Climate Change: Implications for Human Resources in Informal Sector of Eastern India

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ABSTRACT

India, home to one-sixth of the global population, has 39.1% citizens constituting the working population; about 92% of the latter belong to unorganized sector. Hence, the unorganized sector plays a pivotal role in man-days generation and contribution to the national economy, despite the earning per person in unorganized sector being about one-eighth of his/her counter-part in organized sector. On the other hand, Climate Change phenomenon caused inter alia due to Global Warming, because of increased emission of GHGs, has been responsible for about 0.6 ° C rise in ambient temperature during the 20th century and at present the rate of increase is 0.2° C per decade. It is projected that 1.8 - 4.0 (average 3.0) ° C increase will take place by 2100 AD depending on actions taken to limit GHG emissions and future developmental scenario. There will be obvious adverse impacts on health. The human resources belonging to the industrial sector, particularly the unorganized/informal sector for its increased obvious vulnerability, in a tropical country like India neither can remain insulated from the problem. A further rise in ambient temperature, which is taking place, in our tropical environment will definitely aggravate the situation, especially for individuals occupationally exposed to high temperature. The paper elaborates further with occupational health biomarkers and environmental data, of industrial sectors in West Bengal, having high occupational heat exposures, as well as initiatives with potential for being benchmarked, for addressing the problem.

Key words: Global Warming, GHGs, Carbon footprint, CDM, unorganized sector

INTRODUCTION

Climate change, the leading public health threat of the 21st century, caused inter alia due to Global Warming, 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 has been responsible for about 0.6° C rise in ambient temperature during the 20th century and at present the rate of increase is 0.2° C per decade. The average global temperature is still rising and it is estimated that it will go up a further 1.8–4.0°C (estimated average 3.0°C) by 2100 depending on actions to limit GHG emissions, geographic, local met conditions and adaptation measures[1]. Global climate change is affecting living and working environments, creating health threats for millions of people[1,2]. The latter may create impacts both on workers' health[3] and on economic conditions[4]. There is growing evidence that changes in the global climate will have profound

effects on the health[5] and well-being of citizens in countries throughout the world with workers in low and middle-income tropical countries are likely to be at highest risk of excessive heat exposure. India, the second most populous country in the world, being a tropical one, is no exception to it. Unorganized sector in Indian working population accounts for more than 6% of the global population and the proportion is rising fast. The working population in India is about 39% of total population. With increasing population, India is faced with the challenge of sustaining its rapid economic growth while dealing with the global threat of climate change. Carrying out prolonged physical activity in a hot, humid environment increases the risks of heat exhaustion and heat stroke[6,7]. The indirect effects of heat exposure translate into an increased risk of bodily harm and injury, caused by fatigue and reduced vigilance[8]. The accident incidence rate is minimal when the work activity is performed at temperatures of approximately 17°C to 23°C WBGT, but increases with lower or higher temperatures[9]. Work performed at a high ambient temperature can change worker skills and capacities when physical tasks are involved; this in turn can have consequences on work capacity, productivity and safety. The physical discomfort associated with an increase in body temperature can also alter the workers emotional state (e.g. irritability or anger), leading to negligence regarding safety procedures and reducing vigilance during the performance of dangerous tasks[10]. The dehydration caused by exposure to a hot environment also seems to have effects on cognitive performance, visual motor capacities, short-term memory, and vigilance[11]. To date, the scientific community has focused very little on its repercussions on OHS, yet workers can be affected both directly and indirectly by climate change, notably by the heat stress to which they may be exposed and by changes in the ecosystems that form the basis of their economic activities. Present work, in this backdrop, has been undertaken to provide an overview of the links between climate change and its potentially adverse effects on human resources (HR) engaged in different informal sectors of eastern part of India.

APPROACH

Present study was carried out on individuals engaged in different informal sectors of West Bengal having work experience of at least 5 years. Environmental heat stress indices were assessed and physiological stress was estimated. On the basis of the study conducted on HRs, not differing significantly in terms of age, physical parameters, working experience, it may be mentioned that there is occurrence of physiological strain due to work and exposure to heat. On assessment of the thermal status of the work environment in different work zones, it has been found that about two-third of the work zones are not suitable for carrying out activity, particularly in the summer months.

DISCUSSION

Human thermal comfort, a condition of mind, which expresses satisfaction with the surrounding environment, is a prerequisite for better productivity of any organization. High temperatures

and humidity provide discomfort sensations and sometimes heat stress (i.e., reducing the body's ability to cool itself). Moreover, discomfort and heat stress affect performance of workers and may lead to more serious health problems. The impact on human function and health in work situations is a 'neglected' effect of global climate change. The potential health risks and worker productivity reductions due to climate change are substantial; this is in consonance with a previous study[12]. The lack of attention until recently may well be due to the fact that this is mostly a problem in low and middle-income tropical countries where climate change impacts during this century will be prominent and air conditioning is not widely available. Resultant change in climate in low and middle-income tropical countries may increase the prevalence, distribution, and severity of known occupational hazards. There are two approaches to address the problem of climate change namely mitigation and adaptation and recently National Action Plan for Climate Change (NAPCC) addresses the critical concerns through a directional shift in the development pathway through Eight National Missions. In dealing with the challenge of climate change, strategies mainly focus on promoting understanding of climate change, adaptation, mitigation, energy efficiency and natural resource conservation. There are Eight National Missions which form the core of the National Action Plan representing multi-pronged, long term and integrated strategies for achieving key goals in the context of clinate charge. They are namely National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for sustaining the Himalayan Ecosystem, National Mission for a Green India, National Mission for Sustainable Agriculture and National Mission on Strategic Knowledge for Climate Change. The mission regarding Strategic Knowledge for Climate Change has on its research agenda socio-economic impact of clinate charge focusing impact on health. The most commonly used empirical heat index in occupational health is the Wet Bulb Globe Temperature (WBGT) index. This index takes into account air temperature, radiant temperature, humidity and air movement, and is the basis for time limitations of work in different heat exposure standards. Occupational heat exposure guidelines based on WBGT state maximum heat exposures in jobs at different work intensity (in Watts). The international standard presents the proportions of work hours during which workers need to take rest, depending on work intensity and WBGT index value, in order to avoid the core body temperature exceeding 38°C for an average worker. International standard presents WBGT 'reference values' (the point at which some preventive action should be taken) to determine the WBGT levels that require no hourly rest, or rest to the extent of 25, 50 and 75% (rest/work ratios) during the working hour. The US guidelines also include a WBGT level at which no work should be carried out without special protective clothing at a higher level of heat exposure. At light work intensity (200 Watts) the need for rest periods each hour starts at a WBGT of 31°C, while at heavy work intensity (500 W) this threshold occurs at a WBGT of approximately 25.5°C. Although WBGT is very common and widely used indicator, every time it is not considered ideal as an

occupational heat stress index for individual work situations and thus many other alternatives have been proposed; e.g. the Required Sweat Rate index, the Predicted Heat Strain index and the Thermal Work Limit[13,14]. In context of working environment, the work capacity is defined as the percentage of a working hour that a worker can perform his/her intended work. If no rest time is needed, because of heat, during a working hour, then the work capacity is 100%. If 75% rest time is needed, the work capacity is 25%, etc. Using this approach, loss of work capacity in heat exposed occupations for every hour of the day can be estimated. Occupational health, a multi disciplinary approach to the recognition, diagnosis, treatment, prevention and control of diseases/injuries of occupational origin, should aim at the promotion and maintenance of the highest degree of physical, mental and social well-being of all workers in all occupations, the prevention among workers of departures from health caused by their working conditions, the protection of workers in their employment from risks resulting from factors adverse to health, the deployment of workers in an occupational environment adapted to his physiological and psychological ability. It is imperative that measures should be taken to ensure that all the workers irrespective of their place of employment are assured of OHS. The need for remedial suggestion in form of work rationalization is accentuated in view of the likely effects of climate change phenomenon particularly on the human resources engaged in unorganized sector in a tropical LDC like ours. In order to strike a balance between the compelling need of continuation of the work and protecting the health and well being of the human resources in the long run, there should at least be rest/ allocation of light intensity work. The increasing heat exposure due to climate change is likely to create occupational health risks and to have a significant impact on the productivity of many workers, unless effective preventive ('adaptation') and protective measures reducing the occupational heat stress are implemented. This may be practically and economically possible for indoor environments, but it is much more difficult for outdoor environments otherwise, it may adversely impact economic and social development in affected countries especially when the working population is occupationally exposed to high temperature, unless appropriate preventive measures, with potential for being benchmarked are taken, for addressing the problem.

REFERENCES

1. IPCC. Fourth assessment report. Geneva, Inter-governmental Panel on Climate Change. Cambridge: Cambridge University Press; (2007). Available from: www.ipcc.ch [cited 18 October 2008].
2. Costello A, Abbas M, Allen A, Ball S, Bell S, Bellamy R, et al (2009). Lancet-University College London Institute for Global Health Commission. Managing the Health Effects of Climate Change. *The Lancet*. 373: 1693-733.
3. Kjellstrom T. Climate Change, Direct Heat Exposure, Health and Well-Being in Low and Middle-Income Countries. Global Health Action (2009). DOI: 10.3402/gha.v2i0.1958.

4. Kjellstrom T. Climate Change, Heat Exposure and Labor Productivity (2000). *Epidemiology*. 11: S144.
5. Santra T, Chatterjee S, Banerjee N, Mukherjee S (2014). Global Warming: Impact on Human Health, Proceeding of the State Level Seminar on Impact of Pollution: Assessment and Awareness, Nabajatak Prakashan. 113-19.
6. Tanaka, M (2007). Heat Stress Standard for Hot Work Environments in Japan. *Ind Health*. 45: 85–90.
7. Kjellstrom, T (2009). The 'Hothaps' Programme for Assessing Climate Change Impacts on Occupational Health and Productivity: An Invitation to Carry Out Field Studies. *Glob Health Action*. 2: 10-7.
8. Ramsey, J.D (1995). Task Performance in Heat: A Review. *Ergonomics*. 38: 154-65.
9. Ramsey JD, Burford CL, Beshir MY, Jensen RC (1983). Effects of Workplace Thermal Conditions on Safe Work Behaviour. *J Saf Res*. 14 (3): 105-14.
10. Tawatsupa, B, Lim LL, Kjellstrom T, Seubman SA Sleigh A (2010). Thai Cohort Study Team. The Association between Overall Health, Psychological Distress, and Occupational Heat Stress among a Large National Cohort of 40,913 Thai Workers. *Glob Health Action*. 3: 10-20.
11. Grandjean A.C. and Grandjean N.R (2007). Dehydration and Cognitive Performance. *J Am Coll Nutr*. 26(5 Suppl): 549-54.
12. Mukherjee S (2013). Occupational Health scenario in Unorganized Sector in India: Emerging issues, Proceedings of 100th Session of the Indian Science Congress. 123-4.
13. Brake DJ, Bates GP (2002). Limiting Metabolic Rate (Thermal Work Limit) As an Index of Thermal Stress. *Appl Occup Environ Hygiene*. 17: 176-86.
14. Miller VS, Bates GP (2007). The Thermal Work Limit is a Simple Reliable Heat Index for the Protection of Workers in Thermally Stressful Environments. *Ann Occup Hyg*. 51: 553-61.