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Commentary

Extreme weather and psychiatric illnesses

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INTRODUCTION

World is experiencing numerous unprecedented extreme weather events due to climate change. The intergovernmental panel on climate change (IPCC) defines climate change as "a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer."[1] The rapid globalization and economic growth at the cost of environment in 20th century dramatically accelerated weather change and is becoming more severe sooner than anticipated leading to difficulties in adaptation.[2,3] The global weather change is one aspect of "Anthropocene syndrome" of human-induced changes to the global environment.[4]

It is challenging to determine the exact scope and impact of weather change on mental health due to lack of an indicator capable of capturing this impact globally.[5] Since changes in the weather acts as a "threat multiplier", it can undo the progress in development, global health, and poverty reduction which will widen the pre-existing health, racial, and economic gaps and disproportionately impact marginalized and vulnerable population at risk for psychiatric illnesses.[3]

Environmental neuroscience investigates reciprocal relationship between humans and environment focused on functional and structural changes in brain and its relationship with behavioural changes.[6] Human brain is critical for survival in existential challenges and disorders of brain like psychiatric illnesses can compromise its ability to deal with external environmental challenges. Neuroscientists can combine technologies like immersive virtual simulations and neuroimaging to understand neural mechanisms to try to devise interventions to make human brain resilient against climate change.[6] Moreover, researchers are using neuroscientific techniques to better understand neural correlates of pro-environment decision-making which could help to devise climate change communication and behaviour modification strategies.[6]

WHAT DETERMINES PSYCHIATRIC ILLNESS?

In literature various pathophysiological factors have been reported but, a clear understanding is lacking on underpinning mechanisms leading to highly heterogeneous psychiatric illnesses.

Genetics

Polygenic risk and epigenetic mechanisms are associated with highly complex psychiatric illnesses. Future studies will unravel the interaction between environmental exposures, genetic variables, and epigenetic pathways leading to psychiatric illnesses.[7]

Physical health

There is a bidirectional association between chronic medical illnesses and psychiatric illnesses.[7]

Gut-brain axis

The bidirectional communication network of gut-brain axis plays an important role in maintaining homeostasis and, its imbalance-dysbiosis results in neuroinflammation which has been implicated for psychiatric illnesses.[7]

Inflammation

High levels of circulating pro-inflammatory cytokines and chronic inflammation can influence mood, behaviour, and cognition contributing to the pathophysiology and development of psychiatric illnesses.[7]

HPA axis and stress response

Hypothalamo-pituitary-adrenal (HPA) axis and stress response preserve homeostasis and guarantee survival under stressful situations. Prolonged or recurrent exposure to stressful environments combined with dysregulation of the HPA axis leads to an increase in allostatic load and adverse health effects.[7]

Social determinants

The social factors like age, education, race, ethnicity, marital status, migrant status, family and social support, employment status, financial situation, adverse childhood experiences and adverse life events are linked to psychiatric illnesses.[7] Access to healthcare services is influenced by social factors, thus affecting the management and prognosis of psychiatric illness.

THE EFFECTS OF ACUTE AND LONG-TERM WEATHER ON MENTAL HEALTH

Extreme weather events can have both direct and indirect effects on mental health in short and long term.[8] Acute weather events impact people within the designated geographic area while long-term weather events affect a greater geographic area and population. Increased awareness or observation of weather changes affects indirectly, whereas direct effects are experienced directly due to weather change.[8] Every significant weather-linked risk to physical health has detrimental effect on mental health.[8]

Acute weather events

The heat waves, drought, famine, wildfires, tornadoes, hurricanes can directly impact mental health.

Heat wave

Heat waves are associated with mood disorders, anxiety, higher mortality in people with psychiatric illnesses, pregnancy related complications, behavioural and motor issues in children, violence, and risk of suicide.[9]

Floods

Floods are associated with waterborne diseases, infectious diseases, psychiatric illnesses, and exacerbations of chronic illnesses.[9]

Tornadoes, hurricanes, and storms

The hurricane Katrina in 2005 and Sandy in 2012 caused severe damage to healthcare infrastructure, interruption of public health services, serious illnesses, injuries, disabilities and deaths. Delayed onset (one year after the disaster) of psychiatric illnesses is known.[9]

Drought

Drought-related dangers to mental health are more likely to affect farmers leading to increased suicides. Agricultural loss due to drought results in food insecurity, economic hardships, political instability and forced migration which leads to psychological distress and increased risk of psychiatric illnesses.[9]

Wildfires

The effects of wildfires on property loss, personal injury, and mental health are diverse. Effects on mental health can be delayed in onset and persist long term.[9]

Long-term weather events and associated consequences

Perennial weather-related events will alter the landscapes, disrupt socioeconomic systems, leading to food and water scarcity and an increase in communicable illnesses which will impact mental health.[9]

Increase of average land surface air temperature

Higher environmental temperature can impair CNS function, disrupt homeostatic process of thermoregulation, cause temperature stress, exhaustion and sleep disturbance. Increased risk of mood disorders, substance abuse, increased morbidity and mortality in individuals with psychiatric illnesses, violence, and self-harm have been associated with elevated temperatures.[9]

Increase in sea level

The predicted rise in the global sea level will prompt migration from coastal regions leading to deracination, a loss of cultural and physical boundaries, persistent anxiety about relocation and an increase in the risk of psychiatric illnesses in the vulnerable.[9]

Deforestation

Urban green spaces have been linked to lower stress levels, better physical and mental health as well as a longer life, and its elimination leads to feeling of solastalgia.[9] Children's social, emotional, and cognitive development is aided by urban vegetation.

Air and noise pollution

Research show association of psychiatric illnesses with noise and air pollution.[8] The exposure to air pollutants is

associated with brain infarcts, stroke and early onset of dementia.[6]

Social and economic disruption

Weather-related socioeconomic disruption will exacerbate psychiatric illnesses.[8]

Food and water insecurity

Drought-related food and water scarcity will cause economic losses, worsen distress and desperation raising the possibility of psychiatric illnesses.[8]

Communicable diseases

The increase in prevalence of communicable diseases spreading over a wider geographical region will exacerbate the mental distress.[8]

IMPACT OF WEATHER CHANGE ON MENTAL HEALTH

Impact of weather change on mental health can range from mild distress to clinical illness which can be acute or chronic. The weather change will steer shifts in geographic, socioeconomic, political, cultural, health-related, academic, resource availability and allocation related areas in future.[9] The feeling of dislocation, losing possessions and social support, losing one's identity, uncertainty, instability, helplessness, fear, anxiety, and a sense of loss of control will be widely experienced, increasing risk of the psychiatric illnesses in the vulnerable.[9]

The emotional experience of global climate change has given rise to new terminology-"Psychoterratic syndromes" of which "eco-anxiety," "ecological grief," and "solastalgia" have gained widespread attention.[10] "Eco anxiety" is extreme worry about current and future harm to environment caused by human activity and weather change.[9] "Ecological grief" is sense of loss that arises from experiencing or learning about environmental destruction or weather change.[9] "Solastalgia" is distress caused by the gradual loss of solace from one's home environment and territory because of its physical degradation.[10]

Several studies have reported clinical illnesses such as acute stress disorder, posttraumatic stress disorder (PTSD), depression, anxiety, somatic symptom disorder, substance use disorder, suicide and aggressive behaviour.[10] Children can have impaired neuro-development in association with weather change.[10]

MENTAL HEALTH INTERVENTIONS

The interventions can be designed for individuals or groups in a secure environment. It's important to distinguish mental health symptoms between adaptive (main response to situation, non-pathological) and non-adaptive (pathological). It is imperative that interventionists educate themselves and get familiar with the emotional and behavioural disturbances due to extreme weather change.[10]

The interventions should enhance social connection, emotional support, loss management and resilience. Those with pathological symptoms should be evaluated and treated by a psychiatrist.

STRATEGIES TO ADDRESS MENTAL HEALTH EFFECTS OF WEATHER CHANGE

The strategies should be devised to safeguard population at large and vulnerable in particular against extreme weather change related consequences.

Strategies for acute events should include effective and sustainable programs to treat and monitor mental health problems, building resilience of individuals and community, training health workers, maintaining inventories of available resources and risk assessment of the populations.[11]

Strategies for long term events should promote environmental conservation, engaging communities to mitigate weather change effects, evidence-based risk communication and promote positive mental health.[11]

Various strategies such as stepped-care approach, WHO mental health gap action programme (mhGAP), Disaster psychiatric assistance teams (DPATs), psychological first aid (PFA) can be implemented to address mental health effects of extreme weather change.[11]

WAY FORWARD

Emerging research is trying to understand genomic mechanisms and eco-evolutionary processes that are associated with health effects of climate change. Cutting edge methods and multi-omics approaches can help to understand range shifts, phenotypic plasticity and evolutionary adaptation to climate change.[12]

Studying association of genetic variations with environmental variables and phenotypes, under both natural and controlled laboratory conditions can be a powerful tool to understand population's response to recent increases in temperature and to predict their future dynamics. Incorporation of genetic and epigenetic variations into estimates of climate change vulnerability can provide additional power for predicting responses to climate change. Integration of genomic and environmental data collected across multiple sources and combined with targeted experiments, can be used to understand and predict future population-level responses.[12]

CONCLUSION

Extreme weather changes can increase prevalence of psychiatric illnesses in population. It can be challenging for psychiatric patients to adapt to extreme weather changes leading to increase in morbidity and mortality. Various interventions at multiple levels should be implemented for both acute and long-term weather events, like promoting environmental conservation, engaging communities to mitigate weather change effects, evidence-based risk communication and positive mental health. The constantly evolving field of mental health in climate change will require constant monitoring, continuous learning and effective implementation of interventions. Further research should be addressed to understand adaptive and vulnerability factors to predict mental health impact of extreme weather changes in future.

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