INTRODUCTION

Global climatic change is expected to make hot regions further hotter as per predictions (IPCC 2007). There is a widespread agreement that the climate is changing due to a wide range of natural and human factors. The World Health Organisation, and others, now recognise that climate change is not simply an environmental or developmental issue; it is a significant and emerging threat to human health and wellbeing (McMichael et al 2003). Climate change is defined as a change in the statistical properties of the climate system over long periods of time (UNFCCC 2011). It is a significant and lasting change in the distribution of weather patterns over a wide range of periods from decades to millions of years. Climatologists have concluded that as a consequence of global warming, it is likely that heat waves will become more intense and more frequent in the future (IPCC 2007). The causes for climate change are multi factorial such as deforestations, pollution exhaust from industries etc. There is substantial evidence of association between global warming and human health impacts either directly or indirectly (Kjellstrom et al 2013).

The negative impacts of increased temperature may progressively increase in developing countries especially in tropical countries like India. Increase in level of heat pose significant risk to individuals especially to the elderly, the very young, vulnerable people working in the industries and the chronically ill (Joon et al 2012). Heat stress is the net (overall) heat burden on the body from the combination of the
body heat generated while working, environmental sources (air temperature, humidity, air movement, radiation from the sun or hot surfaces/sources) and clothing requirements (ACGIH 2010). Humans, being warm blooded have the tendency to regulate their own internal environment (body fluids, electrolytes, temperature etc..) within a constant level (Homeostasis). The temperature of human body is maintained within a narrow range of 36.5-37.5°C by hypothalamus even during wide fluctuations in environmental temperature (Parson 2003). There exists a thermal balance in the human body between heat gain and heat loss during various day to day activities. Failure of the temperature regulating mechanisms can alter the thermal balance which may lead to heat disorders like heat rash, heat exhaustion, heat stroke etc (Daniel et al 2015).

Workers who are working in various industries where heat production is more are at increased risk of heat related illnesses. They experience an additional heat load on the body from their work environment apart from the external environmental temperature. Significant sources of heat can be found in workplaces such as foundries, smelters chemical plants, bakeries and commercial kitchens (ACGIH 2010). For outdoor workers, direct sunlight is usually the main source of heat exposure. In mines especially deep mines geothermal gradients and equipment contribute to heat exposure (Donoghue A et al 2000). Humidity in workplaces also contributes to heat stress. Indoor & Outdoor work without air conditioning is already a major human heat strain in India (S.K.Dash et al 2011).
labour and poor working conditions have a huge impact on the working population in India. There was a noticeable disconnect between worker’s perceptions and their ability to secure workplace improvements related to heat stress from the management (Balakrishnan et al. 2010). Human metabolic processes are critically temperature dependant. Changes in the thermal balance have negative impacts on the health and work capacity of the exposed population. A rise in the body temperature results in heat related illness. The heat related illnesses includes heat rash, heat exhaustion and heat syncope which can lead to heat stroke if not treated properly. Other health parameters that can get altered due to increase in temperature are sweat rate, heart rate and body fluid levels which may have profound health impacts if left untreated (Srinivasan et al. 2016). The heat strain parameters that were measured in the previous studies include core body temperature (Dehghan et al. 2012), Skin temperature (Parson 2003), Sweat rate (Bates et al. 2008), Resting/working heart rate (Yamamoto et al. 2007), Urinary specific gravity (Montazer et al. 2014), Serum creatinine (Peraza et al. 2012), Serum electrolytes (Morioka et al. 2006), VO₂ Max (Parson 2003). In the study done by Dehghan et al. 2012, more than 60% of the workers had increase in the ear canal temperature was over 1°C in post work measurements. Environmental warmth greatly influenced the sweating response (PK Nag et al. 2007). In the study done by Farshad et al. 2014, there was increase in urine specific gravity in workers exposed to hot environments. In the study done by Yamamoto et al. 2007, heart rate, body temperature and scores for subjective symptoms significantly increased after 30 min heat
exposure. There are many challenges and constraints a researcher faces while doing studies in industries (Srinivasan K et al 2016). Most of the earlier studies on assessing physiological effects have been conducted on experimental settings rather than actual field settings. Such studies although provides us with important information regarding the relationship between heat stress and heat strain, it might not be possible to use the same methodology at work place. There is a dearth of studies on occupational heat stress and its health impacts in India especially in southern India. Therefore it is very much essential in the current scenario to study the health impacts due to heat stress among workers which may provide valuable information to protect their health through planning and implementing suitable interventions to reduce morbidity and mortality. The diversity in Indian climatic systems necessitates scientific studies in different regions of the country (S.K.Dash et al 2011). There are 5000 industries in and around Chennai. Occupational heat stress is a major health issue with several potential negative health and well-being outcomes. Hence the present study focuses on examining the health impacts of occupational heat stress of selected occupational groups in Tamil Nadu, South India.