the respondents had an impact in their daily lives [12]. Even with a high literacy rate in India (Delhi), close to 89% (Census India, 2011), 90% of people wanted to know more about climate change and its impact. The mindset of the population is such that they are not willing to act on government policies. The decisions do not relate to people at ground level who are just living to meet their ends on a daily basis [13].

According to the World Poll, public awareness of climate change as a threat is very high (80–89%). Although people know about climate change, their concerns about it are very low. It is

important to generate awareness among the public.

CONCLUSION

The majority of the participants in this survey had some knowledge about climatic change, according to the findings of the study. Nevertheless, some parts of society were still unfamiliar with the term. According to this study, the urban sector has a high literacy rate in relation to school enrollment. The majority of those with higher education had sufficient awareness of climate change, demonstrating the significance of education. The younger age group was more aware of and enthusiastic about climate change. Due to the better availability of resources, the upper and upper middle classes also showed a positive correlation between awareness and climate change. People's perspectives can be altered by a better comprehension of the shifting features of climate effects.

Recommendations for society: Public education should be the prime motive linking individuals' knowledge and concern. Knowledge of emerging trends and changing concepts can be improved through awareness. Recycling habits and participation in community activities should be promoted. Disease surveillance implemented at the community level should be part of climate change adaptation measures. Promote opportunities for public health officials to educate the public about climate change's health risks, as well as actions needed to limit climate change and adapt successfully to its risks.

ACKNOWLEDGEMENTS

None

CONFLICT OF INTEREST

None

Funding

Self funded

REFERENCES

1. Campbell-Lendrum D, Bertollini R. Science, media and public perception: implications for climate and health policies. *Bull World Health Organ* 2021;88(4):242-243. DOI: 10.2471/BLT.10.077362.

2. Apreda C, D'Ambrosio V, Martino FD. A climate vulnerability and impact assessment model for complex urban systems. *Environ. Sci. Policy* 2019;93:11-26. DOI: 10.1016/j.envsci.2018.12.016.
3. Oldenborgh V, Philip GJ, Kew S. Extreme heat in India and anthropogenic climate change, *Nat. Hazards Earth Syst. Sci.* 2018;18:365–381. DOI: 10.5194/nhess-18-365-2018.
4. Habibi P, Moradi G, Moradi A, Heydari A. The impacts of climate change on occupational heat strain in outdoor workers: A systematic review. *Urban Clim.* 2021;36:100770. DOI: 10.1016/j.uclim.2021.100770.
5. Pandve HT, Chawla PS, Fernandez K, Singru SA, Khismatrao D, Pawar S. Assessment of awareness regarding climate change in an urban community. *Indian J Occup Environ Med.* 2011;15:109-112. DOI: 10.4103/0019-5278.93200.
6. Ochieng M., Koske, J. The Level of Climate Change Awareness and Perception among Primary School Teachers in Kisumu Municipality, Kenya. *Int J HumaniSoc Sci.* 2013;3(21):174–179.
7. BuloshiA, Ramadan E. Climate Change Awareness and Perception amongst the Inhabitants of Muscat Governorate, Oman. *Am J Climate Change* 2015;4:330-336. DOI: [10.4236/ajcc.2015.44026](https://doi.org/10.4236/ajcc.2015.44026).
8. Clayton SD, Pihkala P, Wray B, Marks E. Psychological and Emotional Responses to Climate Change among Young People Worldwide: Differences Associated with Gender, Age, and Country. *Sustainability* 2023;15(4):3540. DOI: 10.3390/su15043540.
9. Venghaus S, Henseleit M, Belka M. The impact of climate change awareness on behavioral changes in Germany: changing minds or changing behavior? *Energy Sustain Soc.* 2022;12(8). DOI:10.1186/s13705-022-00334-8.
10. Lee TM, Markowitz EM, Howe PD. Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change* 2015;5(11):1014–1020. DOI:10.1038/nclimate2728.
11. Gbode IE, Ajayi VO, Ogunjobi KO, Dudhia J, Liu C. Impacts of Global Warming on West African Monsoon Rainfall. *African Handbook of Climate Change Adaptation* 2021:2469-2483. DOI.org/10.1007/978-3-030-45106-6_93.
12. Davydov AN, Mikhailova GV. Climate change and consequences in the Arctic: perception of climate change by the Nenets people of Vaigach Island. *Glob Health Action* 2011;4. DOI: 10.3402/gha.v4i0.8436.
13. Anisimov O, Orttung R. Climate change in Northern Russia through the prism of public perception. *Ambio.* 2019;48:661-671. DOI: 10.1007/s13280-018-1096-x.