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Health and occupational implications of heatwave exposure in Southern India

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Research Article

Keywords: Heat waves, physical and mental health, work productivity, coping strategies

Posted Date: November 23rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11611210/v1

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Additional Declarations: No competing interests reported.

Abstract

Background and Objective The global average surface temperature has surpassed 1.55°C, driving climate and environmental changes that pose an explicit and escalating threat to public health. People with low socio-economic status and the elderly are susceptible to heat-induced illnesses. This study aimed to examine outcomes of heatwave exposure and its association with physical and mental health, work productivity, and coping mechanisms.

Methods The study used an analytical cross-sectional design to examine health outcomes, work productivity, and coping mechanisms associated with heatwave exposure in Chennai and Chengalpattu districts, Tamil Nadu, India. A convenience sampling technique was employed to recruit 944 participants. The semi-structured interview schedule was used to collect information.

Results 92.8% of study participants were exposed to heatwaves. There was an association between heatwave exposure and outcomes of physical health, mental health issues, work productivity, and coping strategies**.** Binary logistic regression showed that gender (AOR = 2.088, 95% CI: 1.236–3.527, p = 0.006) and age (AOR = 0.496, 95% CI: 0.288–0.854, p = 0.011) were significantly associated with heatwave exposure. Monthly mean income loss differences across occupational groups due to exposure were found across occupational groups ($F(2746) = 3.49$, $p = .031$, $\eta^2 = .009$). The daily mean work hours differed significantly across occupational groups due to heatwave exposure ($F(2746) = 15.90$, $p < .001$, $\eta^2 = .041$).

Conclusion The study advocates for multidisciplinary research, developing a policy framework for occupational regulations and localised measures to mitigate climate change and safeguard vulnerable populations.

1 Introduction

The global 10-year average temperature from 2015 to 2024 was 1.14°C above pre-industrial levels, driven by human activities. The global average surface temperature surpassed 1.5°C in 2024, resulting in global climate changes that pose a hazard to public health and the survival of the global population. Heatwaves are no longer rare weather episodes; they have become one of the most visible health consequences of a warming planet[1, 2]. Since the mid-20th century, India has seen a cumulative shift in heat wave patterns, leading to increased mortality and morbidity [3].

According to the National Weather Service of the United States of America, heatwaves were the primary cause of both mortality and morbidity, compared to other weather-related problems[4]. In 2017, the extreme heatwaves in China claimed 16,299 deaths, resulting in 61, 304 million in losses in the country[5]. 1116 deaths occurred annually across 10 cities in India, including Chennai, attributable to exceptional heatwaves(de Bont et al., 2024). People with chronic problems, the elderly and people with low socioeconomic status are susceptible to heat-induced illnesses due to their inability to adjust to the change in temperature. Outdoor workers experienced heat stroke, exhaustion, dehydration and urinary problems more frequently than others(Abunyewah et al., 2025). 338 participants from 44 countries

reported in a study that 83.5% had anxiety, functional disorder, and depression due to exposure to heatwaves[8]. A significant association was found between heat exposure and worsening self-reported mental health, including depression, anxiety, fatigue, and fear[9]. A heat index of at least 49°C was associated with an increased likelihood of heat exhaustion (OR = 2.66, 95% CI: 1.13–6.25, p = .025) [10]. Yet another study highlighted that mental health impacts such as stress, sleep disruption, anxiety, fatigue, and social isolation were the result of exposure to extreme heatwaves[11].

The International Labour Organization reports a notable loss in labour productivity and working hours, with a reduction in labour availability and work capacity when temperatures exceed typical thresholds[12]. The labour force's efficacy on moderate-to-high-intensity tasks was reduced due to heat stress by 50% and between 31% and 38%, respectively, when they were working in temperatures exceeding 33–34 degrees Celsius[13]. Labour productivity may decline by 11–27% by 2050 in Asia and the Middle East, owing to the rise in the frequency of heatwaves and global warming, if initiatives and industrial policies are not acted upon[14].

Many research studies on extreme heatwaves have increased, focusing on social implications and leaving significant gaps in understanding the wider implications. This focus has limited the understanding of the full range of heatwave implications, including public health crises, work productivity, environmental degradation, and economic losses [7, 15–17]. There exists an obvious gap between the development of epidemiological approaches for heatwave-related disasters and their practical application at the local level, as these approaches are often not tailored to the specific needs and conditions of local communities, leading to ineffective responses during heatwave events. Inadequate research has studied heatwaves and preparedness and climate readiness in local public health and health care systems. Consequently, local planning and strategies for adaptation remain unexplored and inadequately informed, leading to a lack of effective responses to heatwave-related health risks in vulnerable communities[18].

In this context, the study endeavoured to analyse the physical and mental health outcomes, work productivity, and coping and resilience strategies in the mitigation process. Its findings could enhance and deepen the current understanding of the effects of heatwaves and contribute valuable insights for future studies, climate adaptation policies, and community-based resilience programs on the burden of heatwaves on physical and mental health.

2 Methods

The study employed an analytical cross-sectional design to examine the outcomes of physical and mental health, work productivity, coping strategies, and their association with heatwave exposure. The study was conducted among a vulnerable population in Chennai and Chengalpattu districts, Tamil Nadu, South India. The study strictly adhered to ethical protocols by obtaining informed consent from participants before data collection, ensuring confidentiality, and preserving anonymity. The inclusion criteria for recruiting participants in the study were as follows: participants had to be aged 18 years or

older, have resided in the Chennai and Chengalpattu districts for at least one year at the time of data collection, be willing to volunteer, provide informed consent, and be able to report their experiences of heatwave exposure.

The sample size was calculated with the single population proportion formula, n = Z^2P(1-P)/d^2. Based on the previous study reporting a prevalence of 23% among workers exposed to heatwaves in Tamil Nadu[19]. The initial sample size was estimated at 756 using a 95% confidence interval (Z = 1.96) with a precision of 3%. The sample size was increased to 945 to account for a 20% non-response rate. Finally, 944 participants were included, comprising 496 from Chennai and 448 from Chengalpattu districts. The participants were selected from accessible areas in two selected districts using a convenience sampling technique. The districts were selected at random; however, when interpreting the findings and their generalizability to the wider community, consider the convenience sampling of participants.

The tool used to collect information from the participants was a semi-structured interview schedule. It included four domains: socio-demographic profile, the implications of heatwave exposure on physical and mental health, work productivity, and coping mechanisms in response to them. Each domain had some substantial questions to gather information from the participants. The pilot study was conducted to assess the study's feasibility. The interview schedule was sent to experts for content validation and then pretested with 30 participants. Consequently, necessary additions and omissions were made in the schedule to enhance its quality. Then, the schedule was administered in the two districts by trained field investigators to gather data from the population in summer 2026.

Subsequent to the data collection, the information collected was checked for authenticity, coded by assigning Arabic numeral codes, entered into an Excel sheet, and then exported to SPSS-21 for analysis. The analyzed data were presented as tables and diagrams with interpretations of important variables relevant to the objectives of the study. Chi-square, ANOVA, and binary logistic regression tests were conducted to assess associations and correlations among variables, including socio-demographic factors, heat wave exposure, physical and mental health implications, work productivity, and coping strategies, among others.

3 Results

Table 1
Distribution of socio-demographic profile

Variables	Gender		Total	Chi-square
	Male	Female	N = 944(%)	p < 0.05
	N = 359(%)	N = 585(%)		
Age category				
18–30	96(26.7)	110(18.8)	206(21.8)	< 0.001**
31–40	95(26.5)	130(22.2)	225(23.8)	
41–50	72(20.1)	177(30.3)	249(26.4)	
Above 50 Years	96(26.7)	168(28.7)	264(28)	
Locality				
Urban	234(65.2)	300(51.3)	534(56.6)	< 0.001**
Rural	75(20.9)	158(27)	233(24.7)	
Semi Urban	50(13.9)	127(21.7)	177(13.9)	
Education				
Illiterate	55(15.3)	158(27)	213(22.6)	< 0.001**
School Education	260(72.4)	383(65.5)	643(68.1)	
Graduate	44(12.3)	44(7.5)	88(9.3)	
Employment				
Unemployed	39(10.9)	156(26.7)	195(20.7)	< 0.001**
Unskilled worker	166(46.2)	284(48.5)	450(47.7)	
Semi-skilled worker	85(23.7)	64(10.9)	149(15.8)	
Skilled Worker	69(19.2)	81(13.8)	150(15.9)	
Marital status				
Married	265(73.8)	511(87.4)	776(82.2)	< 0.001**
Unmarried	90(25.1)	58(9.9)	148(15.7)	
Widow	4(1.1)	7(1.2)	11(1.2)	
Separated	0	9(1.5)	9(1)	

*N=Number, %=Percentage & **p < 0.05 = p- value

Variables	Gender		Total	Chi-square
	Male	Female	N = 944(%)	p < 0.05
	N = 359(%)	N = 585(%)		
Age category				
Ownership of house				
own House	134(37.3)	295(50.4)	429(45.4)	< 0.001**
Rented House	225(62.7)	290(49.6)	515(54.6)	
Roof of house				
Terraced	220(61.3)	324(55.4)	544(57.6)	< 0.001**
Tiled	96(26.7)	163(27.9)	259(27.4)	
Thatched	43(12)	98(16.8)	141(14.9)	
*N=Number, %=Percentage & **p < 0.05 = p- value				

Women constituted the predominant group in the study population (62%). The over-50-year age group constituted 28%, whereas the 41-50-year group was slightly lower at 26.3%. The mean age of the women was ± 42.65 with a standard deviation of 13.792; however, it was ± 39.83 for their counterparts, men, with a standard deviation of 13.962. 56.6% of the participants were from the urban side, whereas 24.7% were from the rural side. 68.1% of participants had completed their school education, and 20.7% had no formal education. 47.7% were engaged in primary unskilled work; on the contrary, 20.7% were unemployed. The study population consisted of 82.2% married individuals. 54.6% of the participants resided in rented houses, which was slightly higher than the participants living in owned houses, at 45.4%. 57.6% resided in terraced houses, and 27.4% in tiled houses. The finding indicated that 25.1% of participants earned 5001–10000/- as their monthly income; in contrast, 24.8% earned 15001–20000/-. Their average monthly income was ± 12,904.34, with a standard deviation of 16,554.470. Table 1 highlights the socio-demographic profile of the participants.

Table 2
Association between locality and physical and mental health outcomes, reactions, and coping strategies due to heatwave exposure.

Variables	Locality			Total	Chi-square
	Urban N = 534(%)	Rural N = 233(%)	Semi urban N = 177(%)	N = 944(%)	p < 0.05
Physical health					
Heat Exhaustion	14(2.6)	2(0.9)	8(4.5)	24(2.5)	< 0.001**
Heat Rash	186(34.8)	116(49.8)	27(15.3)	329(34.9)	
Dehydration	155(29)	68(29.2)	63(35.6)	286(30.8)	
Urinary Problems	116(21.7)	46(19.7)	41(23.2)	203(21.5)	
Skin Burn	19(3.6)	1(0.4)	14(7.9)	34(3.6)	
No Noticeable problem	44(3.2)	0	24(13.6)	68(7.2)	
Mental health					
Irritable	238(44.6)	56(24)	51(28.8)	345(36.5)	< 0.001**
Anxiety	92(17.2)	44(18.9)	28(15.8)	164(17.4)	
Depression	107(20)	98(42.1)	50(28.2)	255(27)	
Poor concentration	53(9.9)	35(15)	24(13.6)	112(11.9)	
No Noticeable problem	44(8.2)	0	24(13.6)	68(7.2)	
Mental health reaction					
Acute Coping	136(25.5)	36(15.5)	52(29.4)	224(23.7)	< 0.001**
Uncomfortable	138(15.8)	77(33)	54(30.5)	269(28.5)	
Drain mentally	216(40.4)	120(51.5)	47(26.6)	383(40.6)	
No Noticeable reaction	44(8.2)	0	24(13.6)	68(7.2)	
Coping strategies					
Stay Indoor	188(35.5)	86(36.9)	46(26.3)	320(34.1)	< 0.001**
Drink a lot of water	228(43)	127(54.5)	99(56.6)	454(48.4)	
Use of fan or AC	87(16.4)	10(4.3)	11(6.3)	108(11.5)	

*N=Number, %=Percentage & **p < 0.05 = p-value

Variables	Locality			Total	Chi-square
	Urban N = 534(%)	Rural N = 233(%)	Semi urban N = 177(%)	N = 944(%)	p < 0.05
Physical health					
Watch TV or Listen to Music	2(0.4)	1(0.4)	4(2.3)	7(0.7)	
Wear Light Clothes	19(3.6)	3(1.3)	8(4.6)	30(3.2)	
Do Breathing Exercises or Meditate	2(0.4)	0	3(1.7)	5(0.5)	
Talk to a friend and loved one	8(1.5)	6(2.6)	6(2.6)	14(3.4)	
*N=Number, %=Percentage & **p < 0.05 = p-value					

92.8% of the study population reported exposure to heatwaves, with 41.9% always, 20.7% often, 17.9% sometimes, and 12.3% rarely. Exposure to heatwaves caused physical health problems, with heat rashes (34.9%), dehydration (30.3%), urinary problems (21.5%), and heat exhaustion and skin burns (6.1%). 92.7% reported mental health problems due to exposure to heat waves, with irritation (36.5%), depression (27%), anxiety (17.4%), and poor concentration (11.9%). According to 79.2%, long exposure to heat waves would cause chronic mental health problems. Regarding their feelings during the summer heat, 40.6% of participants felt mentally drained; however, 28.5% experienced discomfort. Regarding coping strategies for heatwaves, 48.4% of participants increased their water and fluid intake, 34.1% stayed indoors, and 11.5% used fans or air conditioning while wearing light clothing. Chi-square analysis showed significant associations between locality and all four outcome domains examined: physical health, mental health problems, mental health reactions, and coping strategies (all p < 0.001**) (Table 2).

Out of 944 participants, 876 (92.8%) experienced heatwaves and suffered from various physical health issues, with 301 (34.4%) seeking medical attention for heat-induced illnesses at nearby healthcare facilities. Of the total, 136 individuals (45.2%) pursued medical attention for skin allergies, rashes, burning sensations, and irritation; 75 individuals (24.9%) sought care for fever, colds, fatigue, bodily ache, and giddiness; 54 (17.9%) for dehydration; and 36 (12%) for blood pressure and cardiovascular diseases. Exposure to heatwaves was statistically associated with seeking treatment for heat-induced illnesses at nearby health care centres (p < 0.001**).

The effect of heatwave exposure on work productivity disruption was reported in diverse forms, with 79.3% of participants experiencing income loss and work disruption, followed by reduced working hours (40.3%), long breaks (31.1%), and a lack of focus (19.1%). The results clearly indicate that their work productivity is disrupted.

Table 3
Occupation-based differences in disruption of daily work hours and monthly income loss associated with heatwave exposure

Variables	N	M±(SD)	95% CI	F(df)	η²	p value
Occupation						
Disruption of Daily working hours						
Unskilled	450	1.77 (0.48)	1.72–1.81	15.9(2746)	0.04	< 0.001**
Semi-skilled	149	1.57 (0.73)	1.45–1.69			
Skilled	150	1.49 (0.71)	1.37–1.60			
Total	749	1.67 (0.60)	1.63–1.72			
Monthly income loss						
Unskilled	450	4098.14 (3156.76)	3805.69-4390.60	3.49(2746)	0.01	0.031
Semi-skilled	149	4161.64 (2614.20)	3738.4-4584.85			
Skilled	150	4908.07 (4217.75)	4227.58-5588.57			
Total	749	4272.98 (3313.50)	4035.29-4510.66			

*M=Mean **SD=Standard deviation, ***Df=Degree of freedom, ****F = F-value, & *****Sig.=p-value (0.05), ******η²=eta squared & *******CI=Confidence interval.

The ANOVA test indicated that the daily mean work hours differed significantly across occupational groups (F (2746) = 15.90, p<.001, η²=.041). The unskilled workers reported the highest disruption score (M = 1.77, SD = 0.48), compared with semi-skilled (M = 1.57, SD = 0.73) and skilled workers (M = 1.49, SD = 0.71). The difference in disruption scores accounted for 4.1% of the variance by explaining the occupation.

There were mean income loss differences across occupational groups (F (2746) = 3.49, p=.031, η²=.009). The skilled workers had the highest mean income loss of 4098.14, semi-skilled workers 4161.64 and unskilled workers 4098.14. However, the effect was very limited, totalling 0.9% of income loss. The large standard deviations, especially within the skilled group, also indicate a large variation within each group. The 95% confidence intervals for the two groups, unskilled and skilled workers, do not overlap at all, implying that the difference is solely due to those two groups.

The results of the Table 3 indicate that mean income loss was the highest among the skilled workers, whereas work disruption was considerably greater among the unskilled workers. The unemployed group, with 195 participants, was excluded from the test because they neither earned income nor had their work disrupted. The study revealed that the economic and occupational effects of exposure varied across different skill categories.

Table 4
Binary logistic regression analysis of socio-economic factors associated with heatwave exposure

Variables	B	S.E.	Wald χ^2	p-value	AOR	95% CI for AOR
Gender (Male vs Female)	0.736	0.267	7.578	0.006	2.088	1.236–3.527
Age category (Below 40 vs Above 40 years)	−0.701	0.277	6.387	0.011	0.496	0.288–0.854
Education (Illiterates vs Literates)	−0.484	0.346	1.956	0.162	0.616	0.313–1.214
Occupation (Unemployed vs Employed)	0.316	0.330	0.917	0.338	1.372	0.718–2.620
Constant	−2.546	0.243	109.824	< 0.001	0.078	—

*AOR=Adjusted odds ratio, **CI=Confidence interval, ***%=Percentage, ****n=Number, *****B=Regression coefficient, & ******SE=Standard error, & *******Wald χ^2=Wald chi-square statistic.

Binary logistic regression showed that gender and age were significantly associated with heatwave exposure. Males had higher adjusted odds of reporting heatwave exposure than females (AOR = 2.088, 95% CI: 1.236–3.527, p = 0.006). Similarly, participants aged under 40 had lower adjusted odds of exposure than those aged 40 and older (AOR = 0.496, 95% CI: 0.288–0.854, p = 0.011). Neither educational status (p = 0.162) nor occupational category (p = 0.338) was statistically significantly associated with heatwave exposure. Table 4 shows the binary logistic regression analysis of the association between the socio-economic characteristics of the participants and heatwave exposure.

Results indicate that there was no widespread engagement with the set of resilience-related activities measured. According to Fig. 1, the most common response, reported by 55.2% of participants, was that they noticed no activities to improve resilience to heatwaves. However, there was maximum participation in awareness programs (18.3%), followed by volunteering in government programs (11.8%) and planting saplings (11.1%) among the reported activities. The percentages for shelter support (3.0%) and public water facility support (0.6%) were significantly low. The results highlight that there is a need for further strengthening of community participation and institutional support in implementing functional adaptation measures to heatwaves in the community. However, the lack of any reported participation should not be seen as a lack of individual or household resilience.

4 Discussion

4.1 Physical and mental health

The present study findings indicated that there is an association between heatwave exposure and outcomes related to health, work productivity, and coping strategies. It showed that a majority of participants had been exposed to heat waves, which have caused physical and mental health strains, including dehydration, rashes, skin problems, anxiety, poor concentration, irritability, and depression. An earlier Indian study noted heatwave exposure of urban and rural populations, and it is projected that India will see a rise in heatwaves that will be a burden to the health of people and their work productivity[20]. The incidence of physical illnesses among the working-age group between 15 and 65 years rises with elevated heatwaves due to occupational and environmental factors, and it significantly affects their health, increasing morbidity by 5.3% (RR = 1.053, 95% CI: 1.042–1.064)[21]. A study among older adults underscores that heat exposure was associated with increased depressive symptoms (β = 0·09, p < 0·001) and fatigue (β = 0·08, p = 0·001)[22]. High exposure to heatwaves has worsened mental health, including anxiety, depression, and decreased life satisfaction[9, 23]. A study conducted abroad has shown that elevated daily temperatures correlate with anxiety and depression, cognitive decline, sleep disruptions, increased suicide rates, and altered brain activity[24]. It is evident from all studies that exposure to heatwaves has had adverse physical and mental outcomes in all demographic spheres and has become a health concern for people, as their repercussions have been rising year after year.

4.2 Work productivity

In the present study, over half of the participants experienced a loss of work productivity, working hours and income due to heatwave exposure and other socio-demographic factors. A study abroad highlighted that elders and females had negative impacts on their work productivity owing to their outdoor work and exposure to temperature. They also encountered dehydration problems that prompted a loss of work productivity. There was a close relationship between dehydration and loss of work productivity. It also emphasised the importance of physical and behavioural adaptation strategies, such as rescheduling work and acclimatising to high temperatures, to maintain labour productivity. [25–27]. An African study indicated that heat-induced stress significantly reduces work capacity during labour. Self-employed subsistence farmers seem to adjust to heat stress by reducing the intensity of work, scheduling work activities for cooler parts of the day, and shifting activities to cooler times of the year[28]. However, the heat tolerance of workers significantly varies based on age, physical fitness, acclimatization, hydration levels, attire, health status, and medication, rendering static Wet Bulb Globe Temperature cut-offs inadequate as safety benchmarks. Its authors advocate for individualized monitoring alongside multidisciplinary cooperation, complemented by professional education, societal awareness, and climate-resilient infrastructure[29]. An earlier Indian study demonstrated that there was a strong association between severe effects on work productivity and economic loss due to high exposure to high temperatures[30]. Labour productivity is also being impacted by extreme weather and climate change, with a record number of potential labour hours lost in 2023 due to heat exposure, amounting to $835 billion in potential income losses. These losses primarily impacted low- and medium-HDI countries, constituting 7·6% and 4·4% of their GDP, respectively. These economic consequences have the greatest repercussions for the most vulnerable communities, further exacerbating global inequalities by limiting their ability to adapt to and recover from the increasing effects of climate change[31].

It is worth noting that indoor work remains unaffected, while outdoor work is largely affected, irrespective of geographical spheres. The current study is consistent with other studies conducted earlier on the association between the effect on work productivity and economic loss due to exposure to heatwaves. However, the adaptation strategies used to mitigate heatwaves vary according to age, health fitness, attire, hydration, infrastructure, insulation, and medication.

4.3 Coping and resilience strategies

The current study shows that heatwaves affect physical health, mental health, and work productivity, and that people cope through diverse mechanisms, including staying indoors, drinking more water, wearing light clothes, and using coolers and AC. There was an association between localities and coping mechanisms used to address heatwaves. A study abroad has shown that the use of air conditioning as a remedy to heatwaves is not sustainable. Many approaches, including planting trees, creating parks and awareness, shaded buildings, reflective roofing, insulation, and shaded windows, can mitigate urban heat[32]. Rescheduling work to early hours in the morning and acclimatising to heatwaves would increase productivity [25, 33]. At all levels, adaptation strategies have produced prompt and quantifiable decreases in heat-associated illness and deaths, whereas mitigation strategies are crucial for enduring risk alleviation but are yet to be assessed in health contexts[34]. As communities adapt to climate change, population-level behavioural, infrastructural and healthcare adaptations can alter the range of comfortable temperatures. However, low-income and informal-sector communities may be more vulnerable to the health effects of heat due to their limited access to cooling, housing insulation, and healthcare services. Epidemiological and laboratory evidence can inform practicable, place-specific adaptations to the tropical regions, such as creating shaded rest areas, providing drinking water, creating cooling areas, planting saplings, and making heat-health services more accessible[35]. An Indian study highlights the government's frameworks for addressing heatwaves through policy initiatives, which include protecting vulnerable populations, improving early warning communication, preparing the health care system, ensuring access to water and essential services, monitoring health outcomes, engaging the community, and developing long-term urban cooling systems[36]. While the current study aligns with the majority of earlier studies on coping strategies, they vary according to the geographical areas and locations, with local governance addressing the heatwave issues.

5 Strengths and weaknesses of the study

The study's major strengths were its large sample size, inclusion of different geographical settings, examination of physical and mental health outcomes, coping strategies and resilience, and integration of occupational and socio-economic dimensions. However, the analytical cross-sectional study design limits the ability to establish causal relationships between heatwave exposure and the observed outcomes. The findings should therefore be interpreted as evidence of associations rather than definitive causal effects.

6 Conclusion

The study results demonstrated that there was an association between heatwave exposure and outcomes in physical health, mental health issues, work productivity, and coping strategies. Binary logistic regression showed that gender (AOR = 2.088, 95% CI: 1.236–3.527, p = 0.006) and age (AOR = 0.496, 95% CI: 0.288–0.854, p = 0.011) were significantly associated with heatwave exposure. Monthly mean income loss differed across occupational groups ($F(2746) = 3.49$, $p = .031$, $\eta^2 = .009$). The daily mean work hours differed significantly across occupational groups due to heatwave exposure ($F(2746) = 15.90$, $p<.001$, $\eta^2=.041$). It further emphasizes the necessity of targeted, age- and gender-responsive interventions to strengthen nearby accessible health care services and awareness, heatwave preparedness and adaptive measures, and protect vulnerable populations. Comprehensive longitudinal public health and interdisciplinary research is needed to assess heatwave exposure and its effects on health outcomes, work productivity, and coping strategies, which may inform policy measures to safeguard people from the repercussions of heatwaves. Governmental entities may develop occupational regulations to safeguard individuals and implement localized climate mitigation measures.

Declarations

Acknowledgement

We extend our warm gratitude to the SRM Institute of Science and Technology, Kattankulathur-603203, Chengalpattu District, Tamil Nadu, India, for its support and encouragement in conducting this research study.

Authors' contribution

The first author drafted the final research study proposal, conducted a survey, and analyzed the data. The second author wrote a final draft of the paper and did formatting for it. The third author guided all through the study with technical inputs and finalized article for publication.

Funding

No funding was received for this research study

Data availability

Data may be shared on request

Ethics approval and accordance

The study was reviewed and waived by the institutional ethics committee of SRM Institute of Science and Technology, Kattankulathur, Chennai, India, on the grounds of less than minimal risk (IEC:9403/2026). The study was conducted in accordance with the principles of the Declaration of Helsinki and relevant institutional ethical guidelines. Informed written consent was obtained from all participants prior to data collection.

Clinical trial number Not applicable

Competing interest The authors declare no competing interests

Consent for publication Not applicable

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Figures

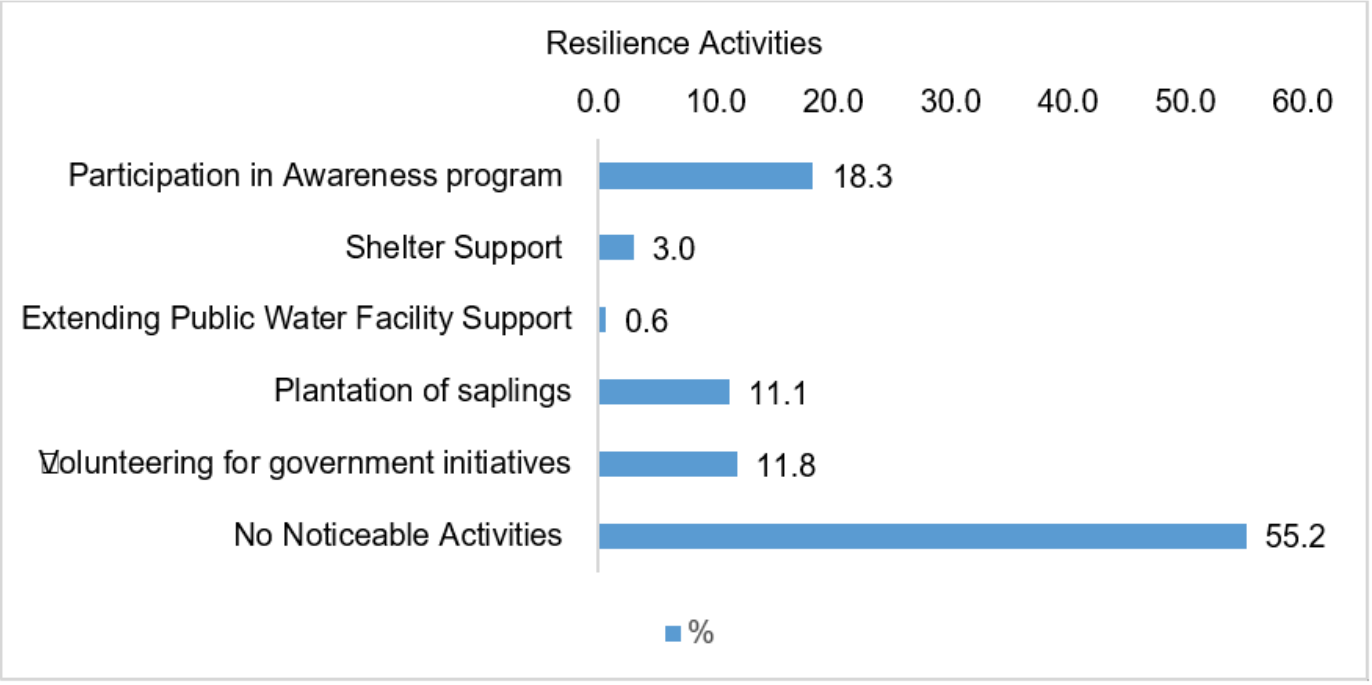

Figure 1

Resilience activities by participants