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FOR ADVANCED STUDIES PAVIA**

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MSc in Psychology, Neuroscience and Human Sciences**



**UNIVERSITÀ
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**THE IMPACT OF CLIMATE CHANGE ON
MENTAL HEALTH**

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Academic year 2023/2024

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Abstract

Climate Change has been a topic of concern over the last few decades. It is perhaps the most pressing global issue of the 21st century. Climate change impacts individuals and communities in direct and indirect ways. Climate change awareness is an important thing at this point in time, however it is not universal. Those who suffer from climate hazards suffer from stress that impacts their mental health. However, these climate hazards, although universal, do not impact all populations in the same way. In this review, a total of nine articles were analysed to understand how climate change impacts mental health; what are the mental health outcomes associated with climate change; and how does the impact vary between different regions and populations. The emerging themes from this review were as follows. Mental health outcomes such as depression, anxiety, and PTS appear to have a positive correlation with the experience of climate change-related events. Higher levels of mental health concerns are seen more in women compared to men. Even without the direct experience of a climate change-related event, individuals feel distressed and anxious about the future on this planet. Eco-anxiety or climate change anxiety was also found to be positively correlated with higher levels of depressive symptomatology. Reported climate change anxiety predicted feelings of anxiety, powerlessness, and hopelessness. Lastly, individuals who expressed feelings of climate change anxiety also participated in pro-environmental behaviour to mitigate their climate change anxiety.

Introduction

Climate change

Climate change is understood as changes in temperatures and weather patterns over a long period of time. These changes can be natural, such as due to the sun's activity. However, since the dawn of the industrial revolution, human activities are the main force that has driven climate change. These activities include the burning of fossil fuels by the use of coal, oil, and natural gas. Greenhouse gases are emitted during the burning of fossil fuels. These phenomena induce a layer of gas to be trapped around the earth, it traps the heat of the sun, and thus through this process, raises temperatures.

The existence of climate change has been known for a long time. Known initially as global warming, a term believed to be coined by Columbia University geochemist Wallace Broecker in 1975. For some time, it was believed that the change was just an increase in temperatures. However, over time it has been found that the change encompasses a variety of erratic and unpredictable weather patterns leading to increasing temperatures, but also natural disasters and calamities. Thus, the more appropriate term of "climate change" is in use today.

The awareness of climate change was low during the initial period when the issue was starting to be known. In the early 1980's the issue of climate change was only starting to be acknowledged in industrialised countries. Over the next few decades, people's opinion and concern about climate change started to grow. This was due to the availability of more scientific evidence and mass media coverage (Nisbet and Myers, 2007).

At this point in time, there is great awareness about climate change. This awareness has also transformed into environmental concern. It is correlated to higher income, higher education, and distress experienced as a result of high temperatures. Younger people in particular have a higher tendency to show environmental concern, as do people who suffer loss as a result of extreme weather events. (Baiardi and Morana, 2021)

Information about climate change is also taught to students in schools and universities as parts of various courses. This might also explain why younger people are particularly aware of climate change. As climate change is a relatively new phenomenon, it has not been incorporated within education curricula around the world. A 2021 UNESCO report with data from a hundred countries stated that only 53% of the world's national education curricula talk about climate change. It is a subject matter that is mentioned, but not given much priority.

Climate change denial is a form of science denial. It is characterised by disputing, rejecting, and refusing to acknowledge the scientific consensus on climate change. Throughout the emergence of the knowledge about climate change, it took time and effort from both the scientific community, and the media guided by industrial concerns, to convince the general public. Deniers of the scientific consensus avoided scientific discourse (Weart, 2011). This, along with people's political alignments, further nudges some deniers into the territory of conspiracy. In general, climate change is an indisputable phenomenon, supported by scientists and governments around the world. However, there does exist misinformation and denial among people.

Mental health

According to the APA, mental health is “a state of mind characterised by emotional well-being, good behavioural adjustment, relative freedom from anxiety and disabling symptoms, and a capacity to establish constructive relationships and cope with the ordinary demands and stresses of life.” It is a state of well-being where individuals can deal with the stresses of everyday life, work in a productive way, and are able to contribute to their community. Mental health is being recognised as vulnerable under the impact of the changing climate. Climate change creates stressors, and exacerbates them, thus affecting mental health and well-being (Clayton et al., 2017). The impacts of climate change manifests psychologically in ways that are both direct and indirect. Thus, it affects individuals as well as communities.

Direct and Indirect Impact

The ways in which the impacts of climate change can be direct are through the psychological effects of experiencing an extreme weather event or a natural disaster, such as hurricanes, typhoons, heatwaves, wildfires, and tropical storms. Such weather events or natural disasters can cause stress that can manifest into post-traumatic stress disorder, and other anxiety disorders. In a study conducted after Hurricane Katrina in the United States, they found that a third of the survivors experienced PTSD, while many others also suffered from other mental health issues such as depression. (Galea et al., 2007)

The ways that the impacts can be indirect are through stress, threat to livelihoods, migration, loss of resources, water and food insecurity, the threat of displacement, and the loss of social community. These factors can lead to

feelings of hopelessness, psychological distress, anxiety, and feelings of instability and uncertainty. Individuals and communities who rely on agriculture for their livelihood are particularly vulnerable to these impacts. Prolonged droughts and heatwaves that cause financial loss and hardship can lead to increased rates of depression and suicide (Hayes et al., 2019). Coastal communities face the risk of loss of their livelihood and their homes, and become displaced. Due to rising sea levels and severe weather events, the forced displacement of these communities disrupts their social networks which can lead to social isolation that renders them vulnerable to mental health disorders (Watts et al., 2015).

Vulnerability

People all over the world are vulnerable to the impact of climate change. Although not everyone faces the same dangers and threats. Some are impacted in just the matters of the weather; at times it gets hotter than usual, at times colder than usual. They are, for now, simply affected by erratic weather. However, others are impacted in more serious ways. For the more vulnerable, survivability might be a question as they battle with water insecurity, food insecurity, safety, and the threat of displacement. Poorer tropical countries are more at risk than industrialised western nations. The irony lies in the fact that the poorer countries contribute comparatively less to greenhouse gas emissions.

For developing countries access to climate information can be a barrier that can hinder them from being better prepared to respond to climate challenges. In 2017, Georgeson et al., conducted an analysis of weather and climate information services (WCIS) and economic development. According to the

findings, per capita spending on WCIS in countries with a very high Human Development Index (HDI) score was at \$21.36, it was \$6.59 per capita for high HDI countries, and for countries that were classified as low-income countries with low HDI, the expenditure was less than \$1 per capita. Such low expenditure on climate information services in poorer countries can hinder the access to climate information. Comparatively, richer and the richest countries spend relatively higher to provide weather and climate information.

Who are the populations most vulnerable to climate change's mental health impact? According to the National Institute of Environmental Health Sciences, the impact on a people group is determined by a combination of three factors: exposure, sensitivity, and adaptive capacity. These factors of vulnerability, originally defined by Turner et al., (2003), determine how vulnerable an individual is or a group of people are to the impact of climate change. Exposure is defined as the contact between a person and a stressor. This stressor may be physical, biological, or psychological, such as the stress induced when affected by climate events. Sensitivity is the extent to which individuals or groups of people are affected by climate change. Lastly, their adaptive capacity is their ability to cope with possible climate hazards, and their responsiveness to the consequences of such hazards.

According to Schulte and Chun (2009), individuals who have occupations that require them to work outdoors such as jobs in construction, utility repair, disaster relief, are exposed to a greater risk of climate hazards as they may be subjected to extreme weather. Other groups of people who are at greater risk of the impact of climate change are women, children, and the elderly (Balbus and Malina, 2009; Gamble et al., 2013). Individuals with cognitive and functional

impairments are also at greater risk. As are individuals with preexisting physiological conditions such as cardiovascular disease, diabetes, and asthma.

Another group of people who are extremely vulnerable are the ones living in poverty (Fothergill and Peek, 2004). They found that the poor are less likely to take hazard risks seriously, and thus less likely to be prepared for them. This may also be because they do not have the resources to alternatives. They are also limited in resource loss mitigation practices such as having insurance. People living under poverty may also be less likely to respond to warnings and thus are at greater risk of injury and death. During the period of post-disaster, they also face challenges in terms of response and recovery, and thus find it harder to process their trauma.

Climate change anxiety and eco-anxiety

The American Psychology Association (APA) describes eco-anxiety as “the chronic fear of environmental cataclysm that comes from observing the seemingly irrevocable impact of climate change and the associated concern for one's future and that of next generations”.

Due to eco-anxiety, people feel anxious about their future. They also feel anxious about the future of the planet. This might motivate them to act, to participate in protests, and to participate in policy and decision-making processes. However, it might also render them anxious and feeling overwhelmed (Usher et al., 2019).

Climate anxiety is experienced by a lot of young people. According to a survey (Hickman et al., 2021) of 10,000 young people between the ages of 16 and 35 they found that 59% of the respondents were very worried or extremely

worried about climate change. 84% said that they were at least moderately worried. The emotions they described were feelings of sadness, anxiety, anger, guilt, helplessness, and powerlessness. They also felt that the future is frightening. The respondents were from diverse geographical locations. A thousand participants each from India, the US, the UK, France, Portugal, Australia, Finland, Nigeria, the Philippines, and Brazil. The broad group of respondents do represent a growing worry surrounding climate change all around the world, especially in the younger generation. The young participants in the same survey also state that they do not have a lot of faith in their respective government(s) to tackle climate change, thus giving a lot of younger people a very bleak impression into the future of the planet that they are going to inherit.

According to data from 32 countries and thousands of participants (N = 12,246), it was found that high levels of climate anxiety correlated with poor mental wellbeing, in all but one of the countries. Furthermore, in 24 of those countries, there was a significant association found between climate anxiety and pro-environmental behaviour. It was found that climate anxiety is related to the content of the information rather than the amount of information being received. It also correlated with information about climate change impact rather than climate change solutions. Pro-environmental behaviour seems to be associated with feelings of climate change anxiety (Ogunbode et al., 2022).

Mental health issues

Climate change impacts can be in three ways (Palinkas & Wong, 2020). They state that the first way is through direct impact in the form of natural disasters, such as floods, storms, and wildfires. The second form of impact can

be in the form of sub-acute effects such as droughts, and heat stress. The third form can be in the way that climate change poses a threat to the future with its long-lasting effects. These lead to impact in various forms of hazard, stress, and long-term effects of displacement and loss.

Mental health issues associated with climate change include anxiety and PTSD, sleep disorders, increased addiction, depression, and suicidal ideation. (Schwartz et al., 2017). The factors that put individuals at risk of developing mental health issues are diverse. Some include: age, gender, low socioeconomic status, lower education, loss or injury of a loved one, minority status, unstable family environment, and lack of social support. There are also negative emotions caused by awareness and knowledge of climate change. These emotions may be seen in individuals who may not be directly affected by climate change and its effects. Such emotions are guilt, pain, anxiety, and demoralisation (Burke et al., 2018)

Individuals who already suffer from psychological and mental health issues, such as psychosis, are at greater risk to mental health impacts during the aftermath of a natural disaster. Such individuals require post-trauma care. It can be very challenging in a post-disaster context, where health infrastructure and services providing mental healthcare may have been damaged or disrupted by the disaster (Gifford and Gifford, 2016).

The review

The study of the mental impact of climate change is a relatively newer area of research, and thus there are not many papers published about this topic. As the climate crisis continues to grow in the future, there will be a need for more to be studied and understood about how it impacts our lives in more ways than just one.

The purpose of this scoping review is to understand what is already known about the impact of climate change on mental health and to see if there are any emerging patterns. Furthermore, it is to understand how it affects different populations and in what ways.

Therefore, the research questions are:

- What are the ways in which climate change impacts mental health?
- What are the mental health outcomes related to the direct and indirect impact of climate change?
- What are the ways in which the impact might be similar and how does it differ across different regions and populations?

Methods and materials

Selection Criteria

A scoping review was conducted on research articles sourced from the electronic databases of PubMed and Scopus, with the aim of analysing the findings of the impact of climate change on mental health. The research articles referenced in this review were in English. The selection criteria included

quantitative studies on the impact of climate change on mental health. The articles that were excluded were: articles that focused on physical health and physiological illness; other reviews and meta-analyses; papers testing psychometric properties; papers dealing with induced extreme weather conditions (for example, industrial working conditions in tropical countries); papers exclusively studying eco-anxiety; and papers studying the mental health of victims in the aftermath of a singular natural disaster.

Selection of Articles

The search was conducted with the use of the following strings:

On PubMed:

(climate change[Title/Abstract]) AND (mental health[Title/Abstract])

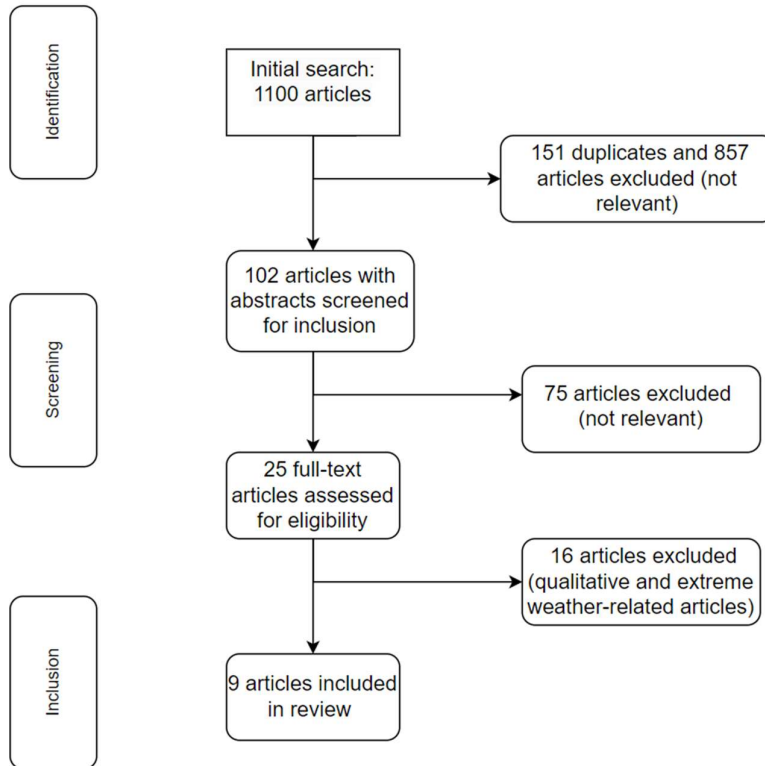
On Scopus:

(TITLE-ABS-KEY (climate AND change OR global AND warming OR environmental AND change OR climatic AND change) AND TITLE-ABS-KEY (mental AND health OR psychological AND well-being OR mental AND illness OR anxiety OR depression OR stress OR emotional AND health OR psychosocial AND impact)).

The searches yielded a total of 1100 results, 763 on PubMed and 337 on Scopus. A comprehensive screening was conducted with the help of the online tool Rayyan. After multiple screening processes including abstract screening and full-text screening, a total of 9 papers were selected for this review. The process of identification, screening and inclusion is summarised in Table 1.

Table 1

Articles identification, screening, and inclusion



Results:

Among the nine articles selected for the review, seven focus on subjects that have had a direct experience of one or multiple climate change-related event(s) (Patrick et al., 2022; Prencipe et al., 2023; Reyes et al., 2021; Ndetei et al., 2024; Pinchoff et al., 2023; Kabir et al., 2024; Pollack et al., 2016). The remaining articles focus on climate change awareness (Schwaab et al., 2022) and climate change awareness related symptoms as ‘Psychoterratic Syndromes through Climate change Awareness’ (PSYCA) (Gebhardt et al., 2023). Table 2 provides the details.

Table 2

Scoping Review of the 9 articles to study the impact of climate change on mental health

Study	Location	Sample Size and Population	Climate Change Variable(s)	Mental Health Outcome(s)	Measurement Tools	Key Findings
Patrick et al., (2022)	Australia	5483 adults (mean age 52,71)	Direct experience of a climate change- related event	Eco-anxiety PTSD Pre-traumatic stress	Eco-anxiety questionnaire (Clayton and Karazsia,2020) PTSD: The PTSD-8 (question 11A)	9.37% respondents indicating significant eco-anxiety, 15.58% with pre-traumatic stress, and 25.60% with PTSD - 1 in 4 with direct experience of a climate change-related experience met screening criteria for PTSD
Principe et al., (2023)	Tanzania	2053 Tanzanian youth (aged 18-23), 55% male and 45% female	- Two categories of climate-sensitive risk factors: livelihood activities and living conditions	- Climate distress - Depression Symptomatology	For Depressive Symptomatology: Centre for Epidemiological Studies Depression Scale (CES-D10) For climate change awareness: Gallup World Poll	Higher education, religious attendance, and being female, associated with greater climate change awareness and distress Reported feelings of distress over climate change are correlated with higher depression prevalence.
Gebhardt et al., (2023)	Heidelberg, Germany	89 patients of a psychosomatic outpatient clinic	Psychoterratic Syndromes through Climate change Awareness (PSYCA)	-Depression Anxiety PTSD	To assess climate change awareness: the European Social Survey Depression (PHQ-9) Anxiety (GAD-7), Traumatic stress (PTSS10)	-99% of the sample stated that the climate is changing (88% or probably changing (11%) Mental health impairments due to PSYCA may contribute to patients' symptomatology Cognitive biases may perpetuate the symptoms

Study	Location	Sample Size and Population	Climate Change Variable(s)	Mental Health Outcome(s)	Measurement Tools	Key Findings
Reyes et al., (2021)	Philippines	433 Gen Z Filipino (145 male and 288 female), ages 18 to 26	-Climate Change Anxiety - Experience of climate-change-related events	- Psychological well-being -Psychological Distress	- Climate Change Anxiety Scale - Mental Health Inventory (MHI-38)	- Significant relationship between climate change anxiety and mental health, climate change anxiety predicting 13.5% of the overall Mental Health Index variance - Majority (69.9%) worries about climate change - Females more worried and afraid about CC compared to males - - Suicidal thoughts were associated with all five concerns about CC
Ndetei et al., (2024)	Kenya	2,652 high school students (Mean age of 16.13)	- Climate change experiences	- Suicidality - Pro-social behaviour and psychopathology	- The Strengths and Difficulties Questionnaire (SDQ)	- 88% of participants perceive CC as real (60% think about it often or very often) - Depression, anxiety, and general perceived stress high, not traumatic stress - High awareness of CC could lead to adaptive reactions
Schwaab et al., (2022)	Germany	203 medical students	- Climate Change Awareness	- Depression - Anxiety - Post-traumatic stress - Perceived stress	- For climate change awareness: The eighth European Social Survey (ESS) (2016) - Depression: PHQ-9 -Anxiety: GAD-7 - Traumatic stress: (PTSS-10) - Perceived stress (PSQ-20)	

Study	Location	Sample Size and Population	Climate Change Variable(s)	Mental Health Outcome(s)	Measurement Tools	Key Findings
Pinchoff et al., (2023)	Mexico	168,407 youth (ages 15-24 years)	<ul style="list-style-type: none"> - Exposure to climate hazards - Perceptions of climate change 	<ul style="list-style-type: none"> - Reported depressive symptoms and anxiety - Common Mental Health Disorder (CMD) 	<ul style="list-style-type: none"> - Depressive symptoms: Patient Health Questionnaire (PHQ-9) - Symptoms of anxiety: Generalised Anxiety Disorder (GAD) questionnaire 	<ul style="list-style-type: none"> - Over a third classified as having a CMD, higher in those who had experienced a recent climate event - CC harms more likely to affect the poor, women, trans youth, and youth are working while studying
Kabir et al., (2024)	Bangladesh	Participants (n = 1,200)	<ul style="list-style-type: none"> - Impact of sea-level rise induced by climate change 	<ul style="list-style-type: none"> - Psychological distress - Depression - Anxiety - Stress 	<ul style="list-style-type: none"> - The Kessler Psychological Distress Scale (K10) - Depression Anxiety Stress Scale (DASS-21) - Environmental Stressor Scale (ESS) - Resource Loss Scale (RLS) 	<ul style="list-style-type: none"> - The results indicated significantly higher levels of psychological distress, depression, anxiety, and stress in residents of high-vulnerability - Resource loss served as a mediating variable between environmental stressors and mental health outcomes
Pollack et al., (2016)	Vietnam	1000 adults, ages 18 to 85 (M=42 years)	<ul style="list-style-type: none"> - Exposure to major storms and other traumatic events 	<ul style="list-style-type: none"> - Trauma - Stress (Post-traumatic, and Financial) - Depression - Anxiety - Alcohol dependence - Functional Impairment 	<ul style="list-style-type: none"> - Patient Health Questionnaire (PHQ-9) - Generalised Anxiety Disorder-7 (GAD-7) - Post traumatic Diagnostic Scale (PDS) - Somatization Scale from the Symptom Checklist-90-R 	<ul style="list-style-type: none"> - 22.7% met caseness criteria in one or more mental health domains, 22.1% reported moderate to severe functional impairment - Elevated rates of PTSD, somatic syndrome, and functional impairment but not depression or anxiety

Subjects studied

The studies have a varied sample size, from 89 (Gebhardt et al., 2023) to 168,407 (Pinchoff et al., 2023). Apart from two studies (Ndeti et al., 2024; Pinchoff et al., 2023) which also involved high-school students, the other seven studies have all adult participants. Out of the nine, there are two studies that focus on niche populations: one study had participants who were all medical students (Schwaab et al., 2022); and the other focused on patients of a psychosomatic outpatient clinic (Gebhardt et al., 2023). Coincidentally, these are also the two studies that focus on climate change awareness and climate change awareness related symptoms (PSYCA), and do not include the direct experience of a climate change-related event as one of the variables. Table 2 provides the details.

Most studies had a larger female population in their sample. Table 3 provides the details.

Table 3*Gender distribution in the 9 articles*

Study	Sample size	Gender (%)
Patrick et al., 2022	5,483	40% male, 58.1% female, and 1.9% diverse
Prencipe et al., 2023	2,053	55% male and 45% female
Gebhardt et al., 2023	89	31% male, 68% female, and 1% diverse
Reyes et al., 2021	433	33.4% male and 66.5% female
Ndetei et al., 2024	2,652	66.6% male, 33.2% female and 0.2% diverse
Schwaab et al., 2022	203	42% male and 58% female
Pinchoff et al., 2023	168,407	48% male, 51% female, and 1% diverse
Kabir et al., 2024	1200	N/A
Pollack et al., 2016	1000	44% male and 56% female

Psychological / Mental Health Factors

The most common mental health variables studied were depression (Prencipe et al., 2023; Gebhardt et al., 2023; Schwaab et al., 2022; Pinchoff et al., 2023; Kabir et al., 2024; Pollack et al., 2016) and anxiety (Gebhardt et al., 2023; Schwaab et al., 2022; Pinchoff et al., 2023; Kabir et al., 2024; Pollack et al., 2016).

The next variable present was stress: stress (Kabir et al., 2024; Pollack et al., 2016) psychological distress (Reyes et al., 2021; Kabir et al., 2024), perceived stress (Schwaab et al., 2022), post-traumatic stress (Patrick et al., 2022; Gebhardt et al., 2023; Schwaab et al., 2022; Pollack et al., 2016). Uniquely, one paper also studied pre-traumatic stress (Patrick et al., 2022).

Other variables studied were pro-social behaviour and psychopathology (Ndeti et al., 2024), alcohol dependence, and functional impairment (Pollack et al., 2016). The mental health variables that pertained directly to climate change were eco-anxiety (Patrick et al., 2022) and climate distress (Prencipe et al., 2023).

Study characteristics

All studies were conducted with the use of quantitative questionnaires. Many share the same assessments, for example the GAD-7 for anxiety. One study (Prencipe et al., 2023), used interviews to gauge the climate distress of their school-aged participants with the aid of the Gallup World Poll. The students had difficulty in understanding and expressing the idea of climate change with technical terms in both English and Swahili (44%). However, in the interview, with simpler terms, they could express their experience of changing weather and its effect on their lives. Other parts of the study were conducted with standardised quantitative questionnaires. Table 2 provides the details.

Emerging themes

Climate change awareness

Most participants in all the studies were aware of the reality of climate change. In one study (Gebhardt et al., 2023), 99% of participants said that the climate is changing (88%), or probably changing (11%). In another study (Schwaab et al., 2022), 60% of participants stated that they think about it often or very often, and the same number of participants stated that they are extremely worried or very worried about it. They also stated that they worry about climate change more than they did five years ago, and 33% of them were more worried than the year before. In the same study, participants also thought that it was not likely that climate change mitigation measures would meet the support required from countries around the world. Although some individuals may not have the full vocabulary to express their concern (Prencipe et al., 2023), they are able to express their opinions about the changing climate when spoken to with simpler terms, and approached with simpler questions outside of technical jargon. A majority of the participants (56%) were aware of climate change, within which 29% of participants were stated to have a great deal of awareness.

Experience of climate change-related event(s)

From the nine articles within this review, a majority of them have included the experience of climate change-related events as one of their variables. Most participants within those studies said to have experienced a climate change-related event. The study from Australia (Patrick et al., 2022), was conducted less than a year after the catastrophic bushfires of the summer of 2019-2020, an event like many others in recent years. A majority of participants in the study (54.63%),

reported that they have had a direct experience of a climate change-related event (e.g. directly affected by bushfire, flood, extreme heatwave).

In the study from the Philippines (Reyes et al., 2021), all but 16 of the 433 participants had experienced at least one of the following: typhoon/tropical storm, flood, tsunami, landslide, drought, heat-wave, volcanic eruptions, or wildfire. In the study from Mexico (Pinchoff et al., 2023) with a large sample size (n=168,407), 8.1% of respondents experienced a climate related hazard in the last 12 months, mainly floods followed by hurricanes, heatwaves, and drought. In Bangladesh (Kabir et al., 2024), the study sample were members of communities who are directly vulnerable to sea-level rising. Such experiences and threats of displacement are uniformly common around the world.

Climate distress and eco-anxiety

Eco-anxiety is a useful way of conceptualising the impact of fear, anxiety and worry about future environmental changes relating to climate change (Patrick et al., 2022). In their study they found that 9.37% of participants screened positive for eco-anxiety. The percentages were slightly higher if looked at the individual subscales with the cognitive subscale at 10.24% and the functional subscale at 12.85%. Eco-anxiety is seen more in younger populations, with the highest among 18- to 24-year-olds. Climate change distress is also seen more in people with higher education. It is also higher among females compared to males (Prencipe et al., 2023). Similar findings with regards to age, education level, and gender can be found consistently in all the articles.

Mental Health Outcomes

The most common mental health outcomes studied were depression, anxiety, and stress. Stress was studied in the form of psychological stress, perceived stress, post-traumatic stress, and pre-traumatic stress. The other mental health outcomes were as follows: pro-social behaviour and psychopathology, alcohol dependence and functional impairment, eco-anxiety, and climate distress.

Depression

Depression, depressive symptomatology, and suicidality, were outcomes studied in seven out of the nine articles. Climate change can often cause vulnerable people and communities to feel saddened by their circumstances. Living in areas that are prone to climate hazards and are under the threat of possible climate change events can be an unsettling and unstable situation, both in terms of physical safety as well as mental health. According to Kabir et al., (2024), communities living in regions under threat of sea-level rising, have higher levels of depression. Community vulnerability predicts depression, and other associated mental health outcomes such as psychological distress, anxiety, and stress. The levels of distress were positively correlated to vulnerability to sea-level rise. Gender was another predictor of depression, being observed more in women compared to men.

In the study with the sample consisting of patients of a psychosomatic outpatient clinic (Gebhardt et al., 2023), 67% of patients were suffering from depression. Of these, 9 patients (11%) screened positive for symptom load regarding climate change awareness. According to Prencipe et al., (2023) 30%

of their participants had depression symptomatology. From the participants who reported extreme climate change distress had a prevalence of 40%. Compared to participants that reported no climate change distress, extremely distressed participants had a 16-percentage point greater prevalence of depression. It is to be noted that this study was conducted with a young population (aged 18 to 23). The finding is consistent with other studies where younger participants are more prone to distress over climate change, and individuals with higher rates of climate distress generally have a higher tendency to screen positive for depression and depressive symptomatology. Many participants have had experiences with a climate change-related event. However, climate distress or worry about climate change on its own can be a factor that influences or exacerbates pre-existing depressive conditions.

Ndetei et al., (2024) also found that suicidal thoughts were associated with concerns about climate change. They also found that suicide plans were associated with concerns about climate change. Furthermore, they state that extreme worry about climate change predicted suicide plans. Three concerns of climate change – worry, anxiety, and powerlessness predicted suicide attempt.

In one of the studies, depression was not positively correlated with the experience of climate change-related events. Pollack et al., (2016) state in their study that their screening for depression resulted in levels below that of non-high-risk populations in other countries. Their study was conducted in Vietnam, and they found that their participants' prevalence of depression (2% for moderate to severe depression) was less than those of non-high-risk in a study from Germany (Lowe et al., 2008) that had found prevalence rates of 5.6% for moderate–severe depression. However, it is also worth noting that this sample reported high rates

of somatic syndrome with 16% of participants meeting the criteria for moderate-to-severe somatic syndrome. Furthermore, the same population also reported high levels of alcohol use, especially in men.

Anxiety

Four studies in this review had studied anxiety as a mental health outcome. Of these, Schwaab et al., (2022) found that in their sample, 50% of participants showed symptoms of general anxiety. These participants also demonstrated a high (58%) level of worry about climate change, in comparison to the general population (Kindermann et al., 2017) of their country, Germany, at 46%. Similarly, according to Kabir et al., (2024), high levels of anxiety correlated with vulnerability to sea-level rise in communities in Bangladesh. The medium and high vulnerability (to sea-level rise) populations reported higher levels of anxiety as compared to the low vulnerability population. The same study also highlighted that anxiety, along with other mental health outcomes, has a higher tendency to be seen in women compared to men. It can be inferred that both climate change anxiety and experience or threat of a climate hazard are correlated with levels of general anxiety.

In the clinical population (Gebhardt et al., 2023) with the prevalence of anxiety disorder at 23%, 20% of all participants reported mild anxious symptoms due to PSYCA (psychoterratic symptoms through climate change awareness). The authors note that persons with a pre-existing mental health condition could possibly perceive burdening topics as a greater mental health burden than persons without such a diagnosis. They do state that general anxiety was a significant predictor of climate change anxiety, and that a generally anxious state

makes it likelier for individuals to be impaired by anxieties surrounding climate change.

Stress and Trauma

According to Patrick et al., (2022), most of their participants (54.63%) reported to have experienced a climate change-related event. These participants were screened for PTSD. 25.60% of these respondents screened positive for PTSD. The other group of participants who had not experienced a climate change-related event were screened for pre-traumatic stress with the same questionnaire set to the future tense. Of this group, 15.68% of participants screen positive for pre-traumatic stress. The higher proportion of those screening positive for PTS (post-traumatic and pre-traumatic) are those who experienced a climate change event. Even without the experience, anticipation of climate change events itself can induce stress. In a population exposed to climate change-related events (Pollack et al., 2016), prevalence rates of PTSD were found to be high at 10%. Comparatively, other studies found PTSD prevalence rates at being between 0.7% and 2% (Lukaschek et al., 2013; Kawakami et al., 2014; Dorrington et al., 2014).

Stress can also be measured in groups who are living in environmentally vulnerable coastal communities. Their experience of stress is correlated to the vulnerability of their communities due to rising sea-levels. The populations living in moderate to highly vulnerable areas report higher levels of stress, along with other mental health outcomes as compared to populations living in low vulnerable areas. In the same study it is also found that women in these communities were

more impacted in terms of psychological distress via environmental stressors. (Kabir et al., 2024).

In the clinical population (Gebhardt et al., 2023), participants did not report traumatic symptoms due to climate change related factors. Their worries about climate change did not translate directly into clinical burden on their mental health. However, the authors have stated that there appears to be a linear relationship between the two variables. Similarly, Schwaab et al., (2022) state that their participants experience significant stress and have an increased risk of mental health problems in relation to climate change. They do however state that the reported stress may not translate into psychopathological symptoms. They highlighted that stress related to climate change correlated negatively with resilience factors (attachment style, structural abilities, and sense of coherence) that help prevent the development of mental disorders. One of the ways that stress may manifest is in the form of positive coping mechanisms, such as pro-environmental behaviour.

Other mental health outcome(s)

Climate change can also impact mental health in other domains. Pollack et al., (2016) found that communities affected by climate change-related events can present with higher levels of alcoholism. Rates of alcoholism are higher for men than women. Pollack et al., (2016) also found that in their sample, 22% of participants reported moderate-to-severe functional impairment, 38% reported less than good (fair or poor) self-perceived physical health, and 23% reporting one or more significant mental health problem from their screening of stress, PTSD, depression, and anxiety, from which PTSD had the highest number of

reports. Trauma and other related mental health outcomes are also found in other reports (Patrick et al., 2022) where most participants reported having experienced a climate change-related event.

Resource loss

Resource loss is a phenomenon that was presented in one of the articles (Kabir et al., 2024). Resource loss is based on the Conservation of Resources (COR) theory. The theory posits that loss of valuable resources leads to psychological distress (Hobfoll, 1989). These resources range from a wide variety of tangible resources, such as property, land, livestock, and livelihoods, to intangible resources, such as social networks and community. They (Kabir et al., 2024) state that resource loss can be a mediating factor between stressors related to the environment and climate change and the mental health outcomes of members of the communities experiencing climate change-related events.

Features of resource loss can be seen within populations in other studies as well (Pollack et al., 2016; Prencipe et al., 2023), although they do not explicitly talk about it, or name it as such. They (Kabir et al., 2024) state resource loss acts as a mediating variable between environmental stressors and mental health outcomes.

What can be seen from these studies are that they talk about the deterioration of individuals' and communities' mental health as a consequence of poverty, rural living, and other such factors. Whereas, if one zooms out, it becomes clearer that this deterioration is an indirect consequence of climate change. The rural, the farming, and the under-educated might attribute their worries as solely limited to whether or not their crops will grow, or whether they

will have enough rain, or enough to feed their animals, and even feed themselves. Fears of possible relocation, migration, and loss of tangible resources, as well as loss of community and their social networks, are all present in populations vulnerable to climate change. These populations, in middle-to-low-income countries, who are the most vulnerable may not have the education and understanding compared to the educated from high-income countries. As compared to the highly educated, they may not be able to articulate their concerns about climate change in the same way. However, throughout some of these articles, they have expressed concern about the changing climate, although they may not necessarily attribute their mental health burden on that change itself. It is the consequences of these changes (resource loss) that become the cause for their mental health burden.

Pro-environmental behaviour

Pro-environmental behaviour is seen in people who are aware of climate change and wish to act in ways that can help mitigate it. It can be understood as behaviours that stem as an adaptive reaction to high awareness about climate change (Schwaab et al., 2022; Wullenkord et al., 2021; Verplanken et al., 2020). Schwaab et al., (2022) state that in their findings, they found that the stated worries by the participants about climate change did not result in a clinical impairment on a psychometric level. That is not to say that these worries do not cause any burden on their mental health, but rather that the individuals may mitigate these burdens by participating in pro-environmental behaviours.

Discussion

There is awareness about climate change amongst the majority of people. Most individuals believe that the climate is changing. The phenomenon that was once described as global warming, is now known as climate change because there has been a realisation that the effect is not simply a rise in temperature, it also encompasses patterns of erratic weather. This has led to numerous events that are a direct result of climate change such as floods, landslides, typhoons, heatwaves, and droughts. These events lead to loss of lives and resources that negatively impacts the health of the victims.

The awareness about climate change is growing with time. Individuals feel that they know more about climate change than they did in the past. It is a pressing issue and that has been at the forefront of global challenges faced by the people of today. Students are taught about climate change in schools and universities. In certain parts of the world, in Kenya for example, students who attended church were more aware about climate change than their counterparts who did not (Prencipe et al., 2023). In that cultural context, religious places act as a place for disseminating knowledge and awareness about health practices, e.g., Covid-19. They serve as entry points for interventions that encourage climate change knowledge whilst also supporting young people's psychological well-being. An equivalent third place (outside of schools and home) cannot be seen in a western context.

A few generations past, climate change as a phenomenon had not yet been an issue, and thus was not a part of educational curricula. Individuals who are now of old age are not the most aware when it comes to the extent of climate

change. They do however share concerns about the changing weather. The elderly are also one of the most vulnerable groups susceptible to the effects of climate change.

Climate change appears to be a bigger area of worry for young people, especially the youngest (15 to 24 years). They are the people who have known about climate change, or known of it as global warming, for their whole lives. Young people also do not feel particularly optimistic about the mitigation of the effects of climate change at the current moment (Schwaab et al., 2022). As such, they might form a very grim prognosis of the state of the world that they will be inheriting and inhabiting in the future. These are also a group of people most distressed by climate change and report comparatively higher levels of climate distress.

For obvious reasons, there is a positive correlation between climate change awareness and level of education. However, city-dwelling individuals with high levels of education are not the people most at risk from the effects of climate change in the current time. The individuals who are at the most risk from climate change may not be able to articulate the phenomenon, they understand the changing climate in their own ways, through their ways of life, often in rural and agricultural communities. Through the process of resource loss, these individuals may feel depressed, hopeless, saddened, and anxious. Such persons may also face challenges with alcoholism and other dependencies, all of which worsen their mental health.

People who are not at high-risk of climate change-related events are still perturbed by the phenomenon. Eco-anxiety and climate distress do feature

through their concerns about climate change. Such concerns may also worsen their existing pathological conditions, and be a source of depression, stress, and anxiety as they navigate their current and prospective lives.

Mental health outcomes with regards to climate change concern show a positive correlation. Individuals who are affected by climate change-related events suffer from trauma. This trauma can manifest in the form of post-traumatic stress disorder. As is often seen with populations who suffer through a natural disaster, they have a high tendency to develop PTSD. People suffering from a climate change-related event can become displaced, unhoused, lose friends and family members, and lose resources. This can be a significant source of stress. Climate change has led to people experiencing threats of displacement, especially those already living in vulnerable areas. Such people groups can also be under financial duress.

Stress can present up in many forms; climate distress, psychological stress, and traumatic stress. These, coupled with financial stress and displacement caused by natural disasters, has shown to result in a higher screening rate for PTSD.

People who have not reported to have experienced a climate change-related event also screen positive for pre-trauma. Pre-trauma is assessed based on the perception of the future. People who may not have experienced a climate change-related event, do have concerns about it. A strong belief in the reality of climate change, and a sense of impending hazard is an important factor that can predict pre-trauma. (Patrick et al., 2022)

Another outcome that is tied to climate change is anxiety. General anxiety has been shown to be elevated in populations who experience climate events. The general understanding of climate change is the presence of erratic weather patterns. These weather patterns can lead to random, unpredictable weather events that people would not be prepared for. The emergence and aftermath of these events can be filled with uncertainty. There appears to be a correlation between high levels of general anxiety and high levels of worry about climate change (Schwaab et al., 2022). Similarly, high levels of anxiety are also seen in populations vulnerable to the effects of climate change, such as storms, typhoons, and sea level rise. Their levels of anxiety are also positively correlated to the extent of their vulnerability. High levels of general anxiety appear to be correlated to both climate change worry and climate hazard experience. In clinical populations, general anxiety is found to be a significant predictor of climate change anxiety (Gebhardt et al., 2023). An anxious state generally makes it likelier for persons to be impaired by worries and anxieties surrounding the changing climate. Thus, those already diagnosed with anxiety could also suffer a higher mental health burden due to climate worry.

Depression is observed to be higher in populations who suffer from climate change-related events. Individuals from such populations can feel hopeless and low about their situation. Residing in areas that are under the threat of possible climate change hazards can undoubtedly be an uneasy and difficult predicament. The rates of depression are also higher for those who lived in highly vulnerable areas (Kabir et al., 2024). There seems to be a positive correlation between high levels of reported depression and high vulnerability of living areas. Within populations reporting high rates of depression those with reported climate change

distress showed even higher rates of depression. These associations make clear that depression is prevalent among those with climate change-related event experience or worry. Worry alone can be a factor that can worsen pre-existing conditions relating to depression. Factors associated with climate change such as worry, anxiety, and powerlessness can predict or affect depressive symptomatology. In the clinical population, patients suffering from depression also show symptom load regarding climate change awareness. People who reported lower levels of depression reported high rates of somatic syndrome.

Resource loss emerged as another interesting phenomenon. Resource loss can be seen as an additional variable that connects the effects of climate change and the mental health outcomes of individuals and communities whose mental health burden may not directly come from climate worry. Rather, their mental health burden is attributed to the consequences of climate change. Through climate change-related events, they lose resources in the forms of land, property, money, farm animals, livelihoods, and intangible resources in the form of social support and community. They might also attribute their distress onto the loss of these resources, but not directly to the phenomenon of climate change.

Climate change also possesses a threat to a significant population of women around the world. An emerging pattern throughout most papers, women's mental health was reportedly worse. They report higher rates of depression, anxiety, psychological distress, and climate anxiety. Women in rural settings, and those living in areas vulnerable to climate change are at greater risk for mental health burdens. It is to be noted however that substance dependence and coping mechanisms such as alcohol use is reported higher in men. Perhaps men are more hesitant to report their mental health burdens. In any case, women have

much higher reported mental health issues across most parameters. Women are often responsible for domestic work which involves the allocation and judicious use of resources. A depletion in resources, with failed crops for example, may worsen the mental health of women who are expected to meet daily needs with resources, however much, available.

Through climate change and its effects of threat, hazards, and natural disasters; and the worry about climate change, mental health outcomes in the forms of depression, anxiety, stress, and traumatic stress were reportedly higher. Other emerging mental health outcomes are low resilience, use of substances such as alcohol, and the feelings of loss and hopelessness. It appears that the direct and indirect effects of climate change further the mental health burdens on individuals and communities, and on those who may not have adequate access to mental healthcare. It also has negative effects on those who already suffer from mental health conditions.

The consequences of climate change, direct and indirect, are known to cause great harm to peoples' mental health. Furthermore, these consequences will continue to emerge and be evident, as is already known, as the result of the most pressing and the most threatening global challenge of our time.

Limitations and Future Directions

There is not a lot of research data present on this topic, and not enough quantitative research papers. There was some difficulty in finding papers. As this is an emerging field, there is hope that more research can be done in this area. It would not be possible to study the mental health impact of climate change with a control group as we are universally affected by it. Nor would it be possible to

study all climate change-related phenomena as one. All studies, with the expectation of two were done in different countries, studying slightly different variables in a range of populations. The data could not be presented in one singular way. Many interesting themes emerged with certainly many commonalities, thus eventually culminating into a cohesive synthesis.

There is a lot of research to be done in the area of mental health with regards to climate change. There are many communities living in vulnerable areas who require mental health assistance and they have clearly reported high levels of mental health burdens. Natural disaster relief teams should also have mental health support with adequate follow-ups, especially for women. Those who suffer from climate change worry should have channels to seek support. Support groups, environmental organisations, and therapists should be able to provide support. Therapists should be equipped to deal with new forms of mental distress that may emerge as a result of continuous climate change.

Further studies could also explore how climate change affects the mental health of those who have relocated due to the threat of climate change. Another important direction could be to study the impact of climate change on the mental health of young adults and the very young as they navigate their lives into an uncertain future.

Conclusion

A great number of people around the world seem to be aware of the dangers of climate change. They might also feel distress about the reality of climate change, and the consequences of climate change-related events. Individuals who may not understand climate change in technical terms are still able to articulate it based on their personal experiences. Climate change anxiety and eco-anxiety are prominent in people, especially the younger generation.

Climate change anxiety and climate change-related event experience positively correlate with measures of depression, anxiety, stress, and trauma, especially for women as they appear to have a higher reported score in all the outcomes. Post-traumatic stress disorder was the most commonly observed outcome, being high in all measures of participants who have experienced climate change-related events. There are also reported studies of pre-traumatic stress relating to the anticipation of a climate change-related event.

Going forward, more research is needed in this area, especially on the well-being of women. Support systems in the form of groups and mental health professionals can be the first step solutions to people's mental health burdens due to climate change.

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