Extreme pollution, climate change, and depression

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One of the arguably most severe challenges facing the world in recent years is climate change. Rapid urbanization and the dramatic increase in CO₂ emissions and short-lived climate-forcing pollutants (SLCPs) mainly black carbon, ground level ozone, and sulfate has led to an increase in global warming, increased heavy precipitation wave, and increased sea level and tropical cyclone activity. However, existing city infrastructure has not been designed for this kind of threats. About one-third of the world population lives on the coast that may be at risk of flood. Heat in many regions especially the Middle East will be so extreme as so to make it routinely hazardous to be outside. The absence of effective infrastructure services, poorly designed and enforced regulations on air quality and waste management, contribute to the deterioration of air quality. A recent Lancet report has stated that air pollution contributed to the unacceptably high number of premature death (Cohen et al. 2017). Climate change does not just affect physical health by exacerbating health problems like respiratory and cardiovascular diseases, it can also pose mental health impacts such as depressive disorders and suicide (Gladka et al. 2018). For instance, studies indicate mental health disorders increased compared to reference data from 0.7 to 52.6% (Rataj et al. 2016). Undoubtedly, human behavior is depleting some of the natural resources ever faster, as well as degrading many parts of the environment, which leads largely to climate change and environmental decline (Tilman and Clark 2014). In addition, the human immune system is

heavily affected by increasing or decreasing of temperature (KhafaieMA and Mojadam 2016) (Dittmar et al. 2014). Therefore, it can be said that atmospheric conditions are also one of the environmental variables that can play an important role in our human physical and mental health (Wu et al. 2016), while this has not been much addressed by researchers.

Researchers at different levels of society have shown that increasing the duration and intensity of sunlight plays a very important role in increasing the satisfaction of individuals relative to their surroundings (Huisman et al. 2012, Keniger et al. 2013). Accordingly, researchers are trying to find out the main cause of the prevalence of depression among people regarding climate change (Majeed and Lee 2017; Padhy et al. 2015), so the results can be used to measure the impact of climate change on human's *psychological and mental health* on a wider scale. Besides, many people are aware of the dangers of rising temperatures, especially the effects of exposure to sunlight, on the increase of the risk of malignancies such as skin cancer (Armstrong and Cust 2017), but are less likely to be aware of the increase in the number of people suffering from mental health. Therefore, it can be said that the climate can play a very important role in the physical and mental health of individuals. People who are exposed to air pollution do not intend to have social communication; therefore, air pollution can also affect human relationships (Qian et al. 2016).

A depressed person always sees the world gray and dusty; thus, too many “bad air days,” the world becomes depressive, dusty, and darker. In addition, people's decision-making ability becomes weaker and they feel less energetic, bored, and tired during polluted days; thus, these factors make depression and symptoms more severe. In air pollution condition, anxious people also experience more concerns about the future.

The researcher reported that air pollution may increase the risk of some psychological disorders such as autism (Jung et al. 2013). Besides, patients with obsessive-compulsive disorder (OCD) are also likely to become more problematic when to be exposed to air pollution (Qian et al. 2016). Such people always have a lot of attention to their bodies and, in the case of

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air pollution, constantly think that they have become ill. This feeling leads to exacerbation of OCD in them and has a “hypochondriasis”. Healthy people may be concerned more about their health status. In air pollution, the percentage of air elements has changed and oxygen levels are reduced. This leads to some degree of impatience, boredom, and aggressiveness and more tiredness than ever. Certainly, when oxygen is low, the feeling of fatigue will be doubled, and consequently, stress cannot be avoided (Sung et al. 2005).

Collectively, depression is a global crisis and is a curable disease as well; thus, it is known that effective scientific interventions can treat it. Unfortunately, most people with depression do not receive proper care and treatment. In some countries, out of every ten people with depression, there is only one person who receives appropriate treatment. So, the lack of adequate access to appropriate health services and social stigma around psychiatric illness are the main barriers to help such people. Among healthy individuals and those with chronic diseases, the use of health service increase in association with higher levels of exposure to air pollution. Future research on all health consequences of air pollution alongside health service economics would do well to measure the utility of targeted air quality advisories to reduce the risk, as well as increase the quality of life of people living in highly polluted areas. Recently, global warming, as well as climate change, brought hottest summers to many places globally, especially in gulf countries.

Given the first global survey, released by the World Health Organization (WHO), cities in Iran, India, and Pakistan rank among the worst on the planet for air pollution, (Gakidou et al. 2016) at the same time, most affected by anxiety, schizophrenia, and bipolar disorder. Asia has an especially low density of psychiatrists, despite, high overall burden of mental illness. Europe has the highest, led by Monaco, Norway, Belgium, and the Netherlands, each with between 20 and 40 psychiatrists per 100,000 people. The USA and Canada have about 13 psychiatrists per 100,000 people, according to the WHO report.

Reducing the future health risk of extreme climate warming interrelated with action to mitigate CO₂ emission and SLCPs. Unlike CO₂, by contrast, SLCPs have shorter atmospheric lifetimes; thus, mitigating SLCPs would be a quick action to improve both air quality and the climate. For this to be done, identifying the sources of SLCPs and control plans are key challenges. As recently, Australian health professionals made a statement on climate change and health; to limit global warming to 2 °C, it is recommended the bulk of current oil, gas, and coal reserves should remain unused. Air pollution from fuel burning is responsible for many health problems and deaths around the world. Disruptions in climate are currently strengthening the frequency, severity, and duration of severe weather conditions such as heating, volcanic eruptions, droughts, and tropical storms that cause damage to livelihoods

and human health. Countries should immediately commit to adopting alternative energy production strategies that put fewer greenhouse gases in the atmosphere.

Given that the mental health effects of extreme climate change and pollution such as depression can contribute to the destabilization of a community, offering a number of possible moves as governmental and health service intervention, and building social connections and fostering confidence in people's own resilience, as well, could help people and communities combat such unwanted health effects. One such program must be supported by proper data generation, compilation, and analysis to ensure that the action plans drawn up are optimal and will yield the desired results. All other siloed response measures are unlikely to be effective. As many people live in cities and countries which experiencing extreme climate changes subsequent of rising air pollution, nowadays, several countries facing many pieces of evidence that revealed the little attention from governments and people themselves to these destructive effects that clearly will transfer to our next generation. Therefore, it is important to send such messages to scientific communities, people, and health service providers to shift the resources alongside education interventions to combat these problems.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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