

“Climate change”-A potential risk factor for cancer ?

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Highlights:

1. Climate change and its consequences are disturbing major resources of life (e.g. air and food)
2. Disturbed climate negatively impacting on human health and causes several health related problems
3. Weather patterns changes can contribute to cancer progressiveness.
4. Lack of awareness and lack of preparedness is a major challenge.

Abstract:

Cancer, mainly known for abnormal growth and altered cellular function is now the second prominent reason of death in the world. There are so many factors responsible for this disease and one of the major factors is climate change. The deviations of weather patterns that is definitely as a result of human activities over long periods of times generally referred as climate change. The consequence's includes, increasing temperature, melting of ice, rising of sea levels, increasing wind speed, changes in rainfall patterns etc. Due to all these concerns, the most important resource for a healthy life– Air, Water, and Food are gets disturbed and as a results causes several health related problems. Previous researches related to this field also demonstrated that climate change played critical role over cancer risk and cancer surveillance. It increases the amount of carcinogens and also its blocks patients' access to cancer hospitality. Here in this article you will get to know about the impacts of climate changes on health. Why this can be potential risk factors for cancer by focusing mainly on lung and skin cancer and about some well-known limitations that we need have to resolve in the near future. In this concerns several steps has been implicated globally but more preparedness and attentiveness are reasonable.

Key words: Climate change, Health impacts, Skin Cancer, Lung cancer, Awareness

1. Introduction:

It is well known to us that the climate change has very unique impacts over health but unfortunately it is dangerous (Haines et al. 2006). Mostly due to human activities the normal patterns of weather gets changed dramatically and the consequences, like high temperature, rainfall, melting of ice, rising of sea levels, increasing of wind speeds all these disrupting the healthcare, social, economic structure globally(Haines et al. 2006; Wright et al. n.d.). Data published on 2008 indicates that the burning of fossil fuels, deforestation by humans helps to increase carbon dioxide up to 30% that traps heat into the atmosphere causing rising of temperature(Asia et al. 2008). The report from AR4 IPCC 2007 also says that at 21 century ends, worldwide peoples will experience a higher temperature than the last 10,000 years because the surface temperature will vary between 1.1 and 6.4 degrees Celsius and the sea level will rise estimated 0.17m during 20th century (Asia et al. 2008). Recent data supports its role in several health related disorders like vector- and water-borne diseases, lung disease, skin problems and also cancer (Kaffenberger et al. 2016; Wright et al. n.d.)(Bharath 2009). Still now the fact is that it is not fully curable but on the other the amount of carcinogens in nature are getting increased by the effect of climate change (<https://www.hsph.harvard.edu/c-change/news/climate-change-and-cancer/> n.d.). It also found to be acts as a barrier for cancer patients' to access cancer care, treatments and hospitality thus impacting on survivals(Nogueira 2020). The major drawback is that majority of the people are not educated or warned in this case that again proved by the small recent survey (see in the point number 5). So for all these everyone should be aware about its bad effects and try to heal our beautiful nature. In this concern more caring and more effective warranted from both nations and every individuals. This abstract was accepted at 2020 GW4 Symposium Climate Change - Science & Society and I have presented my topic on 3rd December 2020. Here in this article, I have tried to present the role of climate changes over health and cancer in brief.

2. Methods:

For this manuscript I did literature review from Google scholar, Research gate and Google search engine. I have used climate change, cancer as the major search keywords. Here a survey data also presented. I did the online survey for one week long through the Google forms (Received response, N = 31) and the main focus of this survey was to get a instant idea about how much aware people about climate change and cancer.

3. The relation with health:

Climate change has very important role in healthcare. It can be comes from several dimension and directly or indirectly can affect the human health's. Here in brief I have summarized the relation between climate change and health problems. Like as heat waves that is linked with climate change and causes highest deaths mostly suffer the Western Europe peoples (Haines et al. 2006; Johnson H, Kovats RS, McGregor GR 2005). Elderly peoples are died in this as it can contribute several cardiac

and respiratory problems as high temperature found to increase the heart rate so can cause heart attack and failure on the other the high temperature can contribute in multi system failure (Giang, P. N., Dung, d., Bao Giang, K., Vinh, H. V., & Rocklöv 2014). Climate change can also increase air pollution too and impacts over health (Haines et al. 2006). Natural disasters like flood, droughts also performed key role in human health's (Ahern M, Kovats RS, Wilkinson P, Few R 2005).

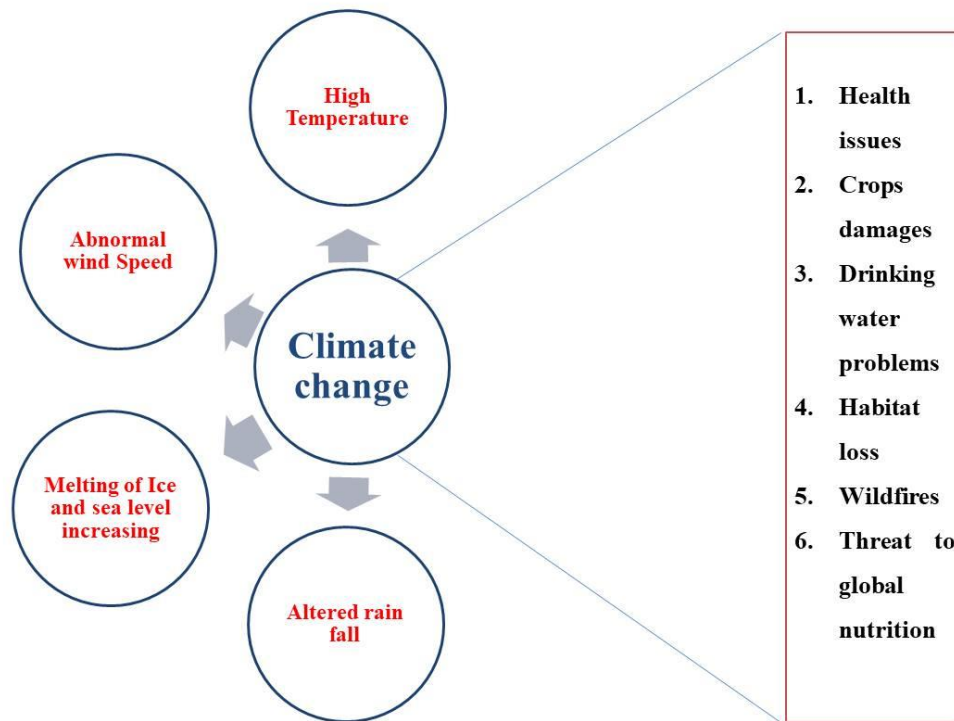


Fig.1, Schematics represents climate change and its effects.

Floods can be the reason for the mobility of toxic chemicals (Albering HJ, van Leusen SM, Moonen EJC and JCS 1999), it cause diarrheal and respiratory diseases (Ahern M, Kovats RS, Wilkinson P, Few R 2005; Haines et al. 2006) both high- and low-income countries, Droughts and floods both together can hindered several important facilities like hospitals, electricity, drinking water, (Meusel D and Dresden, German.In: Menne B, Bertollini R, Kirch W 2005) crops, etc., and by all these means it contribute towards humans health's. Vector born infectious disease also gets affected by means of their transmission procedure with climate change, as associated to humidity, heat, altered rain etc. and contributed to our health (Kovats S, Bouma MJ, Hajat S, Worrell E 2003). A brief overview on this demonstrated in the figure 1.

4. Cancer and climate change:

As discussed, changing in weather causes several health problems it also reported to contribute in cancer. Previous articles published in this field also supports that it can contribute also in

cancer by means of increasing carcinogens(<https://www.hsph.harvard.edu/c-change/news/climate-change-and-cancer/> n.d.) and one of them is dioxin with 50 years half-life (International Agency for Research on Cancer. Polychlorinated Dibenzo-para- Dioxins and polychlorinated dibenzofurans. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, No. 69. World Health Organization/International Agency for Research on 2020; Nogueira 2020). The wild fires that has great role in air pollution also contribute in cancer by increasing the particulate matter in environment(Jaffe D, Hafner W, Chand D and D. 2008; Liu JC, Mickley LJ, Sulprizio MP 2016).

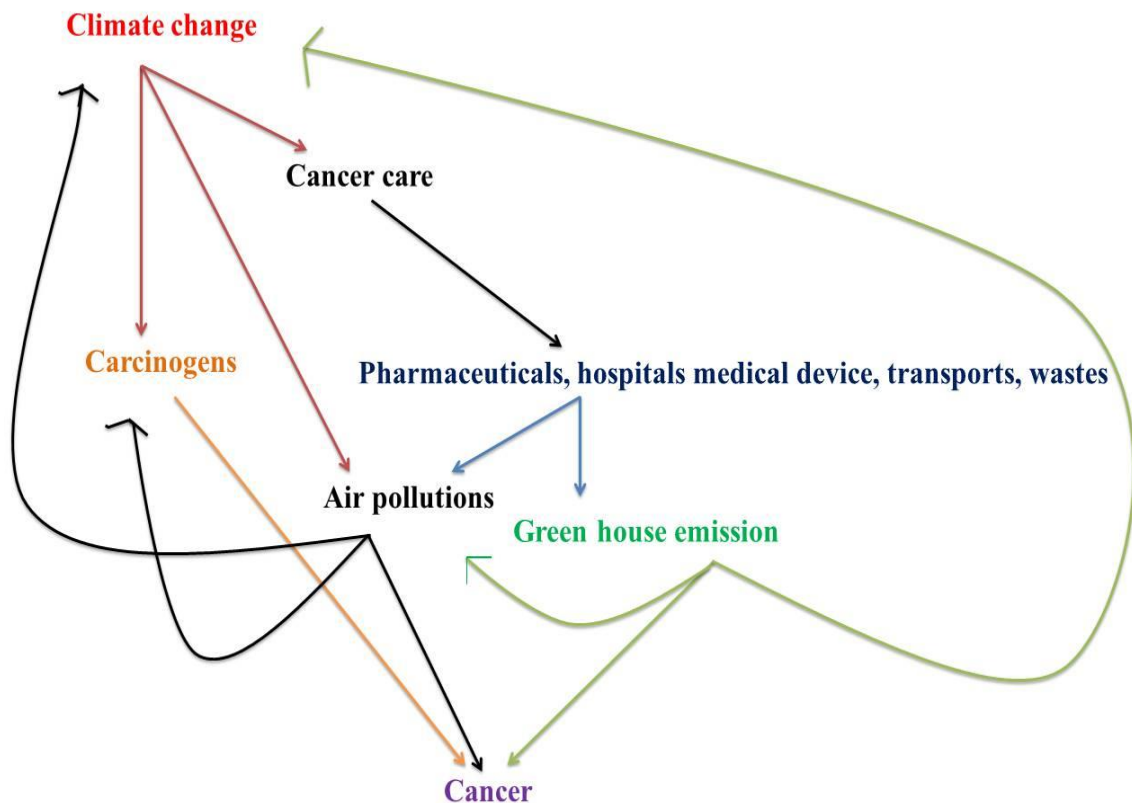


Fig.2, Climate change and cancer relation

Weather changing also can uphold the concentration of aflatoxin, potent carcinogen in dietary source also (Battilani P, Toscano P and HJ 2016). According to the reported data, changes in environment like high temperature can increase the concentration of aflatoxin of *Aspergillus* sp and lower in cold season (A.A. Motalebi, K. Ardalani and S. Jamili 2008). There are mainly 3 types of known skin cancers, Basal cell carcinoma(BCC) Squamous cell carcinoma(SCC), and malignant melanoma(MM) and among these most dangerous is malignant melanoma due to death upto 80% (Bharath 2009). It is reported that weather changes and its adverse effects like heat, ozone depletion by chlorofluorocarbons, and sun exposure, ultraviolet exposure all can

contributes in skin cancer development (Bharath 2009; Diffey B. 2004; Kaffenberger et al. 2016) (Narayanan, D.L.; Saladi, R.N.; Fox 2010). The direct exposure of sun in childhood and adolescence can promote BCC (Corona R, Dogliotti E, D'Errico M 2001), in case of SCC the guardian of genome gets mutated by UV exposure and helps the development of these types of tumors (Ziegler A, Jonason AS, Leffell DJ 1994) and MM also formed due to UV-B and UV-A (Bharath 2009). Apart from that the particulate matters, volatile organic compounds (VOCs), ozone, nitrogen dioxide and sulphur dioxide also contribute in skin cancer (Mancebo, S.E.; Wand 2015), specifically the PM and polycyclic aromatic hydrocarbons impacts majorly in skin cancer experimented in animal models (Zegarska, B.; Pietkun, K.; Gienza-Kucharska, P.; Zegarski, T.; Nowacki, M.S.; Romanska-Gocka 2017).

The adverse effects of climate change also responsible for the lung cancer development (Ku 2011). It's mostly affected by air pollution due to biomass combustion or coal gas (Hopkinson et al. 1985; Ku 2011). Not only lung cancer other respiratory disease like COPD (Chronic obstructive pulmonary disease) are also caused by the indoor pollution (Kurmi OP, Semple S, Simkhada P, Smith WC 2010; Torres-Duque C, Maldonado D, Perez-Padilla R and G. 2008; Zhang JJ 2007). It was measured that apart from tobacco smoking the indoor pollution (wood fire, fire generated from waste or coal) are highly dangerous for the lung cancer especially for the women who are using coal for cooking purpose (Ku 2011). The lung cancer formation rate incidents in women's are found 3 fold higher from past 20 years and according to smoking history it is 50% higher in men than before 20 years (Lan Q, Chapman RS, Schreinemachers DM, Tian L 2002). According to WHO (World Health Organization) the 3 billion people are cooking using the normal stove with kerosene or wood or other waste or coal and 3.8 million people are died due to this indoor pollution and 8% of them are died due to lung cancer (<https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health> n.d.), that tells us about its severity itself. In this concern in India Prime Minister Narendra Modi led central government launched LPG scheme known as Pradhan Mantri Ujjwala Yojana (<https://www.india.gov.in/spotlight/pradhan-mantri-ujjwala-yojana#tab=tab-1> n.d.), that is very effective step, as the main objective is to save rural woman's mainly of India from the health hazards that comes from fossil fuels and it could reduce household air pollution too.

Here the notable point is that the consequences of climate change not only cause cancer by increasing carcinogens only, one another major problem is related with cancer care, because it disrupts healthcare facilities and delivery that is the most important for the treatment, diagnosis of cancer patients (Man RX, Lack DA, Wyatt CE 2018). Due to hurricanes most of cancer patients (Non-small cell lung cancer) are died due to disruption of radiation therapy according to Nogueira LM *et al* research (Nogueira LM, Sahar L and Jemal A 2019) and specifically hurricane Maria in 2018 causes national shortage of intravenous medicine (FDA, Scott, and Gottlieb 2020). The healthcare system mainly the pharmaceutical industries and hospitals are also released several gases like anesthetic gas used in surgery which are more dangerous than carbon dioxide, and this are the source of carbon footprint (Chung JW 2009; MacNeill AJ,

Lillywhite R 2017; Nogueira 2020). The energy costs in cancer treatment facilities, medication, from packaging to delivery of the pharmaceuticals, considerably impacts to greenhouse gas discharges (Nogueira 2020). The transport of patients and staff to specialized cancer treatment indirectly contributed in vehicle emission that promote climate change, although it can be minimize by promoting physical means like waling ,cycling etc. (Demark-Wahnefried W. 2006; Monninkhof EM, Elias SG and Al. 2007).

All the information in this field as proved that climate change is very importantly related with development of cancer, so we can say that this climate change is a potential risk factor for cancer and in present situation everybody should have to be concern with its side effects.

5. Survey results:

For knowing the people awareness about the climate change and its impact on cancer I have performed a 7 days long online survey and the data is very impressive as presented below from fig 3-6. According to the result the peoples from age group of 18 to > 31, the 90.3% of them are very concerned about the climate change and its impact on health but 9.7% are not. Another response from the same age group also indicates that about 12.9% from total participants are not sure whether the weather change can contribute to cancer or not. Data represented here from only 31 responses, and it is based on India thus more responses required from globally for proper evaluation. The data are represented below.

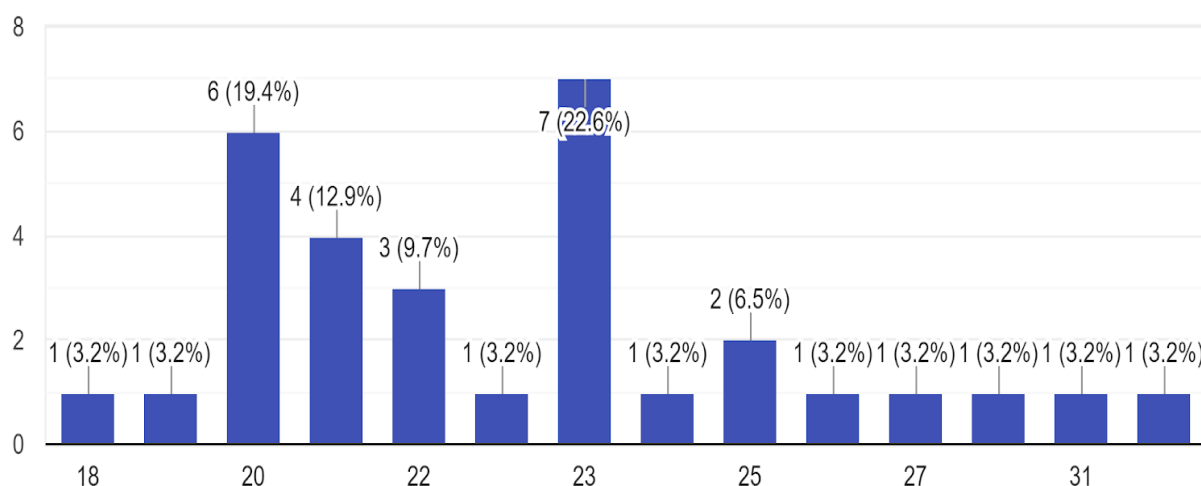


Fig.3. Following chart represent the age distribution of participant's. The X axis is for age and Y axis denotes the number of responses.

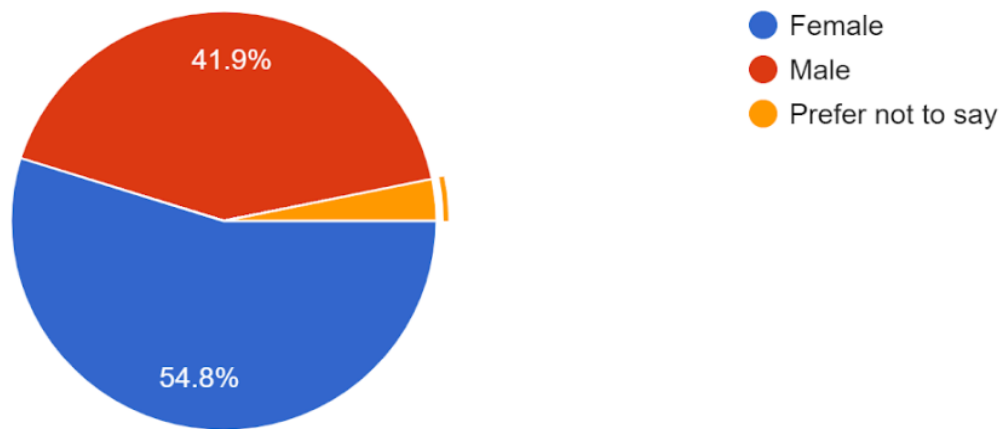


Fig.4. Chart represents the gender ratio of the participant's.

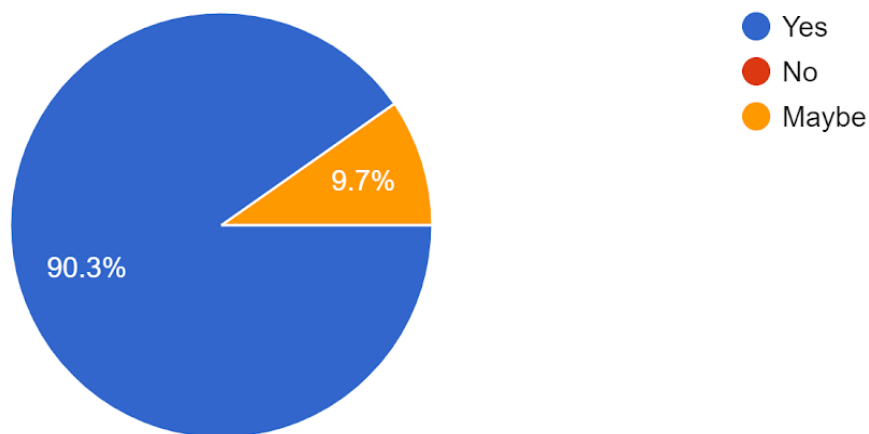


Fig.5. Following chart represent how much people are concerned about the climate change impact on health. The data shows that about 90.3% are very concerned but 9.7% are not sure.

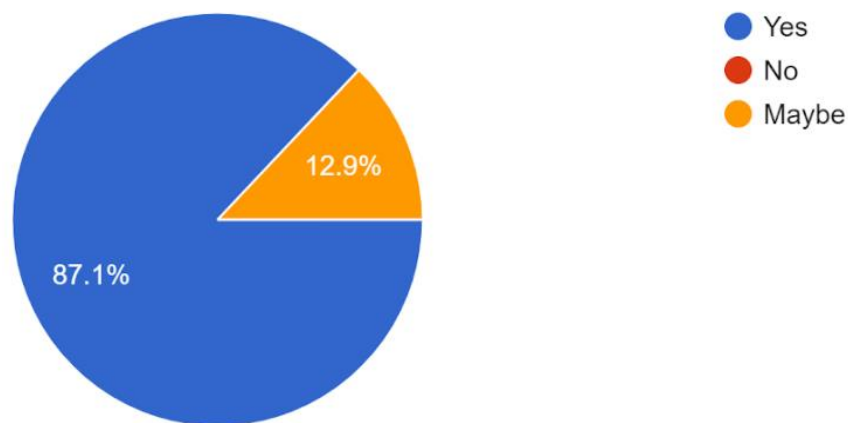


Fig.6, The Chart represent that how much people know that change in climate can cause cancer. The data shows about 12.9% from total participants are not sure.

Conclusions and Future insights:

Still now we have discussed the impact of climate change in cancer. Now here we should point out the limitation in this field and betterment here thus very meaningful. Still now several peoples are not concerned about the effects of climate change and its impact in cancer so more awareness is required both in public and academic level. Several project, camps, internships must be includes in college level that will helps in both improving the knowledge in this filed. It will also help to contribute the students for the betterment of the environment and reduced its risks.

For controlling several consequences in case of climate change several steps has been implicated globally but more preparedness and attentiveness are reasonable. Like for reducing air pollution that found majorly contributed in lung cancer so here smart policies like low or zero emission stove (Ku 2011) must be used. The steps are reasonable in case of developing and low income countries.

To date, no studies have estimated the carbon footprint of cancer care (Nogueira 2020),so more research must be performed for better knowing , both from hospitals and pharmaceutical companies. The work is very important for developed and high income counties. As we know that the health care system of cancer also responsible for a great amount of greenhouse emission starting from the energy, pharmaceutical, medical devices, etc so more development and policies are very meaningful here to control over greenhouse emission. A very effective rule is thus expected to implements in this regard. There is a need to assess weaknesses and categorize cost-effective interposition (Haines et al. 2006) options in the both health and other sector related to health issue because an early planning and detections can help reduce future adverse health

impacts. Lastly we should know that peoples doesn't so what they says so we should focus doing something rather saying lots of things.

In conclusion we can say that the climate change positively contributes in cancer development so everybody should be aware with its consequences. I have pointed out some of the limitations but more are there that needs to be assessed by the governing authority in each country and should be controlled by implementation of some policies.

Declaration:

The author declares that; this work is original & totally done by him. Use or Modification of other's articles (open access) data, idea, and information related to this field done after giving appropriate credit to the original author(s) and the source. The author, furthermore, makes no representations that the data available in the referenced papers is free from error. I am sorry if I did not cite your valuable paper due to space issue.

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