



Climate Anxiety Among Adolescents in Medan City, Indonesia

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Abstract

Climate change represents a significant global crisis affecting human well-being, with over 59% of youth reporting extreme concern. This study aimed to investigate factors contributing to climate anxiety among adolescents in Medan City, Indonesia, a region vulnerable to climate-related challenges. A cross-sectional study was conducted between February and April 2024, involving 372 adolescents aged 12 to 19 years from Medan City. Data on sociodemographic characteristics, climate change knowledge, attitudes, and anxiety levels were collected using an online questionnaire. Statistical analyses included univariate descriptions and chi-square tests. Significant associations were observed between climate anxiety and gender, education level, sources of information, knowledge, and attitudes. Males exhibited lower odds of experiencing anxiety compared to females (OR = 0.472, $p = 0.001$). Higher education ($p = 0.003$), use of electronic media as an information source (OR = 0.466, $p = 0.029$), strong climate change knowledge (OR = 3.933, $p < 0.001$), and positive attitudes toward climate action (OR = 7.269, $p < 0.001$) were associated with increased anxiety. This study highlights the complex relationship between adolescents' understanding of climate change and their emotional responses, emphasizing the necessity for targeted interventions to address climate anxiety within this demographic.

Introduction

Climate change has emerged as a critical global crisis, demanding urgent attention from all nations. This phenomenon not only disrupts ecosystems and the natural environment but also poses substantial risks to human well-being (Abbass *et al.*, 2022; Weiskopf *et al.*, 2020). Climate change is making extreme weather events like floods, droughts, and storms more common and more intense. These conditions disrupt infrastructure, devastate agricultural land, and threaten food security (Duchenne-Moutien & Neetoo, 2021). Furthermore, the melting of polar ice and glaciers causes rising global sea levels. This endangers coastal regions, increases the likelihood of flooding, and may damage infrastructure

while displacing millions of people (Lu *et al.*, 2018). Moreover, rising global temperatures lead to more frequent and intense heat waves, potentially increasing mortality from heat-related illnesses (Caminade *et al.*, 2019; Ebi *et al.*, 2021; Susilawati, 2021). Increased rainfall associated with climate change can contribute to a higher incidence of dengue fever, as it promotes mosquito proliferation (Cahyati *et al.*, 2024; Tulak *et al.*, 2018).

Rising temperatures, shifting rainfall, and a surge in natural disasters caused by climate change can create psychological stress across all ages, but adolescents are especially vulnerable (Clayton *et al.*, 2017). Adolescents are particularly vulnerable to climate anxiety due to their developmental stage, characterized

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by heightened sensitivity to stressors (Sisk & Gee, 2022). A study conducted in the UK found that 57% of child and adolescent psychiatrists in England have reported observing climate crisis-related distress in their young patients (Royal College of Psychiatrists, 2020). Other research shows that many young people experience significant emotional distress due to climate change, with over 59% reporting extreme worry about climate issues. Common feelings associated with climate anxiety include sadness, anger, powerlessness, and guilt, which can adversely impact adolescents' daily functioning (Hickman *et al.*, 2021).

Climate change-related anxiety in adolescents is a complex issue influenced by various interacting factors. An adolescent's understanding of climate change significantly impacts their anxiety levels. Research has shown that adolescents who view climate change as a serious threat often experience heightened anxiety, particularly if they feel ill-equipped to cope with the crisis (Anderson *et al.*, 2025). Additionally, another study indicates that adolescents with a strong sense of future self-sustainability are more likely to engage in positive environmental actions, which may help reduce their anxiety (Qin *et al.*, 2024). Furthermore, research highlights that sociodemographic variables, including age, gender, and socioeconomic status, significantly influence climate anxiety. For instance, studies suggest that younger individuals and women report higher levels of neighborhood anxiety (Hickman *et al.*, 2021; Proulx *et al.*, 2024). Research also indicates that young people in low- and middle-income countries are particularly vulnerable to severe health impacts from climate change and extreme weather events (Clayton *et al.*, 2017; Pinchoff *et al.*, 2025). Exposure to negative news regarding environmental issues can increase feelings of helplessness and hopelessness (Ballew *et al.*, 2024; Soomro *et al.*, 2024). Many young individuals feel isolated regarding their concerns about climate change, which may intensify feelings of betrayal and abandonment toward adults perceived as failing to act decisively on the crisis (Hickman *et al.*, 2021).

Indonesia is exceptionally vulnerable to the impacts of climate change, particularly to

the increasing risks of flooding and extreme heat. Temperatures in Indonesia are expected to rise between 0.8°C and 1.4°C by the 2050s, while the sea level rise threatens about 4.2 million people by 2070-2100 (World Bank Group & Asian Development Bank, 2021). Flooding can disrupt sanitation systems and lead to disease outbreaks. Heat waves may cause heat exhaustion, and rising temperatures will likely expand the habitat of disease-carrying mosquitoes (United Nations Development Programme Indonesia, 2007). While climate anxiety among adolescents is a global concern, research specifically addressing this issue in Indonesia is limited, particularly in Medan City (Ernyasih *et al.*, 2023; Kaligis *et al.*, 2024). This study aims to address this gap by identifying factors associated with adolescents' anxiety related to climate change in Medan City.

Method

This study, conducted from February to April 2024, utilized a cross-sectional design to analyze adolescents aged 12–19 in Medan City, comprising 576,933 individuals across 21 sub-districts (Medan City Statistics Agency, 2022). The age range adhered to WHO standards (WHO, 2021). Using Lemeshow's formula, the minimum sample size was calculated at 372 participants. Additionally, proportional sampling ensured representation from all sub-districts. This study used a closed-ended questionnaire to gather primary data from teenagers in Medan City, administered through Google Forms. The survey included sociodemographic questions (name, gender, education, and information sources) and individual factors (knowledge and attitudes), as well as anxiety levels regarding climate change. Additionally, secondary data from the 2022 Medan City Central Bureau of Statistics report provided demographic insights about local adolescents, including age groups and gender, which informed the sample size determination.

For this study, gender was coded as follows: males as 0 and females as 1. Education levels were classified with codes: 0 for No School, 1 for Junior High School, 2 for Senior High/Vocational School, and 3 for University. Sources of climate change information were categorized as print media (coded 0) and

electronic media (coded 1). The adolescents' knowledge of climate change was assessed through a 15-question questionnaire, adapted from Salem *et al.* (2022), with a Cronbach's alpha of 0.879. Each question had true or false responses, with correct answers scoring 1 point and incorrect answers scoring 0. Knowledge levels were divided into two categories: 'Good' for scores between 8 and 15, and 'Poor' for scores from 0 to 7.

Adolescents' attitudes towards climate change were assessed using a 15-question questionnaire (adapted from Christensen & Knezek (2015); Cronbach's alpha = 0.780. Responses ranged from strongly disagree (1) to strongly agree (5). Favorable attitudes scored 1 point, while unfavorable attitudes scored 0. Total scores indicated attitudes: scores from 15 to 37 reflected a negative attitude, while scores between 38 and 75 indicated a positive attitude. Adolescents' anxiety levels regarding climate change were measured using a 22-item questionnaire (adapted from Clayton *et al.* (2017); Cronbach's alpha = 0.920). Each question offered five response options, with higher anxiety responses scoring up to 5 points. Total scores ranged from 22 to 110; higher scores indicated greater anxiety. Anxiety levels were categorized as 'Not Anxious' for scores from 22 to 55, and 'Anxious' for scores from 56 to 110. A univariate analysis described each variable's characteristics, while a chi-square test assessed

the impact of sociodemographic and individual factors on adolescent anxiety related to climate change. All statistical tests were performed using SPSS version 26. The research has been approved by the Universitas Prima Indonesia's Health Research Ethics Commission, ensuring compliance with ethical standards (No: 092/KEPK/UNPRI/II/2024).

Results And Discussion

A total of 372 adolescents participated in the study, with a mean age of 17.10 years (SD = 2.097; range = 12–19) (Table 1). The sample was predominantly female (54.8%), while males accounted for 45.2%. Most participants were university students (51.1%), followed by high school (30.1%) and junior high school students (18.3%). Regarding sources of climate change information, 84.4% of adolescents (n = 314) reported using electronic media, while 15.6% (n = 58) relied on print media (Table 1). This heavy dependence on electronic media is noteworthy, as our results indicate that information sources were significantly associated with anxiety levels ($p = 0.029$; Table 5). Adolescents who primarily used print media had lower odds of experiencing climate anxiety than those using electronic media (OR = 0.466). This finding is consistent with previous research showing that excessive electronic media use is linked to greater symptoms of anxiety and depression, particularly among adolescents (Dewi &

TABLE 1. Characteristics of Adolescents (n=372)

Variables	n=372	%
Age (12-19 years) (Mean±SD)		17.10±2.097
Gender		
Male	168	45.2
Female	204	54.8
Education		
None	2	0.5
Junior High School	68	18.3
Senior High School	112	30.1
University	190	51.1
Sources of Information		
Print Media	58	15.6
Electronic Media	314	84.4

Source: Primary Data, 2024

Mahyuni, 2024). The interactive and highly stimulating nature of digital platforms may exacerbate anxiety, whereas print media tends to foster a more focused and less disruptive reading experience (Hoge *et al.*, 2017).

The prevalence of electronic media as the primary source of climate change information among respondents underscores the urgent need to enhance climate literacy among adolescents. In the digital era, social media plays a significant role in shaping young people’s understanding and attitudes toward climate change. A study in Indonesia revealed that Instagram and WhatsApp are the most frequently used platforms for discussing this issue (Zein *et al.*, 2024). However, ensuring the accuracy and reliability of information disseminated through electronic media remains essential. Misinformation continues to pose a major challenge, with political and ideological factors influencing public perceptions of climate science (Magar *et al.*, 2024). Therefore, future climate literacy initiatives should harness electronic media as an effective education tool while emphasizing the importance of information verification and the cultivation of critical thinking skills (Treen *et al.*, 2020; Vosoughi *et al.*, 2018).

Survey results indicate that adolescents

possess a strong understanding of the multifaceted impacts of climate change (see Table 2). A notable 94.1% recognize the link between global warming and human health, while substantial majorities acknowledge its effects on floods (85.2%), water shortages (76.6%), glacier melting (77.4%), extreme heat waves (81.7%), and extreme cold events (79.8%). Respondents also associate climate change with the spread of diseases such as gastroenteritis (71.5%), malnutrition (66.7%), and respiratory illnesses (69.9%). Mental health emerges as a significant concern, with nearly 64% reporting increased anxiety and depression related to climate change. Furthermore, 73.4% recognize the strain placed on health institutions, 65.6% identify climate change as a driver of displacement, 71.8% believe developed countries bear greater responsibility, and 73.9% anticipate that climate change will continue to worsen. A strong understanding of climate change and its effects is closely associated with higher anxiety levels. Data indicate that adolescents with good knowledge of climate change are significantly more likely to experience anxiety compared to those with poor knowledge (OR = 3.933, $p = 0.000$; see Table 5).

TABLE 2. Adolescent Understanding of Climate Change Impacts (n=372)

Questions	True (n (%))	False (n (%))
Global warming affects human health.	350 (94.1)	22 (5.9)
Climate change increases the frequency and severity of floods.	317 (85.2)	55 (14.8)
Climate change intensifies the challenge of water scarcity.	285 (76.6)	87 (23.4)
Climate change significantly increases the rate of glacier melting.	288 (77.4)	84 (22.6)
Climate change significantly raises the risk of extreme heat waves.	304 (81.7)	68 (18.3)
Climate change raises the chances of experiencing extreme cold weather.	297 (79.8)	75 (20.2)
Climate change contributes to the rise in transmission of infectious diseases, including gastroenteritis.	266 (71.5)	106 (28.5)
Climate change raises the incidence of diseases associated with malnutrition.	248 (66.7)	124 (33.3)
Climate change raises the risk of non-communicable diseases, including respiratory issues like asthma and other lung conditions.	260 (69.9)	112 (30.1)
Climate change impacts mental well-being and leads to higher rates of anxiety and depression.	237 (63.7)	135 (36.3)

Climate change can impede health institutions from effectively performing their roles during severe cold spells or extreme heat.	273 (73.4)	99 (26.6)
Climate change has the potential to cause significant population displacement, thereby increasing the number of refugees.	244 (65.6)	128 (34.4)
Developed countries are major contributors to climate change.	267 (71.8)	105 (28.2)
Countries with scarce economic resources are especially susceptible to the detrimental effects of climate change.	254 (68.3)	118 (31.7)
Climate change is expected to intensify in the future.	275 (73.9)	97 (26.1)

Source: Primary Data, 2024

TABLE 3. Adolescents' Attitudes about Climate Change Impacts (n=372)

Questions	Answer (n (%))				
	Strongly disagree		Undecided	Agree	Strongly agree
I believe our climate is changing.	4 (1.1)	21 (5.6)	58 (15.6)	189 (50.8)	100 (26.9)
I am concerned about global climate change.	4 (1.1)	18 (4.8)	43 (11.6)	181 (48.7)	126 (33.9)
I believe there is evidence of climate change occurring globally.	3 (0.8)	11 (3.0)	48 (12.9)	164 (44.1)	146 (39.2)
The environment will be affected by global climate change over the next decade.	1 (0.3)	22 (5.9)	57 (15.3)	170 (45.7)	122 (32.8)
Future generations will face significant effects from global climate change.	3 (0.8)	24 (6.5)	33 (8.9)	149 (40.1)	163 (43.8)
Individual actions can significantly contribute to positive changes in global climate change.	6 (1.6)	24 (6.5)	63 (16.9)	167 (44.9)	112 (30.1)
Human actions contribute to global climate change.	5 (1.3)	18 (4.8)	36 (9.7)	177 (47.6)	136 (36.6)
Climate change adversely impacts our lives.	4 (1.1)	28 (7.5)	36 (9.7)	167 (44.9)	137 (36.8)
Global climate change is beyond our control.	30 (8.1)	122 (32.8)	49 (13.2)	94 (25.3)	77 (20.7)
I can contribute to improving the world for the benefit of future generations.	5 (1.3)	21 (5.6)	59 (15.9)	159 (42.7)	128 (34.4)
Understanding environmental challenges and concerns is significant to me.	4 (1.1)	25 (6.7)	41 (11.0)	166 (44.6)	136 (36.6)
I believe that many of the worries regarding environmental issues have been overstated.	36 (9.7)	135 (36.3)	69 (18.5)	101 (27.2)	31 (8.3)
My actions do not impact the quality of the environment.	60 (16.1)	133 (35.8)	65 (17.5)	84 (22.6)	30 (8.1)

Working to address environmental issues is a futile endeavor.	95 (25.5)	142 (38.2)	44 (11.8)	66 (17.7)	25 (6.7)
I have limited options for contributing to the resolution of environmental issues.	58 (15.6)	133 (35.8)	69 (18.5)	75 (20.5)	37 (9.9)

Source: Primary Data, 2024

The findings reveal a significant relationship between adolescents' knowledge of climate change and their anxiety levels. Increased awareness tends to heighten concern, as evidenced by a cohort study indicating that individuals with greater knowledge of climate change also experience higher levels of emotional distress (Veijonaho *et al.*, 2024). Additionally, a literature review demonstrates that heightened awareness frequently leads to increased worry and anxiety (Treble *et al.*, 2023). Despite the associated distress, this awareness underscores the younger generation's potential as future advocates for climate action. Integrating environmental education into school curricula has been shown to enhance understanding and foster positive attitudes toward environmental stewardship (Nugroho *et al.*, 2022). This strategy is essential for promoting pro-environmental behavior, suggesting that greater awareness can drive more active engagement. For example, in the United States, there is a growing movement to incorporate comprehensive climate change education into school curricula (Plutzer *et al.*, 2024).

A large majority of adolescents believe that the climate is changing (77.7% agreed or strongly agreed) and are concerned about it (82.5% agreed or strongly agreed; see Table 3). Most acknowledge the existence of evidence (83.3%), recognize the potential impacts within the next 10 years (78.5%) and for future generations (83.8%), and attribute climate change to human causes (84.2%). The responses also indicate a strong sense of agency: the majority (75%) feel empowered and believe that individual actions can contribute to solutions. However, despite this belief in individual agency, adolescents are not entirely optimistic. When asked whether "Global climate change is beyond our control," nearly half (46.1%) agreed, strongly agreed, or were

undecided, compared to 45.9% who disagreed (see Table 3). A significant proportion also reported feelings of inefficacy: 51.9% agreed or were undecided that their individual actions have no effect, 63.7% felt it was a waste of time to work on solving environmental problems (or were undecided), and 51.3% believed there is little they can do (or were undecided).

While many adolescents believe individual efforts can drive positive change, many also doubt humanity's collective ability to address climate challenges, reflecting a sense of helplessness. In Indonesia, individuals increasingly recognize their role in climate adaptation but feel constrained by larger systemic forces. Despite government initiatives, public skepticism persists, with many citizens asserting that individual actions are insufficient without strong governmental enforcement (Perdinan *et al.*, 2017). This underscores the importance of collective action, which not only addresses environmental challenges but also enhances psychological well-being by reducing anxiety and fostering empowerment (Schwartz *et al.*, 2023).

Furthermore, this study found that a positive attitude toward climate action is strongly correlated with increased anxiety (OR 7.269, $p=0.000$; see Table 5). This suggests that individuals concerned about environmental issues possess a heightened awareness of the complexities. Research indicates that climate anxiety is particularly pronounced among younger individuals who are deeply engaged (Whitmarsh *et al.*, 2022). While moderate anxiety may foster pro-environmental behavior, excessive anxiety can lead to "ecological paralysis," causing individuals to feel overwhelmed and disengaged (Coates *et al.*, 2024).

This internal conflict is reflected in self-reported behaviors (see Table 4). A substantial proportion (68.6%) reported that

TABLE 4. Adolescents' Anxiety about Climate Change

Questions	Answer (n (%))				
	Never	Rarely	Some times	Often	Almost always
Thinking about climate change makes it difficult for me to concentrate.	56 (15.1)	99 (26.6)	95 (25.5)	105 (28.2)	17 (4.6)
Thinking about climate change makes it difficult for me to sleep.	78 (21.0)	122 (32.8)	82 (22.0)	55 (14.8)	35 (9.4)
I have nightmares about climate change.	116 (31.2)	109 (29.3)	76 (20.4)	41 (11.0)	30 (8.1)
I find myself crying because of climate change.	119 (32.0)	107 (28.8)	70 (18.8)	55 (14.8)	21 (5.6)
I think, "Why can't I handle climate change better?"	73 (19.6)	126 (33.9)	89 (23.9)	56 (15.1)	28 (7.5)
I go away by myself and think about why I feel this way about climate change.	93 (25.0)	125 (33.6)	79 (21.2)	52 (14.0)	23 (6.2)
I write down my thoughts about climate change and analyze them.	90 (24.2)	128 (34.4)	92 (24.7)	42 (11.3)	20 (5.4)
I think, "Why do I react to climate change this way?"	77 (20.7)	127 (34.1)	87 (23.4)	53 (14.2)	28 (7.5)
My concerns about climate change make it hard for me to have fun with my family or friends.	69 (18.5)	126 (33.9)	95 (25.5)	54 (14.5)	28 (7.5)
I have problems balancing my concerns about sustainability with the needs of my family.	81 (21.8)	128 (34.4)	89 (23.9)	54 (14.5)	20 (5.4)
My concerns about climate change interfere with my ability to get work or school assignments done.	86 (23.1)	100 (26.9)	102 (27.4)	63 (16.9)	21 (5.6)
My concerns about climate change undermine my ability to work to my potential.	85 (22.8)	125 (33.6)	79 (21.2)	60 (16.1)	23 (6.2)
My friends say I think about climate change too much.	77 (20.7)	113 (30.4)	90 (24.2)	56 (15.1)	36 (9.7)
I have been directly affected by climate change.	39 (10.5)	97 (26.1)	105 (28.2)	80 (21.5)	51 (13.7)
I know someone who has been directly affected by climate change.	57 (15.3)	107 (28.8)	81 (21.8)	86 (23.1)	41 (11.0)
I have noticed a change in a place that is important to me due to climate change.	42 (11.3)	95 (25.5)	101 (27.2)	84 (22.6)	50 (13.4)
I wish I behaved more sustainably.	36 (9.7)	92 (24.7)	88 (23.7)	100 (26.9)	56 (15.1)
I recycle.	38 (10.2)	81 (21.8)	101 (27.2)	100 (26.9)	52 (14.0)
I turn off the lights.	22 (5.9)	57 (15.3)	60 (16.1)	133 (35.8)	100 (26.9)
I try to reduce my behaviors that contribute to climate change.	25 (6.7)	68 (18.3)	91 (24.5)	128 (34.4)	60 (16.1)
I feel guilty if I waste energy.	33 (8.9)	51 (13.7)	85 (22.8)	115 (30.9)	88 (23.7)

I believe I can do something to help address the problem of climate change.	18 (4.8)	56 (15.1)	96 (25.8)	127 (34.1)	75 (20.2)
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Source: Primary Data, 2024

they “sometimes,” “often,” or “almost always” wish they behaved more sustainably. Many engaged in pro-environmental behaviors such as recycling (68%), turning off lights (78.6%), and attempting to reduce those contributing to climate change (75%). A majority (77.4%) also reported feeling guilty about wasting energy, and 79.1% believe they can contribute to addressing the problem. A significant portion of adolescents report experiencing cognitive and emotional distress (Table 4). Many adolescents indicate difficulty concentrating (58.3%), sleeping (46.2%), or experiencing nightmares (39.5%) “sometimes,” “often,” or “almost always” due to climate change. A notable proportion (39.2%) also reports crying with similar frequency as a result of climate-related worries. Climate-related concerns also have a marked effect on daily functioning. Specifically, 47.6% of respondents report difficulty enjoying time with family or friends, 50% report that such concerns interfere with work or school, and 43.6% feel their worries undermine their sense of potential.

Findings suggest that this pattern among youth in Medan reflects global trends (Poortinga *et al.*, 2023). Climate change affects not only the physical environment but also

mental health. Anxiety derived from climate-related stress can impede social interaction and academic engagement. Experiencing such stress during key developmental periods may substantially increase the risk of long-term mental health difficulties (Wu *et al.*, 2020).

Personal experiences appear to further influence these outcomes. Approximately 43.4% report being directly affected by climate change, 45.9% know someone who has been affected, and 43.2% have observed changes in places important to them (Table 4). These findings indicate that both direct and indirect experiences can intensify anxiety. Prior studies show that indirect exposure, such as knowing someone affected, may heighten anxiety and disrupt daily functioning (Turcotte-Tremblay *et al.*, 2024). Therefore, it is crucial to expand access to mental health services that specifically address climate-related anxiety (Dodds, 2021). This aligns with findings from the United States, where adolescents in communities exposed (directly or indirectly) to climate-related disasters also report elevated levels of climate anxiety (Auchincloss *et al.*, 2024).

The study also identified significant associations between additional demographic factors and climate anxiety (Table 5). Gender

TABLE 5. Factors Associated with Climate Anxiety among Adolescents

Variables	Climate Anxiety				p	OR
	Not Anxious		Anxious			
	n	%	n	%		
Gender						
Male	38	10.2	130	34.9	0.001	0.472 (0.298 – 0.747)
Female	78	21.0	126	33.9		
Education						
None	1	0.3	1	0.3	0.003	
Junior High School	22	5.9	46	12.4		
Senior High School	20	5.4	92	24.7		
University	73	19.6	117	31.5		
Sources of Information						
Print Media	11	3.0	47	12.6	0.029	0.466 (0.232 – 0.935)
Electronic Media	105	28.2	209	56.2		

Knowledge						
Poor	29	7.8	20	5.4	0.000	3.933
Good	87	23.4	236	63.4		(2.115 – 7.315)
Attitude						7.269
Negative	12	3.2	4	1.1	0.000	(2.292 –
Positive	104	28.0	252	67.7		23.059)

Source: Primary Data, 2024

emerged as a key variable, with males exhibiting lower odds of anxiety than females (OR 0.472, $p=0.001$). This finding aligns with previous research indicating that females generally report higher levels of anxiety (Cissé *et al.*, 2023; Heeren *et al.*, 2022). A systematic review further emphasizes that both gender and age are important indicators of vulnerability to climate change anxiety, with females typically experiencing higher levels of concern (Quiroga *et al.*, 2024).

Education level is likewise significantly associated with climate anxiety ($p=0.003$), with higher prevalence observed among senior high school and university students compared to those in junior high school. This suggests that greater educational attainment may correlate with increased anxiety, as individuals with higher education frequently report greater concern regarding climate change. Previous studies have demonstrated that education significantly affects students' emotional responses. Recent research from the United Kingdom indicates that students majoring in environmental science experience higher levels of climate anxiety than their peers (Daeninck *et al.*, 2023). Furthermore, increased awareness, often related to higher education, is linked to moderate levels of ecological anxiety among university students (Maduneme, 2024). Consequently, educational programs should not only impart knowledge but also equip students with effective coping strategies (Ahani, 2022; Herzig-Anderson *et al.*, 2012).

This study underscores critical policy implications for Medan City and Indonesia, calling for integrated strategies that simultaneously address environmental and mental health challenges. It recommends incorporating climate resilience and mental health support within urban planning and educational frameworks (Agus *et al.*, 2025).

Climate literacy programs should utilize electronic media responsibly to expand outreach while minimizing climate-related anxiety. Methodologies for such programs could be informed by successful local health promotion strategies, such as peer group education models that have proven effective for behavior change among adolescents in Medan and Buleleng (Dharmadi & Agustini, 2017; Lufthiani *et al.*, 2023). Moreover, promoting collective action and community participation can enhance resilience at both individual and societal levels, empowering youth to respond effectively to climate challenges. Comparable initiatives in the United States have embedded climate education and mental health support into school curricula, encouraged responsible media engagement, and launched community-based climate action programs (Plutzer *et al.*, 2024; Tserej *et al.*, 2024).

This study also acknowledges potential biases stemming from sample representativeness, as 51.1% of respondents were college students, with fewer participants from the senior and junior high school levels. This limitation may constrain the generalizability of the findings to the broader adolescent population, particularly those in secondary education. Furthermore, the reliance on self-reported questionnaires introduces considerable possible response biases, including social desirability and recall bias. Despite these limitations, the study provides valuable insights, emphasizing the need for future research employing more diverse samples and robust methodological approaches to better assess climate-related attitudes and anxieties among adolescents.

Conclusion

This study highlights the intricate issue of climate anxiety among adolescents, influenced

by various factors including knowledge of climate change, media consumption patterns, gender, and educational background. These findings emphasize an urgent need for mental health support systems specifically designed to address climate change-related anxiety among adolescents. To address these issues, several approaches are recommended. Educational curricula should incorporate emotional resilience training alongside environmental education. This aims to equip students with the skills necessary to manage their concerns about climate change effectively. Enhancing media literacy is crucial for helping adolescents differentiate between credible and non-credible sources of information regarding climate change. This can mitigate anxiety stemming from misinformation. Initiatives that promote youth involvement in environmental advocacy can alleviate feelings of helplessness and foster proactive approaches to addressing climate issues. Further research is essential to comprehend the long-term effects of climate anxiety on adolescent development and to evaluate the effectiveness of interventions aimed at alleviating these adverse impacts. Overall, this research underscores that addressing climate change necessitates not only concrete environmental actions but also a profound understanding of its psychological effects on the younger generation.

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