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Climate change and mental health: a review of current literature

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Summary

This review article focuses on mental health implications of climate change. Global warming is likely to cause severe widespread emergencies: extreme heat, droughts, wildfires, water-related disasters (i.e., flooding, hurricanes and coastal storms), extreme snow, severe thunderstorms and tornadoes. Rising temperatures, sea level rise and extreme weather events have led to secondary and tertiary consequences, e.g., social disruption, impoverishment and population displacement. Mental health risks of climate change include greater stress, stress-related disorders, anxiety, despair, depression, and suicidal ideation. Those risks can stem from climate-related natural disasters (e.g., extreme weather events), slower moving events (e.g., drought), or concern about the phenomenon of climate change itself. A focus on the impact of climate change on mental health can help enhance the understanding of factors that strengthen psychosocial resilience and adaptation, as well as design tailor-made local interventions. Proper psychosocial adaptation strategies for the upcoming mental health challenges of climate change require development of social capital and strengthening of institutional systems.

Keywords: climate change, mental health, mental disorders

Introduction

According to the WHO's definition of health, as contained in its constitution: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [1, p. 1]. Mental health is "a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community" [2, p. 23]. "Concepts of mental health include subjective well-being, perceived self-efficacy, autonomy, competence, intergenerational dependence and recognition of the ability to realize one's intellectual and emotional potential" [3, p. 7].

This review article focuses on the mental health implications of climate change. On the one hand, symptoms of common mental disorders (CMD) are the consequences of ecological crisis, on the other, the number of patients suffering from eco-anxiety

and habitual ecological worrying is on the rise. There is some evidence suggesting that the latter can be understood as adaptive responses to the changing climate [4, 5].

Health authorities and researchers from around the world have recognized the serious threat to health that the climate change poses and are taking protective measures to reduce current impacts and future risks. A focus on the impact of climate change on mental health can help enhance the understanding of factors strengthening psychosocial resilience and adaptation. Unfortunately, not all countries, including Poland, collect such evidence-based information about current and possible future risks [6].

Search strategy and literature selection

The aims of this review of literature are: (1) to point out the mental health threats triggered by climate change and (2) to make recommendations for some future local actions. The MEDLINE database (through PubMed) was searched for articles in this field published in 2010–2020. Mental health-related descriptors (i.e., "mental health" or "mental disorders") and the "climate change" term were used in particular searches. Due to the limitations of this work, this study focuses on articles published in peer-reviewed scientific journals published in English which directly concern climate change impacts on mental health. References of the screened full-text articles were manually searched for further literature. Additionally, worldwide publications and reports prepared by mental health and/or climate change organizations were taken into account. The selected publications were categorized on the basis of the impacts of climate factors on mental health, with a focus on high-risk groups and prevention challenges.

Climate change and crucial emergencies

Anthropogenic global warming is connected with the use of fossil fuels, deforestation and pollution. Global warming is likely to cause the following widespread emergencies: (1) extreme heat (increased global mean surface temperature, heat waves); (2) climate change-related water disasters (CCRWDs) (flooding, hurricanes and coastal storms); (3) winter storms, extreme snow and severe CAPE (i.e., convective available potential energy) thunderstorms, tornadoes; (4) droughts; (5) wildfires [7].

The World Health Organization estimates that climate changes are expected to cause an additional 250,000 deaths worldwide per year between 2030 and 2050 [8]. According to estimates, 80% of the global population is affected by water and food insecurity due to climate change effects [9]. For many millions of people climate change poses a threat of food and water insufficiency and physical insecurity, and it heightens the risks of diarrheal disease, malaria, vector-borne diseases and other climate-sensitive infections. All of them can have mental health impacts through climate-related trauma.

High-risk groups

Some population groups may be at greater risk of mental health difficulties during and after disasters. Those groups include, among others: people living in low – or middle-income countries, those with low socioeconomic status, ethnic communities, migrants, indigenous peoples, children and pregnant women, the elderly, people with pre-existing somatic or psychiatric illness, people with disability, as well as sexual minorities [10-12].

Farmers, indigenous people and children are the most at risk for mental health problems. The climate variabilities/drought are one of four most-cited risk factors on the farmers' mental health [13]. Societal changes and assimilation policies have contributed to the loss of language and cultural knowledge and have made indigenous people very vulnerable to the negative effects of climate change [14]. In turn, children and young people growing up with an uncertain future can develop mood and anxiety disorders. One quarter of Australian children are so troubled about the state of the world that they honestly believe it will come to an end before they get older [15].

Temperature and heat waves

Temperature extremes can increase acute stress as well as worsen mental health problems for people with pre-existing conditions or diagnoses including mood and anxiety disorders [16, 17]. With global warming, it is possible that the rates of aggression, crime and self-harm may increase over time. It has been observed that violent suicides are more common when preceded by a rise in temperatures [18-20].

Obradovich et al. [21] found that shifting from monthly temperatures between 25 °C and 30 °C to > 30 °C increases the probability of mental health difficulties by 0.5% points, and that a 1 °C of 5-year warming associates with a 2% point increase in the prevalence of mental health issues. This study was based on data from nearly 2 million randomly sampled US residents between 2002 and 2012 [21]. Heat waves are associated with increased rates of admissions for mental disorders also in conjunction with somatic disorders [22]. The rate of emergency department visits due to mental health concerns increased between 5–10% at higher temperatures (i.e., 25 °C as opposed to 20 °C) [17]. As mentioned, temperature effects on mental health can be direct, but we should not forget about indirect impact (e.g., migration, increased social isolation during an extreme cold event which then influences depression).

Extreme events (disasters and extreme meteorological conditions)

Obradovich at al. [21] found that exposure to Hurricane Katrina increased the probability of mental health difficulties by 4% points. Whaley [23] conducted research

focused on the psychosocial impacts of Hurricane Katrina. The author estimated that 20–35% of Hurricane Katrina survivors experienced some form of mental health issue following the disaster. The team of Galea et al. [24] reported a 31.2% prevalence of anxiety and mood disorders amongst Hurricane Katrina survivors.

Regarding winter extremes, it is known that low temperatures and icy conditions increase social isolation and influence depression. In the cases of places of employment closing during winter extremes or people being unable to safely travel to work, loss of income and resulting financial stress can also adversely affect mental health [25, 26].

Global climate change is likely to exacerbate changes in precipitation patterns, in the coming years. From a current historical frequency of drought of 12%, these events may increase up to 60% [27]. Most of the studies suggest negative drought-related impacts on mental health in several population groups (e.g., increased risk of hospitalization for depression, worse relationships within farm families, psychological distress connected with the degradation of the physical environment) [28]. Research from New South Wales (Australia) found a statistically significant relationship between drought and suicide from 1964 to 2001 [29]. There is strong evidence for a link between drought and farmer suicides [30, 31].

Similarly, wildfires have a negative impact on the mental health of local residents in the affected areas. For instance, the Fort McMurray, Canada wildfire of 2016 burned 5,890 km^2 of land and destroyed more than 2,400 buildings. There were significantly increased prevalence rates for mental health and addiction problems in residents of Fort McMurray 18 months after the wildfires [32]. The youth (age ranged from 11 to 19; mean age was 14.32) with greater impact from the wildfire exhibited significantly higher scores on measures of PTSD, depression, anxiety, and alcohol/substance use. They also had lower self-esteem and quality of life scores. Students with lower resilience scores exhibited a similar pattern [33].

Global sea level is projected to rise between 30 to 121 centimeters by 2100, due to the influx of water from melting glaciers and the expansion of seawater as it warms [34]. Countries with low-lying areas or small islands are concerned that their land areas might decrease due to flooding and coastal erosion. As a result, many people may be forced to migrate. Researchers from all over the world who investigated experiences of mental health related to floods show that those who had residential displacement or damage due to the flooding experienced negative mental health impacts, both during and after the flood [35, 36].

As shown by Graham et al. [35], living in a storm – or flood-related damaged home was as an additional and independent risk factor for CMD. Findings indicated that storm – and flood-related damage was significantly associated with experience of CMD, suicidal ideation and even having attempted suicide. At the same time, associations with other mental disorders, including post-traumatic stress disorder, and with mental

health treatment and use of mental health services were not significant [35]. A six months post-flood study conducted by Matthews et al. [36] indicated that respondents revealed a substantial mental health burden. Over 22% of respondents reported being still distressed about the flood, 16% with probable anxiety, 15% probable PTSD, 15% probable depression and 7% suicidal ideation. Around 27% of respondents reported at least one of these and about 20% reported two or more of these problems [36].

Short – and long-term implications

Primary mental health impact is related mostly to disasters themselves and their consequences: environment of disruption, trauma and grief. Trauma exposure during disasters and pandemics can impair individual well-being, sleep, psychological health and cognitive function (i.e., memory, concentration and executive function). Direct consequences include increased rates of high-risk behaviors (e.g., domestic violence, alcohol and substance use). Mental health effects of disasters may also arise from implementation of public health response strategies, such as evacuation.

The consequences of indirect (secondary) and distant (tertiary) effects pose a significant challenge because they typically result from changes in complex processes [37-40]. Secondary effects of climate change are due to various processes of environmental changes and ecological disruptions. They consist of damages to physical and social infrastructure, physical health effects, food and water shortages, conflict, and displacement. Long-term droughts affect food and water supplies and can subsequently affect the economic and mental well-being of not only the land-based workers, but also various other groups. It should be noted that indirect mental health consequences of climate change at the community level are understudied. The consequences thereof may include things like a diminishment in community cohesion, loss of community identity, threat to a sense of continuity and sense of belonging as people are forced to move in and out of communities because of environmental stressors, and undermining of cultural integrity in the cases where people have to leave their homelands.

Distant effects include diffuse mental and physical health consequences of displacements, community disruptions, migration, environmental decline, conflicts and violence. Forced migration is likely to continue to grow in the coming years due to climate change, disease outbreaks, conflict and other factors. There are a huge number of challenges to maintaining good health, and specifically good mental health, among migrants at all stages of migration [40].

Environmentally-motivated migration and displacement may lead to the disruption of existing social ties. The author can see potentially adverse consequences for migrants as well as their family members who remain in places of origin. Existing social ties may provide social and material resources that buffer mental health stressors related to both prolonged and acute climate events. Children under 18 years old represent over half of the refugee population. In general, children constitute a vulnerable group [40].

Climate change-related phenomena may in themselves lead to mental health problems [7]. One of the reasons is that holistic understanding of mental health, often found within indigenous ways of knowing, includes spiritual well-being and connectedness to nature and one's environment. As people's understanding of climate change grows and deepens, it is likely to have a significant impact on their social, emotional and spiritual well-being [19]. People can experience not only emotional but also moral and ethical distress arising from awareness of climate change as a global environmental threat caused by human activity [41]. In the past decades we could observe the emergence of new terminology related to climate change and mental health, including the terms 'solastalgia'— mental distress caused by experienced environmental changes, and 'eco-anxiety' — climate anxiety or grief related to potential environmental degradation or change [11].

The neologism 'solastalgia' refers to "the distress and isolation caused by the gradual removal of solace from the present state of one's home environment" [42, p. 49] and it provides the framework to explore some of the broader mental health issues, explained on the basis of environmental and existential psychology concepts [43]. Solastalgia, also known as climate grief, is associated with mourning what has already been lost. The crucial part is that solastalgia is a place-based lived experience [44]. *The Environmental Distress Scale* (EDS) was developed and validated in 2006 by Higginbotham et al. [45] in Australia as a tool to measure solastalgia.

Another relatively new concept is 'eco-anxiety,' which refers to the feeling of anxiety or grief related to climate change and environmental degradation; unlike solastalgia, it concerns future, expected negative changes [11]. It is worth mentioning that even high levels of ecological worrying are constructive and adaptive. Verplanken and Roy [5] indicated that there is no correlation between habitual ecological worrying and pathological worry. Instead, habitual ecological worrying was associated with pro-environmental attitudes and behaviors, and with a personality structure characterized by imagination and an appreciation for new ideas [5].

Literature concerning solastalgia and eco-anxiety is rather scarce. The systematic review by Galway et al. [44] included a set of 29 articles regarding general characteristics of solastalgia. Research confirms that both solastalgia and eco-anxiety are experienced by people worldwide. Temte et al. [46] discovered high levels of concern regarding climate change from a population of adult primary care patients in the USA. Researchers demonstrated a positive and highly significant association between an individual feeling concerned about climate change and experiencing dysphoria. Essentially, patients with positive screens for depression or anxiety were no more likely to affirm global warming or human causation of global warming than patients with negative screens [46].

Solastalgia and eco-anxiety especially deteriorate the well-being of the indigenous people. Individuals from indigenous communities are often deeply connected to the land for their well-being. As climatic changes alter the environment, access to places and practices of cultural significance are often disrupted [14, 47].

The table below (Table 1) presents the main consequences of climate change and potential mental health effects.

Table 1. **Main consequences of climate change and potential mental health effects**

Impacts	Risks	Potential negative mental health effects
PRIMARY	Extreme heats	• Exacerbated mood or behavioral disorders • Aggression, violence, crime • Suicide
	Extreme weather event (flood, hurricane, mudslides, etc.)	• Post-traumatic stress disorder (PTSD) • Depression • Anxiety • Suicidal ideation • Aggression and violence • Substance abuse and addiction • Survivor guilt • Vicarious trauma
	Vector-borne disease (VBD) (e.g., Lyme disease, West Nile Virus, ticks)	• Complex mental health problems (e.g., cognitive or neurological impairment, behavioral disorders)
	Climate-related disasters (floods, wildfires, etc.)	• Post-traumatic stress disorder (PTSD) • Depression • Anxiety • Suicidal ideation • Aggression and violence • Substance abuse and addiction • Survivor guilt • Vicarious trauma
	Slow-moving disasters (i.e., drought, sea-level rise, melting permafrost)	• Depression • Suicidality among rural populations • Substance abuse and addiction • Anxiety, worry, or fear of displacement • Anxiety, worry, or fear of job loss • Solastalgia • Eco-anxiety
	Deforestation	• Lower well-being • Losing recreation places • Losing opportunity to contact with nature
SECONDARY	Decrement in the overall arable land, regional food shortages	• Increased diseases and disorders susceptibility (due to malnutrition) • Stress-related disorders

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SECONDARY	Migration and acculturation stress	• Depression • Anxiety • Suicidal ideation • Aggression and violence • Substance abuse and addiction
	Increased poverty and social inequalities	• Decline in social capital, social cohesion, community participation • Depression • Anxiety • Suicidal ideation • Aggression and violence • Substance abuse and addiction
	Loss of individual's connectedness to their environment of residence	• Solastalgia • Depression • Eco-anxiety
TETRIARY	Less recreational and sporting opportunities	• Lower well-being • Stress • Negative emotional states • Losing opportunity to contact with nature
	Losing biodiversity and ecosystems	• Lower well-being • Restricted emotional and esthetic development • Solastalgia • Eco-anxiety
	Resource-related social disruption and civil conflict	• Post-traumatic stress disorder (PTSD) • Depression • Anxiety • Suicidal ideation • Aggression and violence • Substance abuse and addiction • Survivor guilt • Vicarious trauma
	Climate-related displacement (e.g., relocation forced by disaster or resource scarcity, overpopulation, camps, temporary settlement)	• Stress-related disorders • Depression • Anxiety • Suicidal ideation • Aggression and violence • Substance abuse and addiction
	Awareness of climate change threats to human and planetary health and survival, experience of environmental change	• Solastalgia • Eco-anxiety • Stress • Depression • Hopelessness, despair

Implications and challenges

National and international health authorities have recognized the seriousness of the threats of climate change to health. We already have evidence-based information about current and possible future risks to health, vulnerable populations and effective adaptation strategies. Many governments, communities and environmental organizations have begun to develop integrated strategies for climate change mitigation and adaptation.

Future mental health challenges of climate change cover: (1) developing scientific knowledge regarding the adaptation process, pro-health coping and resilience; (2) focusing on the mental health of migrants and their access to mental health services; (3) supporting high-risk groups (e.g., children, agricultural workers); (4) strengthening community engagement; (5) improving capacity for mental health and community services to respond to the needs of disaster-affected populations.

In recent years, there have been many initiatives focusing on climate change policy and research. The Asia Pacific Disaster Mental Health Network is a collaborative body which was established in June 2020 to support improvements in mental health among disaster-affected communities [10]. The "First Scientific Symposium on Health and Climate Change" (H&CC Symposium) took place in Rome in 2018, and its objective was the promotion of an intersectoral and multidisciplinary approach with regard to both mitigation and adaptation to climate change [48]. Organizations such as: the World Health Organization, the American Psychological Association, the American Psychiatric Association, and the Royal College of Psychiatrists are active in promoting mental health and psychological well-being in relation to global change [49]. In Poland, in November 2019, The Ministry of Climate was created, and in July 2020, the Special Committee on Climate Change at the Senate of the Republic of Poland was established. The Climate Psychiatry Commission established in March 2020 by the Polish Psychiatric Association is one of the very few in Europe involved in mental health actions regarding climate change. We should remember that the climate change effects will be differentially experienced by nations around the world; therefore, there is a need to appoint local competent authorities dealing with mental health in the age of climate change.

Some useful psychological intervention strategies to address climate change-related mental health problems or illnesses include: cognitive-based interventions (such as: psychoeducation, cognitive restructuring, anti-stress training, relaxation training and crisis counselling), interventions based on social connectedness and connectedness to nature (e.g., forest-based therapy), and third wave of cognitive-behavioral therapy (e.g., acceptance and commitment therapy, mindfulness).

Proper adaptation to the upcoming mental health challenges of climate change requires natural resource management, enhancing food security, development of social and personal capital, and strengthening of institutional systems. Resilience, understood

as climate change adaptation efforts pursued by individuals and communities, plays a crucial role [6, 11, 40, 48]. Meaningful elements to support mental resilience include engaging with local community life, art, nature and spirituality [47].

Considering the above, the basic future challenge is to develop a prevention strategy targeted at individual groups of inhabitants. Plans and programs for the prevention of climate change-related mental disorders should take into account both local risk factors and available resources.

Declarations
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