Protocol

Climate Change Resilience Training for Adolescent Mental Health in India: Protocol for a Sequential, Explanatory Mixed Methods Cluster Randomized Controlled Trial Within the Ayushman Bharat School Health and Wellness Program

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Abstract

Background: Climate change increasingly affects adolescent mental health, particularly in heat-vulnerable regions such as Odisha, India. Strengthening climate awareness, adaptive behaviors, and psychological resilience among adolescents is therefore essential.

Objective: The goal of this study is to determine the effectiveness of the Climate Change Resilience Training (CCRT) intervention on adolescents' readiness for climate change. The main objectives are to assess climate change–related mental health outcomes among adolescents, explore adolescents' mental health perceptions and coping related to climate change, and evaluate the effectiveness of climate change resilience training on climate change readiness among adolescents.

Methods: A sequential, explanatory mixed methods study will be conducted among adolescents in public schools in Khordha district, Odisha, India. Phase 1 will assess climate change–related mental health outcomes using standardized tools; phase 2 will explore adolescents' perceptions, emotional experiences, coping, and hopes through focus group discussions; and phase 3 will evaluate the Climate Change Resilience Training intervention using a superiority cluster randomized controlled trial with 1:1 allocation between intervention and control schools. The intervention will comprise 5 structured classroom sessions over 1 month and 1 booster session 2 months later under the Ayushman Bharat School Health and Wellness Program. The primary outcome will be the change in a climate change awareness score; secondary outcomes will include heat wave preventive practices, climate-protective behaviors, climate hope, and climate-related mental health outcomes.

Results: Ethics approval was obtained in December 2025. The study was funded in January 2026. As of manuscript submission, participant recruitment had not commenced. Recruitment is scheduled to commence in November 2026 following school permissions and facilitator training. Data collection is expected to continue through 2027, with data analysis planned immediately after completion of follow-up assessments.

Conclusions: The findings may inform the integration of climate resilience and mental health promotion into existing school health programs and support policy development for adolescent health in India and other low- and middle-income countries.

Trial Registration: Clinical Trials Registry–India CTRI/2026/01/101299; https://trialsearch.who.int/Trial2.aspx?TrialID=CTRI/2026/01/101299

International Registered Report Identifier (IRRID): PRR1-10.2196/104387

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KEYWORDS

climate change; adolescents; heat waves; climate change preparedness; protective behaviors; climate hope; resilience; mental health

Introduction

Background

Climate change has emerged as one of the most pressing global challenges of the 21st century, with profound and far-reaching implications for human health, including mental well-being [1]. In recent years, India has witnessed a notable increase in extreme climatic events, such as heat waves, floods, and cyclones [2]. Odisha, a climate-vulnerable state, has been particularly affected [3]. During the 2024 Indian heat wave, the state reported 147 fatalities along with a substantial number of heatstroke cases, underscoring the severity of environmental stressors and their health consequences [4]. While the physical health impacts of climate change have been extensively documented, its psychological consequences, especially among adolescents, remain underexplored [5]. Adolescence is a critical developmental stage characterized by heightened emotional sensitivity and evolving coping capacities, making individuals particularly vulnerable to environmental stressors [6]. Increasing temperatures, erratic weather patterns, and recurrent extreme events contribute to heightened levels of stress, anxiety, and uncertainty about the future among young people [7].

A growing body of literature highlights the concept of eco-anxiety, defined as a chronic fear of environmental degradation and impending ecologic crises [8]. Although widely documented in Western contexts, eco-anxiety is increasingly relevant in low- and middle-income countries [9]. Adolescents experiencing eco-anxiety frequently report feelings of helplessness and emotional distress [10]. Similarly, prolonged exposure to extreme weather conditions has been associated with depressive symptoms and psychological distress [11]. Despite these emerging concerns, there is a notable lack of empirical evidence examining the mental health impacts of climate change among Indian adolescents [12]. In regions such as Odisha's Khordha district, which is frequently affected by disasters, including cyclones and heat waves, adolescents face compounded environmental and psychosocial challenges [13]. These stressors are further exacerbated by limited access to mental health resources within school settings [14].

The Ayushman Bharat School Health and Wellness Program provides a structured platform for promoting adolescent health in India [15]. It is a flagship initiative of the Ministry of Health and Family Welfare and the Ministry of Education, aimed at promoting holistic health among schoolchildren. The program addresses physical, emotional, and psychosocial well-being through structured themes delivered in schools. However, it currently lacks targeted components addressing climate-induced psychological stress and resilience-building. Integrating climate resilience strategies within this framework presents a critical opportunity. Methodologically, existing research has largely relied on either qualitative or quantitative approaches, offering only a partial understanding [16]. A mixed methods approach is essential to capture both magnitude and lived experiences. In alignment with national and global priorities, including India's National Action Plan on Climate Change, the World Health Organization's recommendations, and the Sustainable Development Goals, there is an urgent need to address this intersection [17-19].

Objectives

Primary Objectives

The primary objective of this study is to assess climate change–related mental health outcomes among adolescents.

Secondary Objectives

The secondary objectives of this study are (1) to explore adolescents' perceptions, emotional experiences, coping strategies, and hopes related to climate change and (2) to evaluate the effectiveness of climate change resilience training on climate change readiness among adolescents, operationalized primarily by change in climate change awareness score and secondarily by changes in preventive practices, protective behaviors, and climate hope.

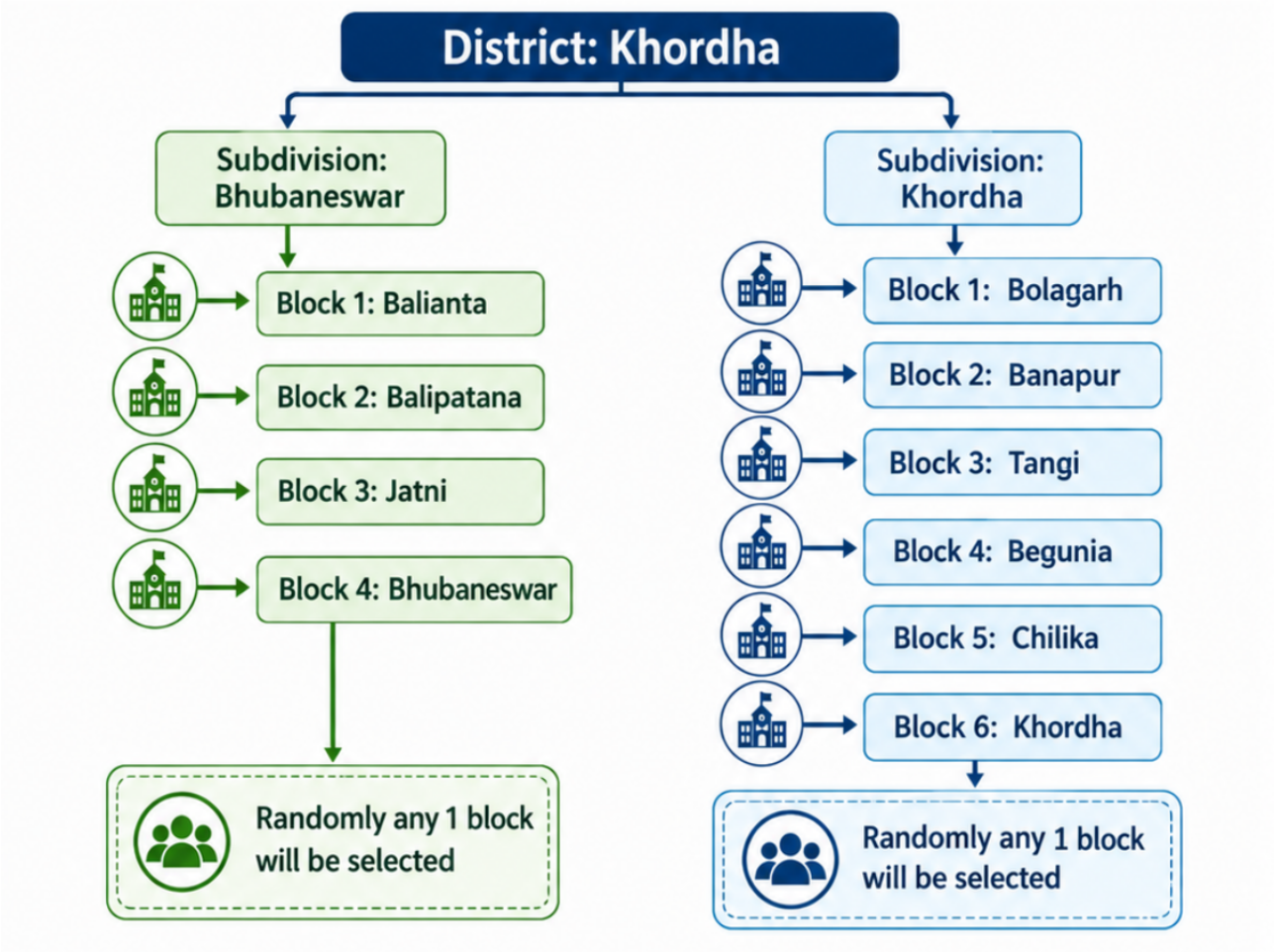
Methods

Trial Setting

The study will be conducted in public schools in Khordha district, Odisha, India, implementing the Ayushman Bharat School Health and Wellness Program (Figure 1). Selected schools from 1 rural and 1 urban block will participate to ensure representation of diverse socioenvironmental settings. Adolescents in grades 8 to 10 will be enrolled in all 3 phases.

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Figure 1. Settings of the study.

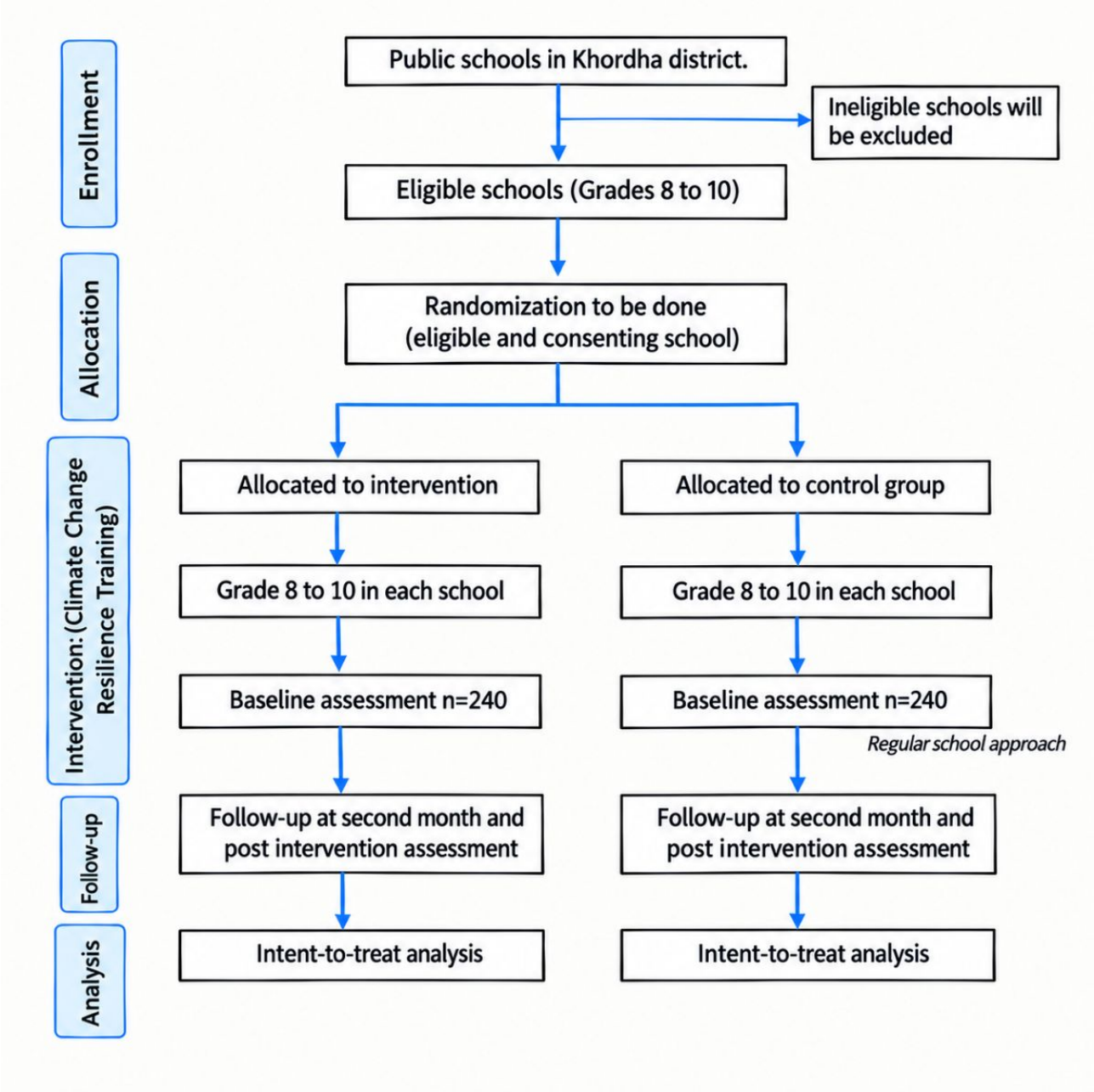


Study Design

This study is a sequential, explanatory mixed methods cluster randomized controlled trial conducted in public schools in Khordha district, Odisha, India, under the Ayushman Bharat School Health and Wellness Program. The study will be implemented in 3 phases. Phase 1 will use a quantitative cross-sectional survey to assess climate change–related mental health outcomes among adolescents. Phase 2 will adopt a qualitative phenomenological approach to explore adolescents' perceptions and coping experiences related to climate change. Phase 3 will use a superiority cluster randomized controlled trial with a parallel-arm design and a 1:1 allocation ratio between intervention and control schools to evaluate the effectiveness of the Climate Change Resilience Training (CCRT) intervention (Figure 2).

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Figure 2. Phase 3 Methodology.



The study will be conducted in selected rural and urban public schools implementing the Ayushman Bharat School Health and Wellness Program. Adolescents studying in grades 8 to 10 will be recruited. Schools assigned to the intervention arm will receive the structured CCRT module, comprising 5 classroom-based sessions and 1 booster session, while control schools will continue routine school activities. Outcome assessors and data analysts will remain blinded to allocation. The institutional ethics committee has approved the study, and participant recruitment is scheduled to begin in November 2026. This study protocol was developed in accordance with the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) guidelines [20].

Ethical Considerations

The study received approval from the Institutional Ethics Committee of All India Institute of Medical Sciences, Bhubaneswar, in December 2025 (reference T/EMF/Nursing/2024-2025/150). The study will be conducted in accordance with the Indian Council of Medical Research National Ethical Guidelines for Biomedical and Health Research Involving Human Participants and applicable Good Clinical Practice principles. Written informed consent will be obtained from parents or guardians, and written assent will be obtained from participating adolescents before enrollment. Participation is voluntary, and participants may withdraw at any time without consequences. Any emotional discomfort arising during discussions of climate change will be documented, and participants requiring additional support will be referred to appropriate counseling or mental health services.

Eligibility Criteria

For all 3 phases, adolescents enrolled in grades 8 to 10 in participating public schools under the Ayushman Bharat School

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Health and Wellness Program in Khordha district, Odisha, will be eligible for inclusion. Students who do not provide informed assent, whose parents or guardians do not provide written informed consent, or who are absent during the data collection period will be excluded from the study.

Teachers involved in intervention delivery must be currently employed in participating public schools and willing to undergo training to implement the CCRT module.

Study Participants and Sample Size

In phase 1, a multistage cluster sampling technique will be used to recruit 608 adolescents from rural and urban blocks of Khordha district, Odisha. Phase 2 will use purposive sampling to conduct 6 focus group discussions, each comprising 6 to 8 adolescents, until data saturation is achieved.

In phase 3, a superiority cluster randomized controlled trial design will be used, with schools as clusters. The primary outcome for the sample size calculation is the change in the climate change awareness questionnaire score. The total sample size was determined using a 2-sided significance level of 5%, 80% power, adjustment for clustering at the school level, and 10% anticipated attrition, resulting in 480 adolescents (240 per arm). The calculation follows established methods for cluster randomized trials, in which the required sample is inflated according to the intracluster correlation and average cluster size [21], and is informed by evidence from a school-based climate change education intervention among adolescents in India [22]. The exact effect size, intracluster correlation coefficient, average cluster size, and software output used for the original calculation should be reported in the supplementary statistical calculation sheet to permit reproducibility [21].

Recruitment and Consent

Students from grades 8 to 10 in selected public schools will be recruited after obtaining permission from the school authorities. Eligible students and parents will be informed about study procedures, and written parental consent, along with student assent, will be obtained before enrollment. Recruitment will aim to ensure representation across grades and genders.

Randomization

Stratified randomization will be performed at the school level to minimize contamination between participants. Eligible schools from selected rural and urban blocks will be randomly allocated to either the intervention or control arm using an open list of random numbers. Allocation concealment will be ensured using sequentially numbered, opaque, sealed envelopes prepared by an independent statistician not involved in recruitment, intervention delivery, or outcome assessment.

Blinding

Participants will remain blinded to group allocation, and anonymized group labels will be used during analysis to reduce assessment bias. Unblinding will occur only after completion of data analysis and interpretation of results. In the event of any protocol deviation or adverse event requiring identification of group allocation, unblinding may be performed by the principal investigator, following appropriate documentation and ethical procedures.

Intervention

The schools randomized to the intervention arm will receive the structured CCRT intervention following completion of the baseline assessment. The intervention will be delivered over 1 month and will consist of 5 classroom-based sessions, each lasting 45 to 60 minutes. The sessions will be conducted during regular school hours by trained facilitators (teachers) under the Ayushman Bharat School Health and Wellness Program framework, with prior approval from school authorities. The implementation of the intervention plan is detailed in Textbox 1. A booster session will be conducted 2 months after completion of the initial training to reinforce key concepts. Outcome assessment will be conducted at baseline (T0), immediately after completion of the 5-session training (T1), and after completion of the booster session (T2). Schools in the control arm will continue routine school health and educational activities.

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Textbox 1. Implementation of the intervention plan.

Modules (each 1 hour)

1. Introduction to climate change and heat waves
2. Health impacts of heat waves
3. Hydration and nutrition during heat waves
4. Heat wave safety at home and school
5. Building a climate resilience mindset

Audiovisual aids

- Short lectures with visual aids (charts/posters)
- Group discussions and peer learning
- Scenario-based problem-solving exercises
- Role-play exercises (eg, responding to a heat wave situation)
- Reflection activities (eg, "How does heat affect how I feel?")
- Simple relaxation or grounding techniques for emotional regulation.

Teaching and learning methods

- Educational sessions followed by participatory and experiential Activities as recommended in the resource guide
- Interactive and group discussions
- Cooperative play
- Storytelling
- Role-play
- Brainstorming
- Within-school debate
- Climate change wall magazine

Development Steps of the Intervention Module

The CCRT module will be designed to fit the local context. It will be developed through consultation meetings with education and health stakeholders (including schoolteachers, public health experts, and program coordinators) and focus group discussions with adolescents (phase 2) to understand perceptions of climate change, emotional responses (eg, anxiety and depression), and existing coping mechanisms. Inputs from these processes will be incorporated into the module. The finalized content will be validated by subject experts before implementation.

Intervention Content and Structure

The training will consist of 5 sequential modules designed to build climate change knowledge, emotional awareness, and adaptive coping skills (Textbox 2).

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Textbox 2. Five sequential modules.

Module 1: Introduction to Climate Change and Heat Waves

- Basic concepts of climate change (causes and global and local trends)
- Understanding heat waves in the local context
- Linking climate change to daily life experiences

Module 2: Health Impacts of Heat Waves

- Physical health effects (heat exhaustion, dehydration, and heat stroke)
- Mental health impacts (irritability, fatigue, anxiety, and sleep disturbances)
- Identification of early warning signs

Module 3: Hydration and Nutrition During Heat Waves

- Importance of adequate hydration
- Locally available, affordable cooling foods
- Avoidance of high-risk dietary practices during extreme heat

Module 4: Heat Wave Safety at Home and School

- Preventive strategies (clothing, timing of outdoor activities, and ventilation)
- First aid and emergency response for heat-related illness
- Role of family, school, and community in protection

Module 5: Building a Climate Resilience Mindset

- Emotional coping strategies (problem-solving, peer support, and stress management)
- Introduction to climate anxiety and normalization of feelings
- Encouraging adaptive behaviors and student-led solutions
- Building self-efficacy and community awareness

Booster session (at 2 months)

- Review key concepts from all modules
- Address misconceptions and reinforce behavior change
- Include interactive quizzes and recap activities
- Provide a platform for students to share experiences and coping practices

Study Outcomes

The primary outcome is the change in the climate change awareness questionnaire score from baseline (T0) to postintervention assessments (T1 and T2). Secondary outcomes include heat wave preventive practices, climate-protective behaviors, climate hope, and climate change preventive practices. Phase 1 mental health outcomes—eco-anxiety, climate change distress and impairment—will be assessed as climate-related mental health outcomes and used to describe baseline status and examine changes over time. The intervention arm will receive the CCRT module over 1 month through 5 structured sessions and 1 booster session, while control schools will continue routine academic and health education activities under the standard school curriculum without additional climate change–specific intervention during the study period.

Content Validity and Reliability

All instruments used in this study will be assessed for validity and reliability before the main data collection. Standardized tools with established psychometric properties will be used where available, while researcher-developed instruments have undergone rigorous validation procedures. Content validity of the researcher-developed tools (tools 4, 5, and 8) will be established using the content validity index (CVI). A panel of 5 to 7 experts in psychology, public health, mental health, and climate change will evaluate each item for relevance, clarity, and simplicity. Item-level CVI and scale-level CVI will be computed, with recommended acceptable values of ≥0.78 and ≥0.80, respectively. All researcher-developed tools will be pilot-tested among 30 to 50 adolescents to assess feasibility, clarity, and internal consistency. Reliability will be evaluated using the Cronbach α coefficient, with a minimum acceptable threshold of ≥0.70 indicating adequate internal consistency. Necessary modifications will be made based on pilot findings.

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Standardized instruments such as the Hogg Eco-Anxiety Scale and the Climate Change Distress and Impairment Scale have demonstrated good internal consistency and validity in previous studies. Permission to use these tools was obtained where required (Table 1).

Table 1. Validity and reliability of study instruments.

Tool	Instrument or construct	Type of tool	Validity assessment	Reliability method	Expected or reported reliability
1	Hogg Eco-Anxiety Scale [23]	Standardized	Established construct validity (literature supported)	Cronbach α	α≈0.80-0.90
2	Mental Health risk Factor assessment tool	Researcher developed	Content validity	Cronbach α	α≈0.80-0.85
3	Climate change distress and impairment scale [24]	Standardized	Established construct validity	Cronbach α	α≈0.85-0.92
4	Awareness of Climate Change Questionnaire	Researcher developed	Content validity (CVI[a] by expert panel)	Cronbach α (pilot testing)	α≥0.70
5	Preventive practices on the scale of heat waves	Researcher developed	Content validity (CVI)	Cronbach α (pilot testing)	α≥0.70
6	Climate Change Protection Behavior Scale	Adapted or composite	Content and construct validity (based on literature)	Cronbach α	α≈0.70-0.85
7	Hope Toward Climate Change Scale	Adapted	Construct validity (based on the Hope Scale framework)	Cronbach α	α≈0.75-0.88
8	Climate Change Preventive Practices Scale	Researcher developed	Content validity (CVI)	Cronbach α (pilot testing)	α≥0.70

[a]CVI: content validity index.

Participant and Public Involvement

Adolescents, teachers, and school stakeholders contributed to the development of the intervention module through focus group discussions and consultation meetings. Their inputs helped identify locally relevant climate-related concerns, coping strategies, and preferred teaching and learning approaches. Participants were not involved in recruitment, outcome assessment, or data analysis.

Data Collection

Participant recruitment, enrollment, intervention delivery, and data collection (all the assessment tools listed in Table 2) will be conducted by trained research staff in collaboration with participating schools in phase 3 (Figure 2).

Table 2. Schedule of assessments.

Phase and time point	Purpose	Measures or activities	Participants
Phase 1—baseline survey	Assess climate change -related mental health among adolescents	Sociodemographic proforma of adolescents, Mental Health Risk Factor Assessment Tool, Hogg Eco-Anxiety Scale [23], Climate Change Distress and Impairment Scale [24]	Adolescents, grade 8 to 10
Phase 2—qualitative exploration	Explore perceptions and coping	Focus group discussion on emotional experiences, coping strategies, hopes, and suggestions related to climate change (Multimedia Appendix 1)	Purposively selected adolescents
Phase 3—T0	Preintervention baseline for trial outcomes	Climate change awareness (primary), heat wave preventive practices, climate-protective behaviors, climate hope, and climate change preventive practices	All randomized adolescents
Phase 3—T1	Immediate posttraining assessment	Repeat all phase 3 outcome measures; intervention fidelity and attendance documentation	All randomized adolescents
Phase 3—T2	Booster follow-up	Repeat all phase 3 outcome measures after the booster session; retention and intervention acceptability documentation	All randomized adolescents

Quantitative Baseline Screening (Phase 1)

Phase 1 will assess baseline climate change–related mental health outcomes among adolescents using validated standardized tools. Data will be collected on mental health risk factor, eco-anxiety, and climate change distress and impairment using the Mental Health Risk Factor Assessment Tool, Hogg Eco-Anxiety Scale [23], and the Climate Change Distress and Impairment Scale [24].

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Sociodemographic characteristics and climate change-related mental health of participants will also be collected through structured questionnaires administered in classroom settings.

Qualitative Survey (Phase 2)

Phase 2 will use focus group discussions with adolescents guided by a semistructured interview guide to explore perceptions, emotional experiences, coping strategies, hopes, and suggestions related to climate change (Multimedia Appendix 1). Discussions will be conducted in a private setting within schools, audio-recorded with permission, and transcribed for thematic analysis.

Intervention and Follow-Up Assessment (Phase 3)

Phase 3 will evaluate the effectiveness of the CCRT using researcher-developed and standardized tools. The primary outcome, climate change awareness, will be measured at T0, T1, and T2. Secondary outcomes—heat wave preventive practices, climate-protective behaviors, climate hope, and climate change preventive practices—will be assessed at the same time points. Baseline assessment will occur before intervention implementation; T1 will occur immediately after the 5-session training; and T2 will occur 2 months after the booster session.

Data Analysis Plan

Quantitative data will be analyzed using SPSS (version 30) [25] following the intention-to-treat principle, in which all randomized participants will be analyzed according to their allocated groups, regardless of adherence to the intervention. Descriptive statistics, including frequencies, percentages, means, and SDs, will be used to summarize demographic characteristics and baseline variables.

The effectiveness of the CCRT intervention will be evaluated using mixed-effects models that account for clustering at the school level and repeated measurements over time. The primary analysis will examine the group × time interaction for change in the climate change awareness score between the intervention and control arms. Fixed effects will include study group, time, and group × time interaction; school will be included as a clustering factor. Secondary outcomes will be analyzed using the same framework, as appropriate to their measurement scale. Intraclass correlation coefficients will also be estimated. Statistical significance will be set at $P<.05$.

Missing quantitative data will be handled using appropriate statistical approaches such as multiple imputation or mixed-model analysis, where applicable.

Qualitative data obtained from focus group discussions will be audio-recorded, transcribed verbatim, and analyzed using thematic analysis to identify major themes and subthemes. NVivo software (version 15; Lumivero) will be used to support coding, organization, and interpretation of qualitative data.

All collected data will be coded using unique participant identification numbers to maintain confidentiality. Personal identifiers will be removed from datasets before analysis and publication. Due to ethical and institutional restrictions, the datasets generated and analyzed during this study will not be publicly shared but may be shared upon request to the primary author.

Following the qualitative and quantitative analyses, the findings will be integrated using a methodological triangulation approach. A joint display matrix will be used to visually map quantitative data (eg, eco-anxiety and climate change distress and impairment) to qualitative themes (adolescents' lived experiences and coping mechanisms). This triangulated synthesis will directly inform the contextual tailoring and development of the phase 3 resilience intervention (CCRT).

Trial Management and Participant Safety

Participants may be withdrawn from the study if assent or parental consent is withdrawn, if they are absent during major intervention or assessment periods, if they develop conditions limiting participation, or if they fail to comply with study procedures; all discontinuations will be documented according to the Consolidated Standards of Reporting Trials (CONSORT) recommendations. Adherence and participant retention will be promoted through regular coordination with school authorities, attendance monitoring, reminder sessions, participatory teaching methods, and scheduling assessments during school hours to minimize attrition. As the intervention is educational and low risk, no major harm is anticipated; however, any emotional discomfort, adverse events, or complaints arising during discussions on climate change will be documented and reviewed, and participants requiring support will be referred to appropriate counseling or mental health services. Process evaluation will assess intervention fidelity, reach, dose, and acceptability through session checklists, attendance records, participant feedback, and observation of selected sessions. Any important protocol modifications will be communicated to the Institutional Ethics Committee, trial registry, and relevant stakeholders before implementation. No biological specimens will be collected during the study, and participants who experience emotional distress during or after participation will be referred to appropriate support services.

Results

Ethics approval was obtained from the Institutional Ethics Committee of the All India Institute of Medical Sciences, Bhubaneswar, in December 2025 (reference T/EMF/Nursing/2024-2025/150). The study was funded in January 2026. As of manuscript submission, participant recruitment had not commenced. Recruitment is scheduled to commence in November 2026 after school permissions and facilitator training. Data collection is expected to continue through 2027, followed by quantitative and qualitative analyses and integration of findings.

Discussion

Principal Findings

Climate change is becoming a serious public health problem, and it is affecting the mental health of adolescents [26,27]. Young people are increasingly exposed to heat waves, floods, cyclones, and other environmental changes, which can lead to stress, fear, sadness, anxiety, and feelings of helplessness

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[28,29]. However, very few studies in India have examined how climate change affects adolescents' mental health. Therefore, this study is important because it will explore climate-related mental health problems among adolescents in Odisha and evaluate the effectiveness of a school-based climate resilience training program. Studies across countries have shown that many adolescents are concerned about climate change. A global survey of 10,000 young people found that 59% were very worried about climate change, and many reported that these worries affected their daily lives and emotional well-being [10]. Studies from countries such as Australia, the United States, and European nations have also reported increased stress, anxiety, hopelessness, and depressive symptoms among adolescents exposed to climate-related disasters [30-31]. Extreme heat and other climate-related events can also affect mental health. Research shows that exposure to high temperatures may disturb sleep, increase irritability, reduce concentration, and lead to emotional distress [32,33]. Adolescents are especially vulnerable because they are still developing emotionally and may not have strong coping skills [34,35]. Odisha is one of the climate-vulnerable states in India and frequently experiences cyclones, floods, and heat waves. These environmental challenges may negatively affect adolescents' physical and psychological well-being.

This study is important because it plans to introduce climate resilience strategies through the Ayushman Bharat School Health and Wellness Program. Schools are among the best settings for promoting adolescent mental health and healthy behaviors. Earlier school-based interventions have shown positive results in improving students' awareness, coping skills, emotional regulation, and protective behaviors [36]. Interactive teaching methods, such as group discussions, storytelling, role-play, peer learning, and problem-solving activities, have been found to improve student participation and learning outcomes [37,38]. Therefore, the proposed CCRT may help adolescents improve their climate change awareness, coping skills, hope, and protective behaviors. Another strength of this study is its use of a mixed methods approach. The quantitative phase will help identify the level of eco-anxiety, climate worry, and depressive symptoms among adolescents, while the qualitative phase will provide a deeper understanding of adolescents' feelings, experiences, perceptions, and coping strategies related to climate change. Using both methods together will provide a more complete understanding of climate change–related mental health issues among adolescents.

The findings of this study may also help improve school health programs and policies. At present, the Ayushman Bharat School Health and Wellness Program includes many adolescent health topics, but climate-related mental health and resilience are not given much importance. The findings of this study may support the inclusion of climate change awareness, emotional coping, and resilience-building activities in school health programs, especially in climate-vulnerable areas.

The study has several expected strengths, including the use of validated tools, inclusion of both urban and rural adolescents, a cluster randomized design, and the use of both qualitative and quantitative methods. However, some limitations are also expected. Because the study uses self-reported responses, there may be a chance of reporting bias. In addition, the study's findings may not be generalizable to all adolescents because it will be conducted only in selected public schools in Khordha district. Even with these limitations, the study is expected to provide important baseline information about climate change–related mental health problems among adolescents in India. It may also provide evidence on the effectiveness of school-based climate resilience interventions. The findings can help future researchers, educators, and policymakers develop strategies to improve adolescent mental health and resilience in the context of climate change.

Conclusions

This study protocol describes the school-based CCRT program aimed at improving climate change awareness, protective behaviors, preventive practices, and climate hope among adolescents in India. The findings may help strengthen adolescent mental health support and guide the integration of climate resilience education into school health programs and policies.

Acknowledgments

The authors thank the institution for support with the Institutional Ethics Committee review and study permissions.

Data Availability

The datasets used or analyzed during this study are available from the corresponding author upon reasonable request.

Funding

Funding was received from the Indian Council of Medical Research, New Delhi, (IIRPSG2025-01-06718) under an extramural small-grant project for the conduct of this study.

Generative AI Use

We used generative AI tool ChatGPT (version GPT-6) [39] during manuscript revision to assist with language editing, organization of the response to editorial comments, and restructuring of the text. The authors reviewed, verified, and approved the revised content and remain responsible for the accuracy and integrity of the manuscript.

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Authors' Contributions

HBJ contributed to conceptualization, methodology, and writing—original draft. AKS contributed to methodology. JJ contributed to methodology and writing—review and editing. APS and SK contributed to supervision and writing—original draft. SM contributed to writing—original draft. SRP contributed to writing—review and editing. All authors reviewed and approved the final manuscript.

Conflicts of Interest

None declared.

Multimedia Appendix 1

Focus group topic and interview guide.
[DOCX File , 17 KB-Multimedia Appendix 1]

Multimedia Appendix 2

Peer review report by the Indian Council of Medical Research.
[PDF File (Adobe PDF File), 499 KB-Multimedia Appendix 2]

Multimedia Appendix 3

SPIRIT 2025 Checklist.
[PDF File (Adobe PDF File), 226 KB-Multimedia Appendix 3]

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Abbreviations

CCRT: Climate Change Resilience Training
CONSORT: Consolidated Standards of Reporting Trials
CVI: content validity index
SPIRIT: Standard Protocol Items: Recommendations for Interventional Trials

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