



Article Information

Received date : August 11, 2020

Published date: August 18, 2020

*Corresponding author

Emine Didem Evcı Kiraz, Aydın Adnan Menderes University, Faculty of Medicine Department of Public Health, Aydın, Turkey

Keywords

Climate Change; Health; Global Warming; Climate Change Impacts; International Classification of Diseases (ICD)

Distributed under Creative Commons CC-BY 4.0

Delayed Interest in the Relationship between Health and Climate Change

Ayşen Özmen¹, Emine Didem Evcı Kiraz^{2*}

¹Izmir Kavram Vocational School Department of Medical Services and Techniques Izmir Turkey

²Aydın Adnan Menderes University Faculty of Medicine Department of Public Health Aydın Turkey

Abstract

This review has been prepared to highlight the importance of the recent growing interest in the relationship between health and climate change. The effects of climate change on human health are inevitable. It is difficult to determine the health effects of environmental factors. Likewise, the effects of climate are not fully defined. Climate issue has not been included in the medical literature. Therefore, it is not an issue addressed by healthcare professionals. Although there are studies in the field of environmental health in cities, the issue of climate change could not go beyond carbon footprint calculation. However, the health effects of climate change will be felt mostly in cities. It has been a great role for researchers and policy makers on the relationship between climate and health have a great role to play. Studies have revealed the relationship between climate and health, diseases that people may face due to climate change in the last few years. Health professionals should be trained on this issue and the capacity of manpower equipped in the field of climate change in health should be increased. There is no data collection system or database where the diseases diagnosed due to the effects of climate change can be recorded. All diseases caused are included in the International Classification of Diseases (ICD). However, there is no ICD code indicating that these diseases are caused by climate change. It should not be late to keep these records. With an increased interest and awareness, evidence should be compiled by doing the necessary studies and should be reflected to the services and policies

Introduction

After industrial revolution, the use of fossil fuels, agricultural activities and the level of deforestation increased. This situation cause serious and permanent damage to the atmosphere. As a result of adverse changes, the natural greenhouse effect, which preserved its balance throughout the history in the atmosphere, was distorted. Also, the increase in the concentration of pollutants such as CO₂ and SO₂, Particulate Matter (PM) has caused an increase in the rate of greenhouse gases in the atmosphere and warming the earth [1]. The high priority of the 17 Sustainable Development Goals included in the 2030 Agenda for Sustainable Development is climate change, combating climate change and adaptation to climate change [2]. According to the data released by NASA, the global temperature has increased by 10°C since 1880; in the last 136-year records, 17 of the hottest 18 years have been experienced since 2001; glaciers of the North pole decreases 13.2% every decade; sea level increases 3.2 millimetres every year and the CO₂ level in the air reached its highest level in 650 thousand years [3]. According to the IPCC 1.5 °C Special Report, which is one of the main issues of COP24, if the increase of 1.0 °C continues in the same way compared to the pre-industrial period, it is estimated that the global warming will reach 1.5 °C between 2030-2052 [4]. Climate change, which has direct and indirect effects on human health, threatens the basic components of health such as drinking water, clean air, shelter and food supply. The World Health Organization (WHO) expects an additional 250,000 deaths per year between 2030 and 2050 due to the effects of climate change [5]. The effects of climate change on humans and nature are already apparent. Increases in average temperature, forest fires, changes in the atmosphere, air pollution, glacial melting, drought, natural disasters, changes in agricultural productivity cause an expected disease burden on humans [6]. The risk of having health problems caused by climate change is higher in low-income countries with insufficient health services [7]. If the necessary precautions are not taken and the temperature increase cannot be stabilized at 1.5°C, an increase of approximately 3°C is predicted until 2100 [4]. If this happens, biological diversity will decrease, agricultural production will become unavailable, water and food access problems will arise, and then epidemics and deaths will occur. Extreme weather events will occur and loss of life and property will be inevitable as a result of disasters (especially vulnerable groups will be affected). This review has been prepared to highlight the importance of the recent growing interest in the relationship between health and climate change.

Health Problems Caused by Climate Change

All the living beings are affected by the changes that occur in the natural cycle in order to survive. Humans are affected by the climate changes caused by themselves. Conditions and diseases caused by climate change are specified in the following headings. The mentioned situations mostly affect negatively the vulnerable groups in the society [7].

Diseases Caused by Extreme Hot and Cold Weather

Due to the change in the climate, the number of hot days increases and the duration of high temperatures during the day is prolonged. In the literature, there are many studies indicating that temperature is closely related with death [8-12]. The human body, which adapts to seasonal high-low temperatures over time, cannot physiologically adapt to sudden temperature changes [7]. When the literature is reviewed, diseases related with hot and cold weather that result in death are cardiovascular diseases, cerebrovascular diseases, respiratory system diseases, hypothermia and trauma. Health problems caused by cold weather are accidents, injuries due to falls, hypothermia, cardiovascular diseases and respiratory problems [13].

Diseases Caused by Ultra Violet Radiation (UVR)

The amount of ultraviolet radiation (UVR) that can reach the ground surface is proportional with the ozone layer [14]. Besides UVR varies according to the wavelength and exposure time, it has effects from premature skin aging to cancer. Malignant melanoma is one of the cancer types that increase due to UVR. Photokeratitis with prolonged UVR exposure; lifetime cumulative exposure causes cornea, lens and retinal diseases [15]. Apart from these, there are studies showing that UVR affects the immune system and provides susceptibility to infectious diseases [16, 17].



Diseases Caused by Air Pollution

Many compounds that contain gas and particles in the air have important effects in terms of energy and reflection from the sun. Particulate matter (PM) can heat and cool the earth depending on its components. This affects the temperature rating of the earth and causes the emergence of temperature-related diseases. WHO estimates that air pollution causes 4.2 million premature deaths worldwide [18]. Depending on the exposure time, air pollution can cause a decreased lung function, respiratory tract infections, asthma and chronic obstructive pulmonary disease (COPD) [19]. When air pollution-related diseases that result in death are examined, it is seen that they are caused by ischemic heart disease, stroke, COPD and lung cancer [18]. Nowadays, we observe the effects of the COVID-19 pandemic, regardless of the development level of the countries. There are studies showing that people living in areas with high PM_{2.5} levels are more vulnerable to the virus than people living in areas with clean air, and that people with comorbid diseases are more susceptible to corona virus infection [20-24].

Extreme Weather Events, Natural Disasters and Health Problems

Climate change, rising temperatures, retreat of glaciers, rising of sea levels, ocean acidification, salinization, soil and forest degradation affects slow-onset events such as decrease in biological diversity, drought, desertification, and extreme weather events. Disasters origin from these effects cause health problems in people directly or indirectly [25]. 61,772,617 people were affected by natural disasters in 2018; 10,733 people lost their lives due to the disaster [26]. People who are exposed or directly affected by disasters such as forest fires, hurricanes, storms, floods, drought; psychological diseases, illnesses due to food and water supply failures, lack of accommodation and related diseases and deaths can be seen [27]. The relationship between climate change and hydro-meteorological disasters as well as geological disasters is also investigated. Studies have shown that the melting of glaciers and the rise of sea level under the effect of temperature are related to geological movements under the effect of the new global water distribution [28, 29].

Infectious Diseases

Vectorial Diseases

The occurrence of vectors cause disease transmission to humans and animals. Changes in temperature and humidity as a result of climate change, changes in ecology and biodiversity (increase or decrease), concreting, excessive rainfalls can vectors be in a different place than where they are seen or multiplication more than expected [7]. As a result of climate change, the shift of hot climate zones to cold climate zones and changes in the distribution of disease-transmitting vectors can also be observed [30]. It was observed that vectorial diseases such as malaria, diseases caused by ticks, tularemia, midge fever, yellow fever, leishmaniasis, ebola, oriental sore, dengue, bird flu, plague, lyme, tuberculosis, western nile virus, chickungunya, malaria, west nile virus increased as a result of uneven distribution of rainfall and rising temperatures [7].

Food and Waterborne Diseases

The supply of drinking and irrigation water and water cleaning facilities can be disrupted by changes in air and water temperature, periods of flood and rainfall. Also, climate changes can disrupt the food security and chain. As a result, food and waterborne diseases can be seen that may affect continents in line with the sanitation process, treatment systems, and community behaviour [7]. Reduction of clean water resources may cause rapid population growth, water and food orientation of the society, food supply problem, salinization in agricultural areas, water scarcity, pollution in water resources, flood, employment and housing problems, impoverishment, climate migration, infectious diseases, epidemics and even deaths [7]. Polluted waters and deteriorating food quality due to conditions come from climate change can cause diseases such as salmon, campylobacter, shigella, tularemia, diarrhea, dermatitis, contontivitis, influenza, allergies [31]. As a result of congestion or flooding in the sewer system affecting the water quality, the incidence of diseases such as cholera, typhoid, paratyphoid and deaths are increasing [30].

Mental Health Diseases

Extreme weather events can cause hot/cold air waves, simple/chronic stress problems, and the effect of stress can cause diseases such as heart attack, temporary loss of consciousness. Wider impacts will cause post traumatic effects after disasters such as forest fires, earthquakes and hurricanes. People who lose their relatives, shelter areas, jobs and social environment can have psychological diseases [7, 32].

New / Re-emerging Diseases

With climate change, migration is expected not only for humans but also for natural life. Climate change may lead to the emergence of diseases that are not seen in a region before, and the reappearance of a disease that is no longer seen after a possible climate crisis [7]. As melting of the glaciers, viruses that we have not met yet are being investigated

in literature [33]. In addition, further studies should be carried out on the diseases they may cause when they occur. The relationship between COVID-19 which is an emerging disease and climate change, should not be ignored. In addition, the application of social isolation applied in the COVID-19 pandemic has shown the applicability of 10% reduction in PM levels and 40% reduction in NO₂ level in emission emissions. We should always remember that we may face a new disease in the future, we should be prepared for new diseases by seeing the global pandemic as a climate change fragment [34].

Conclusion and Recommendations

The effects of climate change on human health are inevitable. It is difficult to determine the health effects of environmental factors. Likewise, the effects of climate are not fully defined. Climate issue has not been included in the medical literature. Therefore, it is not an issue addressed by healthcare professionals. Although there are studies in the field of environmental health in cities, the issue of climate change could not go beyond carbon footprint calculation. However, the health effects of climate change will be felt mostly in cities. It has been a great role for researchers and policy makers on the relationship between climate and health have a great role to play [35, 36]. Studies have revealed the relationship between climate and health, diseases that people may face due to climate change in the last few years. Health professionals should be trained on this issue and the capacity of manpower equipped in the field of climate change in health should be increased. There is no data collection system or database where the diseases diagnosed due to the effects of climate change can be recorded. All diseases caused are included in the international classification of diseases (ICD). However, there is no ICD code indicating that these diseases are caused by climate change. It should not be late to keep these records. With an increased interest and awareness, evidence should be compiled by doing the necessary studies and should be reflected to the services and policies [37].

References

- (2020) NASA, Climate Change.
- TC Cumhurbaşkanlığı Strateji Ve Bütçe Başkanlığı (2019) Sürdürülebilir Kalkınma Hakkında Temel Bilgiler, Ankara.
- (2020) NASA, Climate Time Machine.
- IPCC (2018) Intergovernmental Panel On Climate Change, Global Warming of 1.5 ° C Special Report.
- World Health Organization (2014). Quantitative Risk Assessment of The Effects Of Climate Change On Selected Causes Of Death, 2030s And 2050s.
- World Health Organization (2018) COP24 Special Report Health And Climate Change.
- Kiraz E (2019) İklim Değişikliğinin İnsan Sağlığına Etkileri, Ankara: İklim Değişikliği Eğitim Modülleri Serisi
- US EPA (2019) A Guide to The Uv Index.
- Gasparrini A, Guo Y, Hashizume M, Lavigne E, Zanobetti A et al. (2015) Mortality Risk Attributable To High And Low Ambient Temperature: A Multicountry Observational Study. *The Lancet* 386: 369-375.
- Guo Y, Gasparrini A, Armstrong B, Li S, Tawatsupa B, et al. (2014). Global Variation in the Effects Of Ambient Temperature On Mortality: A Systematic Evaluation. *Epidemiology* 25: 781-789.
- Ho HC, Knudby A, Walker BB, Henderson SB (2017) Delineation of Spatial Variability In The Temperature-Mortality Relationship On Extremely Hot Days In Greater Vancouver, Canada. *Environmental Health Perspectives* 125: 66-75.
- Vardoulakis S, Dear K, Hajat S, Heaviside C, Eggen B, et al. (2014). Comparative Assessment of The Effects Of Climate Change On Heat-And Cold-Related Mortality In The United Kingdom And Australia. *Environmental Health Perspectives* 122: 1285-1292.
- World Health Organization (2018) WHO Warns: Stay Alert and Help Vulnerable as Cold Grips Europe.
- (2020) Türkiye Meteoroloji Genel Müdürlüğü, Ultraviyole Radyasyonu Etkileyen Faktörler.
- Bais AF, Lucas RM, Bornman JF, Williamson CE, Sulzberger B et al. (2018)



- Environmental Effects of Ozone Depletion, UV Radiation and interactions With Climate Change: UNEP Environmental Effects Assessment Panel, Update 2017. *Photochemical & Photobiological Sciences* 17: 127-179.
16. Bernard JJ, Gallo RL, Krutmann J (2019) Photoimmunology: How Ultraviolet Radiation Affects The immune System. *Nature Reviews Immunology*.
 17. Cramp RL, Franklin CE (2018) Exploring the Link Between Ultraviolet B Radiation And Immune Function In Amphibians: Implications For Emerging Infectious Diseases. *Conserv Physiol* 6: 1-35.
 18. (2020) WHO, Ambient (outdoor) air pollution.
 19. (2020) WHO, Ambient air pollution: Health impacts.
 20. Sipra KM, Abrar MM, Iqbal M, Haider E, Shoukat HMH (2020) Can Pm2. 5 Pollution Worsen The Death Rate Due To Covid-19 In India And Pakistan?. *The Science of the Total Environment* 742: 144557.
 21. (2020) Centre For Research on Energy and Clean Air, 11,000 air pollution-related deaths avoided in Europe as coal, oil consumption plummet.
 22. Urrutia Pereira M, Mello Da Silva CA, Solé D (2020) Covid-19 And Air Pollution: A Dangerous Association?. *Allergologia Et Immunopathologia* 0546: 30109-30119.
 23. Chang HH, Meyerhoefer C, Yang FA (2020) Covid-19 Prevention and Air Pollution In The Absence Of A Lockdown (No. W27604). National Bureau of Economic Research.
 24. (2020) Centre For Research on Energy and Clean Air, How air pollution worsens the covid-19 pandemic.
 25. İklim Değişikliğinin Neden Olduğu Afetlerin Etkileri (2019) Ankara: İklim Değişikliği Eğitim Modülleri Serisi.
 26. Undrr (2019) 2018: extreme weather events affected 60 million people.
 27. Akay A (2019) İklim Değişikliğinin Neden Olduğu Afetlerin Etkileri, Ankara: İklim Değişikliği Eğitim Modülleri Serisi.
 28. Brandes C (2018) Can Climate Change Cause Earthquakes?
 29. Masih A (2018) An Enhanced Seismic Activity Observed Due To Climate Change: Preliminary Results From Alaska. In *Iop Conference Series: Earth and Environmental*.
 30. SB (2015) İklim Değişikliğinin Sağlık Üzerine Olumsuz Etkilerinin Azaltılması Ulusal Programı ve Eylem Planı, Sağlık Bakanlığı, Türkiye Halk Sağlığı Kurumu, Ankara.
 31. TUBA (2020) Türkiye'de İklim Değişimi ve Halk Sağlığı Raporu, Ankara.
 32. Yüksel B, Boğa SM, Yıldırım, SA (2018) Küresel Isınmanın İnsan Sağlığı Üzerine Etkisi, Uluslararası Marmara Fen ve Sosyal Bilimler Kongresi 2018 Bildiriler Kitabı 23-25.
 33. Zhong ZP, Solonenko NE, Li YF, Gazitúa MC, Roux S, et al. (2020) Glacier ice archives fifteen-thousand-year-old viruses. *Bio Rxiv*.
 34. Hawryluk I, Mellan TA, Hoeltgebaum HH, Mishra S, Schnekenberg RP, et al. (2020) Inference of COVID-19 epidemiological distributions from Brazilian hospital data.
 35. Myllyvirta L (2020) Thieriot H 11.000 air pollution-related deaths avoided in Europe as coal, oil consumption plummet.
 36. Kiraz E (2020) Pandemi, Sağlık ve İklim Denkleminde Yeni Bilinmeyenler Eklendi.
 37. Kiraz E (2020) İklim Değişikliğinin İnsan Sağlığına Etkileri (İklimİN).