

Climate Change and Its Impacts on Mental Wellbeing

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Abstract: Climate change has posed unprecedented challenges in many aspects of the biosphere including human life. Global warming and extreme weather events induced by climate change have far-reaching implications on people's physical and mental wellbeing. This review aims to examine the impacts of climate change on people's mental wellbeing which represents a domain that is currently understudied. To achieve the aim, relevant peer-reviewed scholarly articles published between 2000 and 2021 were sourced from journal databases namely Scopus, Web of Science, PubMed and ProQuest. It reveals that climate change could affect mental health in multiple ways including the experience of mild stress, distress, sleep disturbances, depression and anxiety. Extreme weather events posing risks to life could trigger post-traumatic stress disorder, depression, anxiety, substance abuse and even suicidal thoughts, in addition to disrupting social support and networks. Gradual climate change yields less dramatic impacts on mental wellbeing. Global warming is associated with transient mental disorders, episodic mood disorders and higher inclination towards aggression while rising sea level stirs fears and worries of inundation, safety and food security. Melting ice changes landscape and triggers solastalgia besides loss of individual identity. Climate change calls attention to differentiated vulnerabilities of different segments of the society, to the consequent mental implications and the need to address inequalities in relation to access to resources, services, infrastructure, facilities, employment and education.

Keywords: Anxiety, depression, extreme weather, global warming, mental health, post-traumatic.

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1. INTRODUCTION

While the arguments revolving around the causes of climate change are still ongoing, there are increasing evidences pointing to a changing climate [1]. Climate change has manifested in different forms, particularly as global warming and the occurrences of extreme weather events [1]. Global surface temperature has increased by 1.02°C from the baseline of 1951-1980 average, with 2016 and 2020 being the warmest thus far. 2011 to 2020 was the warmest decade wherein six warmest years have been recorded, particularly since 2015 [2]. With

increasing global surface temperature, the arctic sea ice has been retreating at a rate of 13.1% per decade in relation to the 1981 - 2010 baseline and the lowest sea ice extent was recorded in 2012 [2]. Furthermore, the mass of polar ice sheets has been decreasing since 2002 with Greenland ice sheet recording a higher decline rate of 277 billion metric tons annually in comparison to 151 billion metric tons of the Antarctic ice sheet [3].

The shrinking ice as a result of warming temperature causes more freshwater to enter the

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sea. The sea level has been on the rise at a rate of 3.4 mm per year based on satellite altimeter record [4]. Besides melting sea ice, ice sheets and mountain glaciers, sea level rise is also driven by thermal expansion of seawater as it absorbs the heat from the warming climate [5]. Higher global sea level has led to coastline erosions as well as more frequent and severe floods in island and low-lying countries and regions [6]. Besides global warming and its associated impacts, climate change has resulted in variations in the frequency and intensity of extreme weather events. Typical examples of extreme weather events are heat waves, heavy rainfalls, major hurricanes and tropical cyclones, and droughts [2]. The occurrences of extreme weather events have increased significantly over the decade. Climate change has brought more frequent and severe heatwaves around the world [5]. A study suggested that the summer heatwave experienced in Korea in 2013 was highly likely a result of climate change [7]. Climate change was also found to contribute to the heatwaves in Australia in 2014 [7]. Besides, the likelihood and severity of rainfall or flooding have also been found to increase due to climate change. The same was reported for drought events [8]. Though a clear link has yet to be established between climate change and the frequency of hurricanes, there is increasing confidence that warmer ocean and higher global sea level will lead to more intense hurricanes bringing larger impacts [5].

In addition, the arguments between the natural and anthropogenic causes of climate change are increasingly taking the anthropogenic side as human activities result in the emissions of greenhouse gases into the atmosphere at an unprecedented rate while dwindling carbon sinks [9]. The effects of human activities have been shown to significantly outweigh natural climate forcings such as solar activities and aerosols [10]. With anthropogenic climate change unfolding and has no end in sight yet, the impacts of climate change are increasingly felt. Climate change has threatened different components of the ecosystems. It has triggered range shift, contraction and expansion of habitats of plants and animals, with implications on changing their distribution, abundance and diversity [6, 11]. Climate change has also caused coral bleaching, thus damaging important marine ecosystems [6]. These impacts on the natural environment cascade to human who depend on the natural resources for survival. Some of the most obvious impacts are food security and income stability as climate change affects crops, livestock, fish, wild animals and plants [8, 12]. Climate change, particularly extreme weather events, also results in loss of properties and mortality [13]. Global warming has given rise to new concerns in

occupational safety, putting outdoor jobs requiring exposure to heat at greater risk, especially in the tropics [14, 15].

These challenges in relation to climate change have far-reaching impacts on people's mental wellbeing. While adaptation to climate change has been preached, the process of adapting itself could be stressful and the success of adaptation often depends on the vulnerability of an individual to climate change which is affected by a multitude of factors ranging from geographical location, demographic factors and political setting to income and education levels [16]. Besides, adaptation to climate change is likely to expose a myriad of inequities and inequalities which may correlate with mental wellbeing. This review, therefore, presents the impacts of climate change on people's mental wellbeing to enable the impacts to be more carefully dealt with in our constant adaptation to and combat against climate change.

2. METHODS

This review salvaged peer-reviewed scholarly articles from journal databases namely Scopus, Web of Science, PubMed and ProQuest published between 2000 to 2020 with keywords comprising depression, anxiety, mental health, mental wellbeing, climate change, extreme weather events, heatwaves, floods, hurricanes, wildfires, global warming and drought [17]. Articles related to the impacts of air and water pollutions as well as ionizing radiation on mental wellbeing were excluded as these aspects are not directly related to climate change though air pollution could contribute to climate change [18].

3. RESULTS AND DISCUSSION

Literature revealed that climate change could cast an array of impacts on mental wellbeing from mild stress, distress and sleep disturbances to psychological disorders, depression and anxiety [19, 20], and such impacts are particularly prevalent before or after an extreme event [21]. Post-traumatic stress disorder (PTSD), depression, anxiety, substance abuse and even suicidal thoughts have been associated with life-threatening extreme weather events which often lead to mortality, damage of properties and resources, as well as disruption to social support and networks [22, 23]. Peritraumatic distress could trigger the onset of PTSD. Survivors of such events are at risk of disorientation and disrupted daily activities. Witnessing such events without directly being involved could also stir intense emotion, disorientation and passivity [24, 25]. This section therefore, delves into the impacts of climate change on mental wellbeing from two perspectives 1) the impacts of extreme weather events which are often

drastic, and 2) the impacts of gradual climate changes which are often incremental.

3.1. The impacts of extreme weather events

As defined earlier on, extreme weather events comprise heatwaves, flooding, hurricanes and cyclones, drought and wildfires typically which bring significant damages and harms over a relatively short timeframe. These events produce substantial mental and physiological distress. The impacts of each event are further narrated here.

Heatwaves are characterized by larger-than-normal temperature rise lasting for days. With climate change, their frequency and intensity are increasing. Heatwaves cause heat stress which brings anxiety and affects mood (Figure 1) [26]. Those with mental illness are at almost a threefold greater risk of dying from heatwaves compared to those without [19]. Heatwaves could also affect behaviors, psychomotor and cognitive abilities among children and adults [19]. Different genders and age groups may have different vulnerability to heatwaves with some studies showing elderly women having higher mortality than men during

heatwave occurrences [27]. In line with the concept of differentiated vulnerability towards climate change, social factors comprising gender (women), age (young people) and socioeconomic status (those in the low category) are correlated to higher susceptibility to disasters-related anxiety and mood disorders (Figure 1) [28]. Heatwaves are known to affect mood. Hot weather tends to provoke hostile emotion and aggressive thoughts and possibly actions and this is evident in higher incidences of heat-related violence in hot summers and hotter years [29]. Extreme heat also causes physical and psychological fatigue. Burke et al. found higher temperatures led to higher suicide rates in the United States and Mexico, particularly during the peak of summer [30]. Besides, unusually high temperatures in the peak of summer were also linked to higher cases of aggressive crimes, and it was found that a combination of weekends and hot summer might have contributed to higher cases of shootings [31]. Heatwaves attributed to climate change could be exacerbated by urban heat island effect and require proper attention to minimize their impacts on mental wellbeing which could in turn affect behaviors [14].

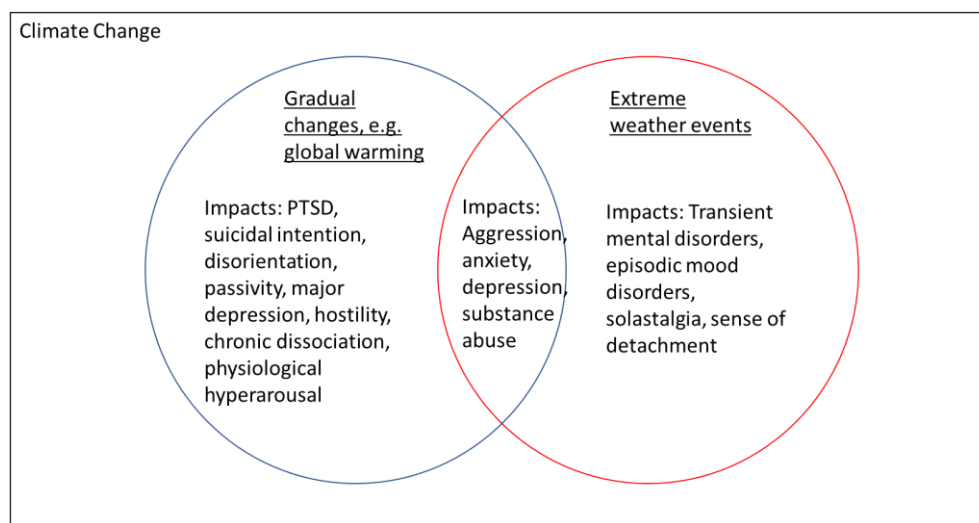


Figure 1: Major impacts of different types of climate change on mental wellbeing

More frequent and intense flooding is another manifestation of climate change. Its impacts on community health have been well studied and flood-related mortality includes drowning, electrocution, nonfatal injuries and exacerbation of chronic illnesses [32]. In terms of mental health, flood is connected to PTSD and its severity seems to be proportional to the intensity and severity of flood [33]. It was observed in Bangladesh that numerous individuals having gone through the acute emergency phase were at risk of psychological distress and mental health problems, which could be attributed to loss of lives and belongings [34]. A study among 2126 flood victims in England revealed

higher psychological morbidity among them with 20.1%, 28.3% and 36.2% showing signs of depression, anxiety and PTSD respectively. The extents of these morbidities appeared to correlate with floodwater depth [35]. Psychological implications seem to sustain even after flood has subsided due to downcast emotions, economic losses and behavioral problems of children [36, 37]. There were also instances of higher substance abuse and domestic violence due to aggravation of existing mental health problems by flooding [38, 39].

Furthermore, flooding also reveals different vulnerability towards climate change with those of

lower socioeconomic status and lacking access to healthcare, the young or elderly, women, the disabled, households led by female, those of an ethnic minority and those with lower level of education more susceptible [40]. Inequities could be widened by flooding particularly in accessing mental healthcare, standard health care systems and infrastructure [41]. Higher vulnerability and inequity are linked to higher risk of PTSD [34] and people experiencing these are more susceptible to mental health problems in the short-, medium- or long-term [41]. The disruption to social network and cohesion caused by flooding could take a toll on families not directly affected by the flood [42]. Therefore, community or social resilience has beneficial effect on sustaining mental wellbeing of people directly or indirectly affected by flooding.

While changes in the frequency of hurricanes and storms as a result of climate change have yet to be established, it is increasingly clear that climate change has brought hurricanes and storms of higher intensity. These extreme events could bring along psychological stress which worsens existing morbidity such as cardiovascular diseases, and prenatal maternal stress and depression while they might lead to the experience of anxiety and fear as well as reduced responsiveness to pleasant stimuli among infants [43, 44]. Those exposed to the events are at greater risk of PTSD, stress, anxiety and suicide [45, 46] and those experiencing economic losses are more inclined to substance abuse [47]. It was reported that one in six people residing in an affected area developed PTSD while 50% of them developed anxiety or mood disorder, including depression [19]. Other consequences which could potentially have psychological implications include loss of belongings and social support, job insecurity, displacement and disrupted healthcare system [48]. As with flooding, vulnerability to the events differs with factors ranging from age, gender, education level and socioeconomic status to status of employment, fitness and status of marriage [48].

Climate change has prolonged droughts and made them occurred more frequently. Drought is associated with great economic implications especially for the farmers, putting them at the frontline of mental health risk. Besides, drought has also increased social distance and predisposed individuals to the negative perception of climate conditions [49]. A study on the health impacts of drought in the semiarid region of Brazil showed it led to psychological problems. The study pointed to potential increase in cases of depression during drought periods and in few instances, such depression was sufficiently severe to lead to suicide of older farmers mainly due to loss of agricultural

and livestock production, idleness, anxiety of household income, anguish and sadness [50]. Inequalities come into play in determining vulnerability among the populations exposed to droughts induced by climate change and they include access to potable water and food, education, income, access to employment and access to healthcare, among others [50].

Incidences of wildfire have been on the rise recently, particularly in the Amazon, Australia and California and Southeast Asia. Some wildfires started as bushfires caused by anthropogenic activities such as illegal burning and slash-and-burn agriculture, which eventually escalated into firestorms prompting evacuation, claiming lives and bringing destruction [51]. A study conducted one year after bushfires in Australia revealed a shocking 42% of the exposed population was still categorized as potential psychiatric cases [52]. In California, 33% of those experiencing wildfires eventually demonstrated symptoms of major depression and 24% had symptoms of PTSD. Similarly in Greece, there were increased symptoms of somatization, depression, anxiety and hostility among those who experienced wildfires [53]. Common mental health problems post-wildfires include PTSD, physiological hyperarousal, chronic dissociation, depression, disorientation, detachment and poor concentration [53]. Children and youth were reported to have been affected by the experience of wildfires with the latter demonstrating symptoms of anxiety disorders, panic attacks, sleep disruption, acute stress disorder, compulsively repetitive play, flashbacks and psychotic disorders [54].

3.2. The impacts of gradual climate change

Climate change is usually gradual, unfolding over a long timeframe and representing the average weather conditions over 15 to 20 years. Unlike weather which changes quickly, climate tends to show a more stable trend [1]. Global warming and the associated changes such as melting of ice and sea level rise are instances of gradual climate change which take decades to become apparent [2]. Global warming increases the risk of heat stress and heat stroke which can affect biochemical levels of human body, thus affecting psycho-physiological functions [55]. Unlike heatwaves, global warming presents a more lasting yet less dramatic impacts on physiological and mental wellbeing and the effects could differ in different geographical area as well as political and social settings [55]. For instance, poor countries in the tropics are more vulnerable to climate fluctuation than wealthier countries [56]. Warmer temperatures are connected to higher risks of mental disorder especially mania among the elderly, transient mental disorders, episodic mood disorders and increased hospital admissions due to

mental illness (Figure 1) [55]. Drug-related mental disorders have been reported to become more prevalent when temperature rose above 20°C and there was greater risk of mortality and morbidity among individuals with existing mental and behavioral disorders [55]. Individuals with existing schizophrenia, schizotypal disorders and mood disorders are also more susceptible to high temperature [56]. Besides, rising temperature tends to provoke aggression, causing violence, homicide and self-harm [25][55]. Warming climate is translated into rising sea level which stirs fears of being engulfed or sieged by the sea [57]. These fears are particularly strong for residents of the Pacific Islands threatened by rising sea level which pushes seawater further to the land. Among the worries expressed by residents of low-lying villages of the Solomon Islands were the fear of shortage of land to build houses, safety concerns due to in-pushing seawater and high tides, and the concerns about food security [58].

Retreating glaciers as well as melting sea ice and polar ice sheets modify landscape and induce a sense of detachment or loss of connection among individuals who are used to a certain environment (Figure 1). These changes could trigger solastalgia, an emotional distress caused by environmental changes [59]. The environmental changes may also produce challenges in adaptation, thus increasing the risks of mental health [26]. For instance, loss of employment resulted from environmental changes could affect individual identity while decrease of natural resources and accessibility to medical services could acutely and adversely influence psychological wellbeing [59]. Generally, gradual changes of the climate, whether global warming, rising sea level or melting ice, have both acute and chronic psychopathologic implications comprising PTSD, depression, anxiety, aggression, substance abuse, social disconnectedness, solastalgia, loss of autonomy and control and even suicidal intention [19].

4. CONCLUSION

Climate change affects mental wellbeing in various ways. It can lead to immediate effects as in the case of heatwaves, provoking aggression while affecting psychomotor and cognitive abilities. It can also cause short-term effects especially during and after events such as floods, tornadoes and hurricanes, causing depression, anxiety and PTSD. Long-term effects often accompany landscape modification, prolonged droughts and increase in sea level, resulting in emotional distress, loss of connection and anxiety. In serious instances, these events could give rise to suicidal intention and even attempts. Certain groups of people are more vulnerable to the mental implications of climate

change, particularly women, the elderly, children, people with existing or history of mental complications, those of lower socioeconomic status and the indigenous communities. Vulnerability is also affected by geographical locations as well as political and sociocultural settings. Climate change exposes and widens inequalities in terms of access to resources, infrastructure and facilities as well as employment and education opportunities which contribute to one's vulnerability, hence the ability to adapt to climate change. This review calls for resilience-building for mental health through providing support in restoring social cohesion as well as counselling and psychological support post-trauma. It also deems that proper emergency response would minimize losses caused by extreme weather events, and the resulting psychological disorders. Proper displacement to shelter is crucial to prevent moving from one shelter to another which could be traumatic as displacement to shelter is already stripping an individual from social support network. There is an impetus to identify the vulnerable groups and provide them with psychosocial support in moments of distress caused by climate change. Having said that, it is equally important to address the inequalities which worsen vulnerability via maintaining access to essential services, infrastructure and resources. Successful adaptation to the various manifestations of climate change is the essence to ameliorate their mental implications. As there is only so much that resilience building and adaptation can achieve, it is necessary to mitigate climate change, for instance by responding to the Paris Agreement's pledge to keep global warming below 2°C.

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