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Policy Brief

MITIGATING CLIMATE CHANGE IMPACTS ON MATERNAL AND NEWBORN HEALTH IN PAKISTAN:

INSTITUTIONALIZING CLIMATE-RESILIENT MATERNAL AND NEONATAL HEALTHCARE FRAMEWORKS

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INTRODUCTION

Pakistan occupies a unique and tragic position in the global climate landscape. While it contributes remarkably little to the problem – just 1.01% of total global greenhouses gases (GHG) emissions – it stands on the front line of its most devastating consequences.

Pakistan ranks at the top of the Global Climate Risk Index 2025 alongside Belize and Italy. The mean annual temperature increase is 0.63°C. Rising temperatures and climate disasters, particularly devastating floods and extreme heatwaves disproportionately affect the most vulnerable (women and Children) segments of the population. The 2022 floods are just one example, which caused over 1,700 deaths, displaced 8 million citizens, and caused economic losses over 30 billion US dollars.

The interaction of climate change and maternal health has emerged as a critical threat requiring urgent policy decisions. Rising ambient temperatures and frequent floods are intensifying the causes of maternal and neonatal morbidity. Extreme heat exposure during pregnancy is consistently associated with increased risks of preterm birth, stillbirth, and low birth weight. Quantitative estimates indicate that for every 1°C rise in ambient temperature, there is a 4% increase in preterm birth risk, which can escalate to 26% during extreme heat events. On the other hand, biological and behavioral changes during pregnancy render women more susceptible to dehydration, kidney failure, and water-borne diseases.

This policy brief presents findings from a comprehensive intervention research project, **"Mitigating Climate Change Impacts on Pregnancy Outcomes and Newborn Health in Pakistan,"** conducted by Bahria University Medical College at Karachi and Thatta, under the supervision of the Research for Social Transformation and Advancement (RASTA) initiative of Pakistan Institute of Development Economics (PIDE). The study advocates for implementing a scalable, climate-informed maternal healthcare model known as Enhanced Antenatal Care (EANC). By embedding climate resilience within the national and provincial healthcare delivery, Pakistan can significantly reduce its burden of maternal and neonatal morbidity and mortality.

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RESEARCH METHODOLOGY

The research utilized a quasi-experimental pretest–posttest design to evaluate the effectiveness the EANC intervention across two contrasting environments: urban Karachi (PNS Shifa Hospital) and rural Thatta (District Hospital, Taluka Hospital, and 6 Rural Health Centers). These sites represented the diverse climate-health realities of Pakistan, from the "urban heat island" effects of a metropolis to the resource-limited, high-heat settings of rural Sindh. This policy paper arises from the results of the knowledge, attitudes, and practices (KAP) surveys comparing the pregnant women who received EANC with those who received the routine antenatal care.

The sample comprised 1,116 pregnant women in their third trimester or immediate postpartum period (within 1 to 3 days of delivery) —481 in Karachi and 635 in Thatta. Data collection involved structured KAP questionnaires measuring changes in the knowledge, attitudes, and practices of the women regarding heat exposure and adaptation during pregnancy.

The EANC Intervention*:* The core of the project was the introduction of the Enhanced Antenatal Care (EANC) protocol, which integrated heat-adaptation counseling into routine maternal care. The intervention focused on:

- *Provider Training:* Training for 129 healthcare providers, including OB-GYNs, medical officers, nurses, Lady Health Visitors (LHVs), and midwives. The training transformed the traditional antenatal care into "heat-aware" clinical practice, focusing on screening for heat exhaustion and providing education on heat mitigation and adaptation.
- *Patient Education:* Disseminating pictorial educational materials in local languages and conducting counseling sessions on heat mitigation and adaptation strategies.
- *Technological Integration:* Utilizing Doppler technology (such as ultrasound and intended UmbiFlow devices) to monitor the Umbilical Artery Resistance Index (RI), which can identify fetuses at risk of oxygen deprivation due to maternal heat stress.
- *Home-Based Solutions:* Empowering families to implement "Heat Action Plans," including monitoring indoor temperatures, using nature-based cooling (green rooftops, insulation), and enhancing social support from male family members.

Analytical Framework: Participants were categorized into "Poor," "Moderate," or "Good" proficiency levels based on their KAP scores. The physiological impact of heat was quantified with composite risk scores: the Heat Exposure Score, the Dehydration Score, and the Heat Stroke Score These indicators were compared between the pregnant women who received EANC versus those who were on routine antenatal care.

FINDINGS AND CONCLUSIONS

The research revealed a high baseline burden of adverse pregnancy outcomes and physiological stress and demonstrated the transformative potential of climate-informed interventions.

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The study recorded high levels of neonatal deaths and miscarriages (17.5% and 42.7% of women reporting a prior neonatal death and miscarriage, respectively). In the urban site, the proportions of women reporting a prior miscarriage (57.4%), stillbirth (31.6%), and neonatal death (24.7%) were significantly higher than in rural Thatta. This could be attributed to a better recall in urban settings and the presence of severe environmental and lifestyle stressors like pollution and overcrowding.

Physiological Impact of Heat and Dehydration

- ***Critical Emergencies in Thatta****:* Rural women faced catastrophic health burdens. Over 70% of women in Thatta reported fainting and nearly 70% reported coma-like symptoms related to heat exposure. This signals a public health crisis driven by a lack of cooling infrastructure and physically strenuous outdoor work.
- ***Dehydration and Systemic Stress****:* High rates of dehydration markers were found in both sites, with over 40% of women reporting "False Labor Pains," which are often triggered by inadequate hydration. Karachi women reported higher rates of dizziness (54.5%) and fatigue (53.8%) compared to their rural counterparts.
- ***Chronic Disease Burden****:* In Thatta, over 70% of pregnant women had pre-existing diabetes or heart disease, representing a double burden of reproductive risk and chronic illness.

The Transformative Impact of EANC

The EANC intervention achieved highly significant improvements ($P < 0.001$) across all measured domains:

- ***Knowledge and Attitude Shifts:*** In Thatta, the intervention halved the "Poor" knowledge category (from 57.1% to 27.2%) and tripled the "Good" attitude levels (from 19.9% to 55.0%). This proves that targeted education can overcome low formal literacy—nearly 74% of women in Thatta had no schooling.
- ***Behavioral Adoption****:* Practice scores improved dramatically. In Karachi, 84.1% of EANC recipients reached "Good" practice levels, demonstrating high adherence to dietary and cooling advice.
- ***Dietary Improvements****:* In Thatta, EANC recipients significantly reduced their intake of risky items, such as salty foods (dropping from 50.8% to 26.0%) and caffeine/soda (dropping from 31.2% to 16.0%).

Reduction of Physiological Risk

The EANC group showed a consistent downward trend in physiological risk scores.

- *Heat Stroke Prevention:* In Thatta, the Heat Stroke Score dropped significantly from 3.57 to 2.76, demonstrating that EANC has immediate life-saving potential.
- *Dehydration Mitigation:* Lower dehydration scores across both sites confirm that counseling on fluid intake and salt reduction is effective and practical for expectant mothers.

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Conclusions:

Climate change is a direct and escalating threat to maternal and neonatal health in Pakistan. The study demonstrates that EANC is a vital, effective, doable, scalable, life-saving tool; informed, anticipatory care can significantly reduce the burden of maternal and neonatal emergencies in a warming climate. It successfully empowers mothers to mitigate climate-related health risks through behavioral changes, even in resource-poor settings.

KEY POLICY RECOMMENDATIONS

Based on the statistically robust evidence generated by this project, the following actions are recommended to the federal and provincial health departments of Pakistan:

Institutionalize EANC in National Health Frameworks*:* The EANC protocol should be formally integrated into the routine antenatal care provided at public and private health facilities. Health departments must move beyond general maternal care and adopt "heat-aware" clinical guidelines as a standard of practice. This includes making heat-adaptation counseling a mandatory component of all antenatal care visits in heat-vulnerable regions.

Nationwide Training and Capacity Building*:* Launch a comprehensive training program for all facility-based healthcare providers, with a focus on frontline workers such as Lady Health Visitors (LHVs), midwives, and nurses. The training should emphasize:

- Symptom screening for heat-related illnesses.
- Use of Doppler technology for fetal monitoring at the primary care level (Task-shifting).
- Counseling families on environmental monitoring and "Heat Action Plans".

Integrate Climate Resilience into RMNCH Services*:* Develop and standardize plans for uninterrupted Reproductive, Maternal, Newborn, and Child Health (RMNCH) services during climate disasters, such as floods. This includes ensuring that rural health centers are equipped with cooling infrastructure and that birth preparedness plans specifically account for climate-related disruptions.

Community-Based Outreach and Family Engagement*:* The outreach programs must move the burden of care from the clinic to the home. Public health campaigns should:

- Focus on home-based interventions and Lady Health Workers engagement.
- Involve male family members in heat-mitigation education to improve social support for pregnant women.
- Utilize pictorial materials in local languages to reach populations with low literacy.

Promote Nature-Based Cooling Solutions*:* Advocate for and subsidize household-level nature-based solutions for heat mitigation, particularly in underprivileged areas. This includes promoting

green rooftops, improved insulation, natural ventilation, and the planting of rapidly growing shade trees around homes to reduce the internal thermal load on pregnant women.

Urban-Tailored Dietary and Lifestyle Counseling*:* Develop specific EANC modules for urban centers like Karachi that focus on navigating processed food environments and high-stress lifestyles. While rural areas showed success in habit-replacement, urban counseling needs to address the higher prevalence of salt and stimulant consumption found in city residents.

Implementation Considerations

Feasibility

- High (uses existing RMNCH platform)

Cost Implications

- Moderate (training + materials + minimal technology)

Human Resources

- Requires scaling of trained frontline workers

Barriers

- Low literacy in rural areas
- Weak infrastructure
- Heavy Patient loads in antenatal clinics
- Late antenatal bookings / un booked

Facilitators

- Strong LHW network
- Existing antenatal care system
- High community receptiveness

Closing Statement:

Protecting the health of mothers and newborns in the face of climate change is not merely a health priority—it is a national development imperative. By adopting the EANC model, Pakistan can transition from reactive crisis management to proactive, resilient healthcare, ensuring that the next generation of citizens is born healthy despite a changing climate.