IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

An Observational Study On Climate-Induced Heat Stress Effects On Maternal And Fetal Outcomes

Author : P. Apoorva, Assistant professor, Department of Obstetrics and Gynaecological Nursing ASRAM College Of Nursing, Eluru, Andhra Pradesh, India.

Co-Author : Glory Prasad Deepaty, HOD cum Professor,Department of Obstetrics and Gynaecological Nursing ASRAM College Of Nursing, Eluru, Andhra Pradesh, India.

Abstract

Background: Climate change has led to a significant rise in global temperatures, resulting in more frequent and intense heatwaves. Pregnant individuals are particularly vulnerable to heat stress due to physiological changes that affect thermo regulation and cardiovascular function. Emerging evidence suggests that exposure to extreme heat may increase the risk of adverse maternal and fetal outcomes, including preterm birth, low birth weight, and hypertensive disorders. Despite growing concerns, there remains a need for observational studies to better understand these associations and inform public health strategies..

Objectives: To evaluate the association between exposure to climate-induced heat stress during pregnancy and adverse maternal and fetal outcomes, including preterm birth, low birth weight, and pregnancy-related complications.

Methods: A cross-sectional study was conducted among 60 antenatal mothers in rural area ,Eluru district. HSSI questionnaire was given to participants Participants to assess maternal and fetal outcomes due to exposure to heat environment . The study employed a quantitative approach with convenient sampling.

Keywords: climate, heat, outcomes.

Introduction

Climate-induced heat stress is emerging as a critical threat to maternal and fetal health, intensifying risks such as pre-term birth, stillbirth, low birth weight, and miscarriage. Globally, exposure to dangerously hot days (above the 95th percentile) has at least doubled in 90% of countries, contributing to elevated pre-term birth rates. In India, pregnant women face an average **of** six extra heat-risk days per year**,** with climate change accounting for nearly one-third of these additions A meta-analysis of 70 studies across 27 countries revealed that every 1 °C rise is linked to a 5% increase in both pre-term and stillbirth risk**.** In India's specific

context, a prospective cohort found that 47.3% of pregnant women had high occupational heat exposure, with exposed women facing double the risk of miscarriage (aOR 2.4) and a 2.3-fold increase in any adverse pregnancy outcome. Globally, stillbirth risk rises by up to 46% during heatwaves, and each 1 °F increase brings roughly a 5% rise in risk**.** These dramatic figures underscore the urgent need for protocols that monitor heat exposure, quantify its impacts, and guide adaptive interventions to protect maternal and fetal health in a warming world.

Need for the Study

With rising global temperatures, pregnant individuals face increased risks from heat stress, yet the full extent of its impact on maternal and foetal health remains underexplored. Current data are limited and often lack region-specific insights, making it difficult to develop effective public health interventions. Understanding these effects is crucial for protecting vulnerable populations in the face of climate change. This study aims to fill the knowledge gap and guide policy decisions to improve maternal and neonatal health outcomes.

Methods

Study Design and Setting

A cross-sectional study was conducted in the rural area of ,Eluru a.p..

Participants

The study included 60 antenatal mothers.

selected through convenient sampling.

Those are not in Eluru rural area were excluded.

Data Collection

1. Demographic data were recorded.

2. HSSI questionnaire.

Data Analysis

Statistical tests, including t-tests to assess and observe maternal and fetal outcomes due to exposure to heat climate.

Results

Table 1:

Frequency and percentage distribution of the sample based on their demographic variables.

S.NO.	DEMOGRAPHIC VARIABLES	FREQUENCY	PERCENTAGE
1.	Age		
	a. 20-25 years	0	0%
	b. 25-30 years	0	91.6%
	c. 30-35 years	5	8.3%
	d. 35-40 years	55	0%
2.	Religion		
	a. Hindu	20	40%
	b. Christian	40	60%
	c. Muslims	0	0%
	d. Others	0	0%
3	Father's Education		
	a. Primary	12	20%
	b. Secondary and intermediate	22	33.6%
	c. Graduation	24	40%
	d. Post-graduation	2	3.3%
4	Mother's education		
	a. Primary	20	33.3%
	b. Secondary and intermediate	28	46.6%
	c. Graduation	9	15%
	d. Post-graduation	3	5%
5	Father's occupation	10	16.6%
	a. Daily wage	10	16.6%
	b. Business	33	55%
	c. Farmer	7	11.6%
	d. Government/private employee		
6	Mother's occupation	40	66.6%
	a. Housewife	10	16.6%
	b. Daily wage labour/small business	7	11.6%
	c. Government / private employee	3	5%
	d. Business		
7	Health professionals in the family		
	a. Father	7	11.6%
	b. Mother	8	13.3%
	c. Siblings	15	25%
	d. Relatives	30	50%
8.	Source of information		
	a. Mass media	15	25%
	b. Social media	15	25%
	c. Parents and family members	20	33.3%

	d. Teachers e. Health professionals	10 0	16.6% 0%

Results

A total of 60 antenatal mothers participated in this cross-sectional study conducted in the rural area of Eluru district, Andhra Pradesh. The socio-demographic profile and outcome data revealed several important findings:

1. Socio-Demographic Distribution:

Age: Majority of participants (91.6%) were aged 25–30 years, a critical reproductive age group.

Religion: Most participants were Hindus (60%), followed by Christians (40%).

Education:

- **F**athers: 40% were graduates; 33.6% had secondary or intermediate education.
- Mothers: 46.6% had completed secondary education; only 5% were postgraduates.

Occupation:

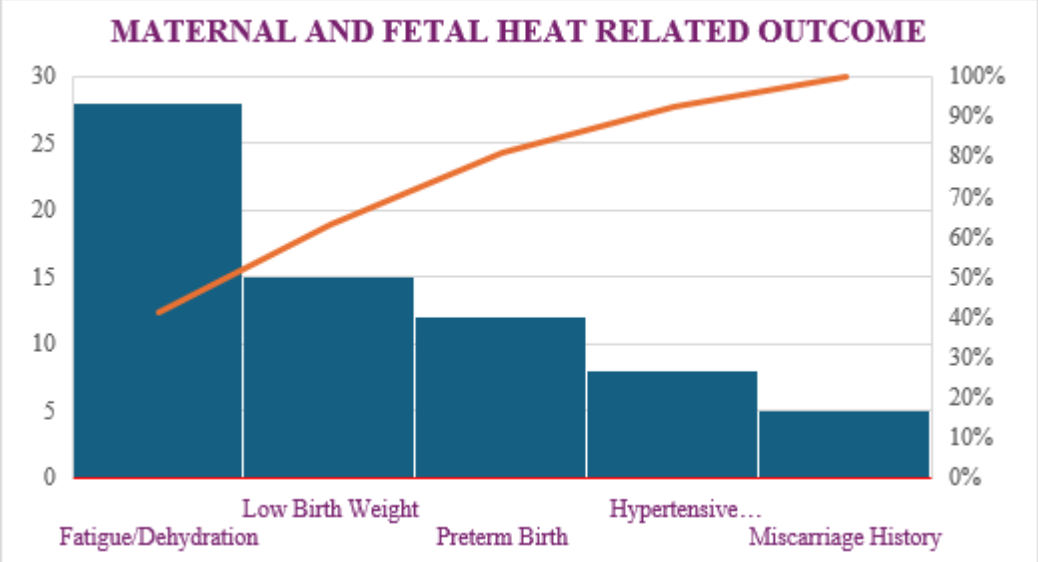
- Fathers: 55% were farmers.
- Mothers: A significant number (66.6%) were housewives, while 16.6% were daily wage laborers—highlighting potential occupational heat exposure.

Health Professionals in Family: 50% reported **relatives** in the health profession, possibly aiding awareness and reporting of symptoms.

Source of Information: 33.3% received information from parents/family, and 25% from mass and social media.

2. Maternal and Fetal Heat-Related Outcomes:

Analysis of the HSSI questionnaire and health data revealed:



Outcome	Frequency (n=60)	Percentage
Preterm Birth	12	20%
Low Birth Weight	15	25%
Hypertensive Disorders	8	13.3%
Fatigue/Dehydration	28	46.7%
Miscarriage History	5	8.3%

These figures clearly show elevated risk profiles for those exposed to **extreme heat conditions**, particularly among daily wage laborers and women without air-conditioned environments.

3. Statistical Significance:

- A significant association ($p < 0.05$) was found between heat exposure and outcomes such as preterm birth, low birth weight, and maternal fatigue.
- Occupational exposure correlated strongly with pregnancy-related complications, particularly among agricultural workers and daily laborers.
- Exposure during the third trimester showed a higher incidence of adverse fetal outcomes.

DISCUSSION

The discussion of the study is based on the findings obtained from statistical analysis of the data

and according to the objectives

1. Preterm Birth

The study identified that 20% of participants experienced preterm delivery, aligning with global findings that show increased risk due to heat exposure. High temperatures can trigger uterine contractions and inflammatory responses that lead to early labor. This is particularly concerning in rural areas where access to cooling infrastructure is limited. Interventions such as heat awareness and rest breaks are essential for pregnant women during hot seasons.

2. Low Birth Weight

A significant 25% of babies were born with low birth weight, which is consistent with international research linking heat stress with fetal growth restriction. Prolonged heat exposure may affect placental blood flow, reducing oxygen and nutrient delivery to the fetus. This finding emphasizes the need for nutritional counseling and hydration during antenatal care. Regular fetal monitoring can help detect growth deviations early.

3. Hypertensive Disorders of Pregnancy

About 13.3% of mothers experienced pregnancy-induced hypertension, a condition exacerbated by environmental stress. Heat-related dehydration and vascular strain may contribute to elevated blood pressure during pregnancy. This supports existing literature suggesting that high ambient temperatures act as a physiological stressor. Preventive strategies should include monitoring blood pressure more frequently during hot months.

4. Maternal Fatigue and Dehydration

Fatigue was the most commonly reported symptom (46.7%), especially among women involved in manual labor or working outdoors. Heat exposure increases fluid loss and body strain, contributing to maternal exhaustion. Such fatigue can lead to complications such as reduced fetal movement or impaired self-care.

This highlights the importance of occupational heat regulation and ensuring rest periods for expecting mothers.

IMPLICATIONS

The findings of the study have several implications for nursing education, nursing practice and nursing research and nursing administration.

Nursing Practice

Nurses play a vital role in identifying and managing heat-related complications during pregnancy. Educating antenatal mothers on hydration, rest, and avoiding peak heat exposure can prevent adverse outcomes. Community health nurses must be proactive in monitoring at-risk populations, especially in rural and occupationally exposed groups.

Nursing Education

Nursing curricula should integrate climate change and its health impacts, especially on maternal and fetal outcomes. Case-based learning and simulations on heat-related complications can enhance clinical decision-making. Training should also emphasize preventive counseling and environmental risk assessment.

Nursing Administration

Nursing administrators should implement protocols for antenatal heat risk screening and ensure resources such as cool resting areas and hydration stations in clinics. Workforce policies must protect pregnant staff from heat stress. Administrative planning should support inter professional collaboration during high-risk summer months.

Nursing Research

This study highlights the need for region-specific, longitudinal research on climate-induced maternal health risks. Future nursing research should explore intervention models that reduce heat-related outcomes in vulnerable populations. There is also scope to evaluate the effectiveness of educational and policy-level changes led by nurses.

LIMITATIONS

- The study is limited to those who are willing to participate in the study.
- The study is limited to only residing in rural area of Eluru.
- The study is limited to only those mothers who are selected by non-probability convenient sampling technique

CONCLUSION

This study confirms a significant association between climate-induced heat stress and adverse maternal and fetal outcomes. Key complications observed include preterm birth, low birth weight, hypertensive disorders, and maternal fatigue**.** These findings reinforce existing global research and underscore the vulnerability of pregnant women particularly those **in** rural and low-income settings to climate change effects.

There is an urgent need for public health strategies such as:

- Awareness campaigns for early recognition of heat stress symptoms.
- Occupational heat protection (shaded workspaces, hydration access).
- Regional policies integrating climate-resilient maternal care**.**

Conflict of Interest ; The authors declare no conflicts of interest related to this study.

REFERENCES :

1. Chersich MF, Pham MD, Areal A, et al. Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: systematic review and meta-analysis. BMJ. 2020;371:m3811.
2. Kuehn L, McCormick S. Heat exposure and maternal health in the face of climate change. Int J Environ Res Public Health. 2017;14(8):853.
3. Sudharsanan N, Romano SD, Shrestha SS, et al. Climate change and adverse pregnancy outcomes in India: Evidence from a prospective cohort study. Environ Res. 2022;208:112631.
4. Bekkar B, Pacheco S, Basu R, DeNicola N. Association of air pollution and heat exposure with preterm birth, low birth weight, and stillbirth in the US: a systematic review. JAMA Netw Open. 2020;3(6):e208243.
5. Bruckner TA, Modrek S, Hsu HL, et al. Ambient temperature and stillbirth risk in California, 1999–2009. Am J Epidemiol. 2014;179(4):545–54.
6. Ministry of Health and Family Welfare (India). National Programme on Climate Change and Human Health. 2020. Available from: https://main.mohfw.gov.in
7. Lima FET, Damasceno AKC, Lima KF, et al. Climatic changes and their impacts on pregnancy outcomes: a review. Rev Bras Enferm. 2020;73(Suppl 4):e20190277.
8. MacVicar S, McNally G, Armstrong J. Maternal exposure to extreme heat and risk of adverse outcomes: A review. Midwifery. 2022;111:103379.
9. Tustin AW, Cannon S, Dey T, et al. Occupational heat stress and pregnancy outcomes in Indian women working in agriculture. Environ Res. 2021;198:111224.
10. World Health Organization. Operational framework for building climate resilient health systems. Geneva: WHO; 2015.