

# A Review of Measures against Increasing Temperature and Climate Change for the Safeguard of Workers in India

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## ABSTRACT

Severe heat causes various health related problems among the workers in India. Working under hot and humid environment damages health of workers especially the agriculture labourers, construction workers, rickshaw pullers, vendors, brick kiln workers and daily wage labourers. High humidity and high temperature can lead to heat stress even in 38°C temperature. The damage might be temporary, like heat related injuries to permanent like, critical heat stroke. Sometimes, it leads to occupational hazards which is irreversible in nature. Despite these serious issues, there is minimal preparation which exposes the workers to serious conditions. This paper evaluates various consequences of climate change and increasing temperature on the workers. Various databases like PubMed, Scopus and Google Scholar have been enquired to bring evidences across industry and places. The effects of heat and temperature were thematically arranged to understand the seriousness of the issues. Suggestions and way forwards are also discussed for the solution for workers and sustainability of various sectors depending on labourers working under the heat of sun. The paper suggests the requirement of creating a heat combating environment by coordinating among various government departments and agencies for the welfare of the workers. The industrial workers have to be provided with sufficient measures by various industries as per the governing laws. The agriculture and brick kiln workers have to work in mild heat and with sufficient protection to avoid consequences. The government need to monitor the unorganised sectors for protection of workers by law enforcing organs.

**Keywords:** Heat stroke, Health and safety, Occupational health hazards, Unorganised workers

## INTRODUCTION

Climate change affects many facets of life in entire globe due increasing in temperature in every decade. The effects of long summer period and climate change can be avoided by preventive and adoptive measures [1]. The ill effects of climate change and heat wave are causing reduction of agricultural production, increase of infectious diseases and difficulty in adapting warmer and unpredictable weather in daily life. Working under hot and humid environment damages health of workers especially the agriculture labourers, construction workers, rickshaw pullers, vendors, brick kiln workers, daily wage labourers and other vulnerable groups [2-4]. The Indian workers engaged in physical work are highly exposed to the detrimental effects of environmental stress. In addition, many workplaces, such as steel plants and factories are hot and stressful for the workers. However, some cities have their own heat action plans in a fragmented manner like Ahmedabad and Bhubaneswar [5,6]. After a record setting heat wave in 2010, the city of Ahmedabad in Gujarat created a heat action plan and has published materials for policy makers, employers, medical personnel and citizens to help them prepare for future acclimatisation to heatwaves [5]. Odisha State Disaster Management Agency (OSDMA) also comes up with a health action plan for Odisha in 2017 [6]. A heat wave in hot weather can be harmful to vulnerable groups [7].

Heat stroke is common in India especially in summer season with cases reported in various media [6,7]. Evidence shows that hyperpyrexia develops after strenuous work under the sun [8]. Heat related illness ranges from minor exhaustion to fatal heat stroke [9]. Heat stroke has 10% to 50% mortality range in a scientific study conducted in India [10]. The survivors of heat stroke continue with permanent neurological damages [11]. Besides these, the heat stroke also damages brain, skeletal muscles, lung, intestine, blood and pancreas [12,13]. Studies found that in multi-organ failure due

to heat stroke, there is high rate of mortality even with advanced critical care services [14].

It has been found that due to changing climatic conditions there is twice rate of increase of global temperature which would result in high seasonal heat exposure to the workers [15]. This climate change would make the existing work tedious for millions of workers [16]. Indian workers depending on manual work have to be affected by the climate change in different forms like heat exhaustion, and serious form of fatigue [16-18].

## Literature Review

The study adopts secondary literature review method. This paper evaluates various consequences of climate change and increasing temperature on the workers. The effects of heat and temperature were thematically arranged to understand the seriousness of the issues. Suggestions and way forwards are also discussed for the solutions relating to health of the workers. The evidence based practices from different part of India are discussed. Based on scientific evidences arguments are made for the improvement of the working conditions. Suggestions are drawn from social and scientific value of the recent time.

## Findings

Various articles are reviewed based on the working conditions of brick kiln workers, industrial workers, rice harvesters, manual labourers, etc. A study in West Bengal, India found that the women working in brick kiln suffer five months of heat stress and radiation from the brick kiln. There is linear lowering of productivity in working under heat of the sun for longer period of time which is based on weekly data points. The cardiac parameters measured in hotter days (26.9 to 30.74°C temperature) were significantly higher than cooler days (16.12 to 19.37°C temperature) for the brick molders [7]. The problems are numerous in the Indian setup especially in

summer season for the outdoor workers. Most of the problems in last decade are attributed to climate change and increasing temperature at various places [16-18].

According to a study in agriculture field, exposure to occupational heat resulted in heat illness and reduction in performance [19]. Various strategies have been developed according to international thermal ergonomic standards to facilitate the workers. The poor and developing countries are exposed to excessive heat with little preparedness [19]. The high prevalence of excess heat in many occupations and cultural contexts results in poor implementation of various guidelines meaningfully [20]. Further, the global warming and climate change is supposed to escalate the situation in many places [16].

A study on rice harvesters show that heat exposure on the workers increase the risk of heat stroke and limit the essential productivity [6]. The measurement of hourly heat exposure in rice fields and perceived health problems by interviewing 124 rice harvesters shows various outcomes. The study found that most workers reported exhaustion and pain while working on hot and humid days. The heart rate recovered very first in days having low temperature and slowly in days having high temperature [7]. This indicate there is a clear cardiovascular strain on the workers in hot days. This reduction is supposed to be escalated by climate change and have effect on the local economy [7]. The studies conducted in Pune, Ahmedabad and Surat found that there is increase in risk of all-causes of mortality rate during prolonged summer and spells of high ambient heat [21-23].

### Cooling System for Factory Workers

The Factories Act 1948 has elaborate provision for the structure and layout of the industry to maintain proper temperature [24]. The said act needs to be followed strictly with sufficient provision of good ambience in the industrial settings. Many industries have inadequate provision of cooling systems, natural shades or shed with fans in the working place. Government should subsidise the cooling equipments for local business where cooling system is used to protect the workers. Those business houses practice scientific cooling system needs to be incentivized.

The details of cooling system is provided in a scientific manner by adopting improved cooling tower performance, increasing capacity of the existing plant and energy audit [25]. Engineering control by air conditioning and proper ventilation help in reduction of heat related illness. There are some emergency concerns for provision of affective clothing, measuring the heat and humidity index and proper ventilation for creation of an effective working environment [25]. Environment of the work place need to be controlled basing upon the air temperature and relative humidity while radiant heat and air movement should also be considered as an important factor in planning stage [24]. The consequences like excessive sweating leads to severe dehydration and ultimately end up in chronic kidney failure affecting the health of workers [26].

### Provision of Cotton Clothing

The Building and Other Construction Workers Act 1996, The Factories Act 1948, The Dangerous Machines (Regulation) Act 1983, and The Municipal Solid Waste (Management and Handling) Rules 2000 provide guidelines about clothing for the workers [24]. In this respect, use of thin breathable cotton clothes would be promoted. Scientifically designed heat-protective clothing help in reducing body temperature than the ordinary clothing for the workers. Light clothing and long underwear moderates the extreme weather conditions for workers stationed in hot and cold places alternatively. Hand gloves, full face mask and protective equipments are provided by many industries for the protection of workers and quality of work. However, those organisations who do not comply with such standards have to be brought into notice. Studies found

that high mortality due to heatstroke is found due to the failure of multiple organs where all the protective measures are not followed in the industry [27].

### Providing Rest Hour During Work

Government of India regulations for the safety of workers in different settings is available. Regulations like Occupational Safety and Health (OSH) at workplaces namely The Mines Act 1952, The Factories Act 1948, The Building and Other Construction Workers Act 1996, The Dangerous Machines (Regulation) Act 1983, The Insecticides Act, 1968, The Municipal Solid Waste (Management and Handling) Rules, 2000, and The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 details about the safety and security of workers [24]. There is specific guidelines for working hour, breaks in between working hour, details of the equipments required for the work and medical checkups. However, these laws are not followed in proper spirit due to lack of implementation and enforcement by the industry and regulatory bodies' respectively [6].

There should be breaks in between the working hour to reduce the risk of dehydration, nausea and vomiting, heat stroke and musculo-skeletal pain. Rest at regular interval is adopted as a technique in many industries for the improvement of production, reduction the accidents and reducing of attrition. It has been found that, if a worker is physiologically acclimatised, then the health risk are reduced [26]. Also, behavioural acclimatisation by slowing down the pace of the work helps in reducing strain on human body [28-30]. Rest during work to cope up with difficult situations would help in achieving the goals of the organization [5,6].

### Provision of Cold Water

The Mines Act 1952, The Factories Act, 1948, and The Building and Other Construction Workers Act 1996 encourage provision of cold water for the workers [24]. The basic facilities are mostly not available in the work places as mentioned by various reports [5,6]. Maintaining sufficient body fluid during work is essential for those working under the sun. The workers must have sufficient fluid in their body to maintain the cardiac volume [31,32]. Encouraging hydration by providing drinking water and other drinks like buttermilk, raw mango juice, and coconut water help in improving the work culture. Some companies make special provision for refreshment of the workers especially in a hot and humid environment.

### Adopting Better Food Habit

The food habit with sufficient calorie and fluid has a great influence on the endurance of heat [31,32]. Evidences show that lack of sufficient food and strenuous work results in less productivity [5,6,31,32]. Eating large meals at a time also results in heat generation inside body. So, small meals should be taken by the workers at relatively lesser interval. Labourers working in large organisations usually have to work in the day time like farmers, venders and rickshaw pullers, as the job is available mostly in day time. However, the work schedule could be modified to encourage small meals for the improvement of the health of the labourers. Physiologically the workers should be physically fit in the working hours. Evidences shows that Gastrointestinal symptoms such as nausea, vomiting and diarrhea are common due to exposure to heat of sun. This is a secondary symptom of the heat stroke due to low volume of body fluid [31,32].

### Scheduling of Work During Less Heat

Evidences shows that heat exposure in agricultural and brick kiln workers lead to fatigueless and ultimately reduction in the productivity due to untimely scheduling of work under the sun [33]. So, it is important to schedule the work in such a way that the exposure to heat would be less. There may be a trade-off between maximising wage or income and working under the sun. If possible, work shift

policies should be there to avoid outdoor work during dangerous afternoon heat. In India, the summer seasons are less productive due to heat waves. However, it can be given a good shape by adopting better working schedule especially by introducing early working hour for outdoor activities wherever possible.

### Reducing Physical Damage

The work has to be classified and provided with sufficient engineering aptitude for management. Evidences found that there is neurological disorder after the exposure to heat stroke while working excessively [11,31]. This manual workers face accidents at work place. Avoidance of such activity would provide a safe environment and free from neurological disorders. To reduce physical damages mechanical assistant can be provided for proper facilitation of work [11]. Manual works are getting replaced by machines especially heavy works. It is the sole duty of the industry to reduce heavy manual work. The physical damage have to be reduced for the betterment of the workers. In agriculture mechanisation or semi-mechanisation of many activities have to be there to reduce physical labour. Brick kilns and construction sites may use different automated machines as substitutes for muscle power.

### Awareness Among Supervisors and Workers

Studies have been found that excessive environmental heat deranges the physiological function and health status [34,35]. Workers as well as their supervisors need to be vigilant of the dangers of heat stress [35]. There is requirement of advanced knowledge of working environment to understand the mechanism of heat in the human body. The signs and symptoms of heat stroke should be disseminated among the workers. The knowledge about the referral network should be told in advance to the workers for further treatment. Supervisors needs to have orientation training to monitor the heat wave situations to avoid accidents among the workers [5].

### Involvement of Local Press and Media

Local press and media are always helpful for the dissemination of messages among the targeted workers and their employers. The media should provide information regarding maintenance of proper temperature, prevention of sickness and essential requirements for extreme weather which are otherwise also available in various action plans [5,6]. There should be inter-agency collaboration to ensure successful running of all the systems before extreme heat events involving media. Local press and media not just help in disseminating the awareness against hot and humid atmosphere but also disseminate the information forecasted by meteorological department for the benefit of the workers.

### Special Protection of Female Workers

The decrease in productivity of female worker has a negative impact on family finances. In India, there is no guideline for normal temperature range for women to work under the hot and humid weather. So, there is a significant need for regional, occupational and gender-specific guidelines for tropical countries like India. Men and women are affected by heat differently in terms of muscular strength, body weight, blood volumes and thermoregulation [5,6]. Women have additional responsibilities of cooking and taking care of children after a long day of physical labour. They may also find it difficult to carry out strenuous physical activity during menstruation. Unequal wages distribution creates additional threats to cope their health problems. Domestic work and nursing kids in home makes women's more vulnerable than men. There should be a separate neat and clean toilet for the women workers in workplaces. Where ever possible the eligible women workers should be given maternity benefit in industrial and organised sectors. Exhaustive and comprehensive legislation is urgently needed for regulating working conditions, wage structure, welfare measures of the women workers [24].

### Strengthening Health Centres

Strengthening the base of the Primary Health Centers (PHCs) for ensuring the health and nutritional status of the workers is a major concern [5]. The PHCs needs to be equipped with a separate facility to treat heat related cases with air conditioning and emergency medicines. Evidence shows that the high rise of temperature results in increased admissions of heat related cases at the Intensive Care Units of Chennai, Tamil Nadu. The vital parameter of heat stroke affected patients were deranged due to lack of effective treatment procedures at health centres [31]. So, there is need for the optimal preparation at health facilities for prompt treatment of the heat stroke cases. Only health sector preparedness to fight the heat wave cannot work, rather other departments should be coordinated for the benefit of the workers [36]. The health department have to work on the policies of climate risk assessment, providing awareness, intersectoral co-ordination, surveillance, and reporting.

### Involvement of NGOs

Powerful messages need to be spread out through the use of local Non-Governmental Organisations (NGOs) for mass coverage on the climate issues and safety of workers [1]. Communication through self-help-groups of women and NGOs is needed for the receptivity among workers and employers. There are a large number of women groups and NGOs which work with migrant population in the unorganised sector. Empowering these groups with the relevant latest IEC materials would enable them to fight the heat wave. Evidences show that old age alcoholics and people suffering from neurological disorders and dehydrating illness have higher risk of heat stroke [37-39]. Hence, the NGOs have to target these vulnerable groups and protect them by educating while going to work. They can also provide protective equipments to the vulnerable group of workers.

### Role of Administration

The District Collectors, District Magistrates, Labour Officers, and other key government officials can take constant surveillance and surprise visits to ensure the owners of organisations are transparent in implementation of safety measures [5]. Based on the meteorological predictions, the local administration can provide information for the awareness of general public regarding heat wave. Yellow alert is provided if the temperature ranges between 41.1-43°C, orange alert is provided when it ranges between 43.1-44.9°C, whereas red alert with extreme heat alert day is declared when the temperature is more than 45°C [5]. Monitoring of the hazardous sites by government officials is an important activity. The Mines Act 1952, The Factories Act, 1948, The Manufacture, Storage and Import of Hazardous Chemicals Rules 1989, and Bio-medical Waste Management and Handling Act 1998 make specific provision to monitor specific conditions for the welfare of the workers by saving them from hazardous conditions [24]. However, it is monitored with less rigorous process by the concerned administration. Various Acts like the building and other construction workers Act, which focuses on the better management of workers should be enforced in letter and spirit [5]. There is a need to form acts and laws for the unorganised sector with clear instructions for the benefit of the workers.

### Suitability of Suggested Actions

Many of the studied aspects were suitable for factory workers only, like provision of clothing, air conditioning, health management of employees, working hour reduction and gaps in between work. Most of these factors do not apply to other type of workers like farmers, vendors, brick kiln workers and rickshaw pullers who works on unorganised sectors but face similar heat conditions. However, the preparedness by government, civil society, NGOs and media should equally promote for the protection of all the workers. The aspects like role of administration and precautionary



measures have been discussed for the protection various type of workers.

## CONCLUSION

Rescheduling of the working hour, following rest cycle and frequent fluid intake can reduce the effect of heat wave among industrial workers, agricultural labourers, brick kiln workers and other vulnerable labourers working in hot and humid weather. However, those working in unorganised sector have to be provided with sufficient information on precautionary measure for combating heat wave. There is a need to create a heat resilient environment by coordinating between various departments and agencies. Overall the suggested activities for improvement of working conditions have to be carried out for the welfare of workers.

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