Editorial

Heat Exposure in Pregnancy: A Global Threat with Unequal Consequences

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Introduction

Extreme heat is no longer an episodic environmental hazard; it has become a defining characteristic of a rapidly warming world. With the acceleration of climate change, heatwaves are increasing in frequency, duration, and intensity across diverse settings, posing a growing threat to population health. While the broader health consequences of heat exposure are increasingly recognized, its impact on pregnant women remains insufficiently integrated into public health discourse and climate policy. This oversight persists despite a growing body of evidence demonstrating that pregnancy represents a uniquely vulnerable physiological state in the context of environmental heat stress.

An Under-recognized Maternal Health Risk

Rising ambient temperatures have been linked to a spectrum of adverse health outcomes, disproportionately affecting populations with limited adaptive capacity.[1] Among these, pregnant women represent a critical yet under-prioritized group. Epidemiological evidence from large cohort studies and meta-analyses consistently links heat exposure during pregnancy with increased risks of preterm birth (PTB), low birth weight, and stillbirth.[2,3] Although the observed effect sizes are modest, typically ranging from 1.04 to 1.26 for PTB and around 1.13 for stillbirth, their public health significance is considerable. Given the high global burden of these outcomes, even small relative increases can translate into a substantial absolute burden, amplifying the global impact on maternal and neonatal health. The magnitude of this burden is illustrated by recent estimates from China, where over 13,000 preterm births annually have been attributed to heatwave exposure, accompanied by substantial economic losses.[4] Such findings underscore that heat exposure is not merely an environmental issue but a measurable contributor to maternal and neonatal morbidity with tangible societal costs.

Biological Plausibility and Physiological Vulnerability

Pregnancy is characterized by substantial physiological adaptations that support fetal growth and development, including increased metabolic demand, elevated baseline body temperature, and major cardiovascular adjustments. These adaptations, while essential, reduce the margin for thermoregulatory compensation under conditions of external heat stress.[5]

Exposure to high temperatures during pregnancy can therefore impose additional physiological strain. Dehydration and reduced plasma volume may impair uteroplacental perfusion, potentially limiting oxygen and nutrient delivery to the fetus. Heat stress may also trigger systemic inflammatory and oxidative stress pathways, both of which have been implicated in adverse pregnancy outcomes.[6,7] These physiological mechanisms provide strong biological plausibility for the epidemiological associations observed and reinforce the conceptualization of pregnancy as a climate-sensitive physiological state.

Timing Matters: Late Gestation as a Critical Window

Emerging evidence suggests that the impact of heat exposure during pregnancy is not uniform across gestation, indicating a pregnancy-stage dependency. While early pregnancy appears relatively less sensitive, vulnerability increases in the later stages, particularly during the third trimester.[8,9]

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Studies from multiple settings consistently show that exposure to heatwaves or extreme temperatures in the days or weeks preceding delivery is associated with an elevated risk of PTB.[2,8-10] This temporal pattern suggests that heat may act as an acute trigger for the onset of labour, rather than solely influencing long-term fetal development. Recognizing late gestation as a critical window of susceptibility has important implications for targeted interventions, including timely public health advisories and clinical risk stratification during periods of extreme heat.

Inequalities in Heat-related Pregnancy Risk

Perhaps the most concerning dimension of heat-related pregnancy risk is its unequal distribution. Evidence reflects that the adverse effects of heat exposure are substantially greater in low- and middle-income countries (LMICs) than in high-income settings.[2,11] Each 1°C increase in temperature has been associated with a 61% increase in the odds of PTB in LMICs (OR 1.61, 95% CI 1.39–1.86), compared with an approximately 11% increase in high-income settings (OR 1.11, 95% CI 1.06–1.15).[2] Disparities are even more pronounced for stillbirth, with an estimated OR of 1.05 per 1°C increase in HICs versus ORs ranging from 1.18 to 2.04 across studies conducted in LMICs.[11]

These disparities are driven by intersecting structural and social determinants. Pregnant women in LMICs are more likely to be engaged in outdoor or physically demanding occupations, often without access to protective measures such as shaded environments, rest breaks, or cooling interventions. Housing conditions frequently exacerbate heat exposure, with poor ventilation and heat-retaining materials elevating indoor temperatures beyond ambient levels.

At the systemic level, gaps in infrastructure further compound vulnerability. Many LMICs lack effective heat–health warning systems, limiting preparedness and response.[1] Health systems may face constraints in capacity, surveillance, and integration of climate data, while access to quality antenatal care remains uneven.[12] Together, these factors amplify exposure and constrain adaptive capacity, resulting in disproportionately higher risks for pregnant women.

From Evidence to Action: Integrating Maternal Health into Climate Policy

The evidence is clear that heat exposure during pregnancy is a significant and growing public health concern shaped by both environmental change and social inequity. Yet, current climate adaptation strategies rarely prioritize maternal health explicitly. This gap represents a critical missed opportunity.

In the short term, pragmatic measures such as heat–health warning systems, occupational protections for pregnant workers, and targeted public health messaging can mitigate acute risks during heat events. Integration of heat-risk counselling into antenatal care, particularly during late gestation, may further reduce preventable adverse outcomes.

Over the longer term, structural interventions are essential. Climate-resilient housing, heat-sensitive urban planning, strengthened labor protections, and integration of climate considerations into maternal health systems will be necessary to reduce sustained exposure and vulnerability. Importantly, these strategies must be explicitly equity-focused, prioritizing populations with the greatest risk.

Conclusion

Heat exposure during pregnancy exemplifies the intersection of climate change, biological vulnerability, and social inequity. Recognizing pregnancy as a climate-sensitive condition is not merely conceptual it is a public health imperative. As global temperatures continue to rise, failure to integrate maternal health into climate policy risks widening existing disparities and undermining gains in maternal and neonatal health.

A coordinated response bridging climate science, public health, and maternal care is urgently needed. Protecting pregnant women from the escalating risks of heat exposure is not only a clinical priority but also a critical step toward achieving health equity in a warming world.

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