

Birthing in burning places: intersecting climate crises, maternal health challenges and structured vulnerabilities in Sindh Province of Pakistan

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Birthing in burning places: intersecting climate crises, maternal health challenges and structured vulnerabilities in Sindh Province of Pakistan

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ABSTRACT

Objective: We explore and analyze the intersection between rising temperatures, maternal health challenges, and systemic vulnerabilities, with a focus on how the growing climate crisis disproportionately affects pregnant women in Sindh Province of Pakistan.

Background: Climate change presents substantial health risks worldwide. Likewise, in Sindh Province it significanlty affects pregnant women, who are among the most vulnerable groups. Rising temperatures in association with existing socioeconomic and health disparities are increasing the vulnerabilities of these women.

Methods and materials: This article is based on a critical analysis of a report on the impact of climate-induced heat on childbirth in Sindh Province, as well as a review of relevant published literature. We also draw on our previously conducted ethnographic research on maternal health in the province.

Results and discussion: We illustrate how heat stress intersects with other structured social identities and roles to intensify physiological risks during pregnancy, while interacting and influencing socioeconomic contexts, particularly for women involved in household chores and agricultural labor. Their limited capacity to rest, due to ongoing caregiving and economic responsibilities, highlights how structural inequities—such as gender, economic status, and social position—shape their vulnerability. These challenges are further worsened by inadequate health infrastructure and limited policy responses, affecting women differently based on these intersecting identities and roles.

Conclusions: By framing maternal health within the broader context of climate justice, we call for urgent policy interventions that address both the environmental and social determinants of women's health.

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KEYWORDS

Heat stress; gendered labor; environmental vulnerability; socio-economic inequality; climate justice; public health policy

Introduction

We begin our article by noting, as it is relatively widely understood that the current global climate crisis is intensifying and is thereby leading to increasingly frequent extreme weather events. We continue by explaining that many regions, primarily in low- and middle-income countries (LMICs), are experiencing rising temperatures, disruptions in the water cycle, and ever-increasing sea levels. Cyclones, droughts, heavy rainfall, flooding, and heatwaves have become increasingly common, resulting in widespread weather disturbances, primarily in LMICs [1]. Global surface temperatures have already increased by 1.1 °C compared to those during the pre-industrial period [2]. In accordance with the Paris Agreement, also known as the Paris Accords or the Paris Climate Accords, active efforts are presently underway in nations such as Germany, France, Canada, Japan, and the United Kingdom, as well as major emitters including China, the United States, and India, to maintain the global average temperature increase below 2.0 °C and to strive toward limiting it to 1.5 °C above pre-industrial levels. Scientific consensus indicates that remaining below 1.5 °C—preferably within the range of 1.4–1.6 °C—is crucial to avert the most severe climate impacts, as delineated in Article 2 of

the Agreement and the IPCC Special Report on Global Warming of 1.5 °C [1]. However, as per the weather forecasts, there is a 5% chance that this limit will be possible to reach by the end of the twenty first century [3], which, of course, will leave at least the next three generations of the world's population having to deal with the extreme impacts of this current climate crisis. The probable range of this very high global temperature increase is around 2.0 °C to 4.9 °C, which the entire world's population is expected to face around 2050 [3].

This critical global warming has resulted in multiple heatwaves, which have already affected many LMICs, including Pakistan [1,4]. Completely unprecedented and extremely high temperatures are becoming more frequent, intense, and prolonged, with significant implications for public health and many LMICs' healthcare systems. Over the past 40 years, Sindh Province, Pakistan, has already experienced significant warming, with temperatures in certain areas rising by up to 1 °C. The hottest day of the year is now, on average, 1.5 °C warmer than it was around a decade ago, thereby making the Pakistani summers increasingly humid, intense, and sweltering [5,6]. The rising temperatures pose significant challenges for people, particularly those who cannot afford air-conditioning systems in their homes or workplaces.

These extreme effects of the climate crisis vary across regions and populations, with some communities facing more severe consequences than others. Some research has clearly shown that women and girls are unduly affected by climate-induced crises more than are men and boys [6], as the impacts of extreme weather events are presently being greatly exacerbated by the Pakistani social and gender norms and traditions that are mainly biased against women. While both men and women engage in outdoor agricultural labor in many rural communities—most notably rural women—often take on additional outdoor agricultural and household responsibilities, such as picking cotton, harvesting wheat, fetching water, and gathering firewood. This cumulative exposure, combined with limited opportunities for rest due to ongoing caregiving duties, puts them at greater risk of exposure to heat-related ailments and infectious diseases [6]. These women also include pregnant and post-delivery mothers, who actively fulfill such roles and responsibilities.

Heat stress and drought-like conditions have a severe impact on food security and the nutrition of women and children. In 2016, high malnutrition rates had been found among pregnant and breast-feeding women in drought-affected areas, most especially in Pakistan's rural areas [7]. Similar trends have been observed in the Thar Desert of Sindh Province, which experienced severe drought conditions from 2013 to 2015 [8,9]. In 2018 alone, over 500 newborns whose mothers had been living in Thar died from causes such as low birth weights, neonatal sepsis, and birth asphyxia. These causes have mainly been linked to climate change-induced crop failures and declining food security in Pakistan [7].

Pregnant and breastfeeding mothers living in Sindh, particularly in its northern districts, which include the cities of Jacobabad, Shikarpur, Sukkur, Larkana, and Khairpur, are among the most vulnerable populations, as, in these cities, and also in their surrounding regions, temperatures are currently soaring from between 45 to 50 °C. On the one hand, natural disasters such as extreme heat, flooding, and heavy rain directly affect women's health. On the other hand, socio-cultural patterns—such as societal norms, values, and gender-discriminatory practices—exacerbate these impacts, thereby further limiting women's access to essential resources, including health care [10].

Emerging evidence suggests that extreme heat conditions are associated with an increased risk of pregnancy complications that may result in adverse maternal and neonatal outcomes, including gestational diabetes, hypertensive disorders, preterm births, low birth weights, and stillbirths [6]. Beyond the direct health risks that have been linked to inadequate nutrition, water, hygiene, and sanitation, exposure to climate hazards during and after pregnancy can also negatively affect mothers' mental well-being. This may potentially contribute to the transmission of intergenerational traumas that have most likely resulted from the significant impacts of climate change. Heightened stress, anxiety, and depression, which are recognized risk factors for adverse perinatal outcomes, are highly likely to become intensified due to these extreme heat conditions.

In Pakistan, and, as is also the case in multiple other LMICs, pregnant women face heightened vulnerabilities to environmental hazards such as extreme heat, which is due to both biological and social factors [6]. Physiological changes, including increased fetal and placental metabolism and greater body mass, have challenged "thermoregulation," which is the regulation of body temperature [11,12].

In multiple LMICs, including Pakistan, most, especially rural women, continue to do very essential chores, such as fetching water, mostly from wells, which are often placed at long distances from where such women live. During their pregnancies, they also continue doing very labor-intensive agricultural work, often having to endure high temperatures even before recognizing that they are pregnant, or are working beyond their heat tolerance limits to sustain their much-needed incomes [13,14].

These complex and interwoven biosocial factors illustrate the entangled "biosocial worlds" [15] in which women, who are already socio-culturally marginalized and biologically impacted by these extreme heat conditions, become even more vulnerable in the face of climatic crises. This phenomenon has been described as a "syndemic," wherein multiple reinforcing crises—biological, environmental, and social-intersect to amplify the harms caused to both women and children by these heat conditions [15,16]. A "syndemic" approach to such conditions refers to the synergistic interactions among multiple health conditions that exacerbate one another and that are often driven by socio-cultural, economic, political, and environmental factors—which may include norms, values, poverty, unemployment, healthcare systems, housing policies, exposure to pollution, and climate crises [15]. These factors influence the emergence and interaction of multiple health conditions.

A note on methods and materials

This article draws on a comprehensive analysis of the report, "Birth in a Burning World: The Intersecting Extreme Heat and Maternal Health Crises in Sindh Province, Pakistan," in conjunction with a review of pertinent published literature. The authors did not conduct original field research for this publication; instead, they rely heavily on the report's empirical findings, testimonies, and data to examine the intricate interactions between extreme heat exposure and maternal health vulnerabilities in Sindh.

To complement the report, a narrative literature review was conducted, examining peer-reviewed studies, policy documents, and secondary sources related to the impacts of climate change on maternal health, gendered socio-economic vulnerabilities, and structural inequalities in South Asia. This approach enabled a multidisciplinary synthesis situating the report's localized findings within broader academic and policy frameworks.

Furthermore, both authors have been engaged in ethnographic research pertaining to health, with a specific focus on women's health and its correlation with climate change, in Sindh Province. Insights derived from their continuous fieldwork and community engagement have informed the analysis, thereby offering contextual depth and nuanced interpretation of the data presented in the report and relevant literature.

By conducting a thorough thematic content analysis of these combined sources, we systematically examined the data to identify recurring patterns and key themes. This careful process allowed us to organize the following section into two clear subheadings, each representing a main thematic area that emerged from the data. Categorizing the information this way improved the clarity and flow of our presentation, making it easier for readers to follow the main points and insights. Additionally, this approach facilitated a more focused and detailed discussion of the core issues, enabling us to explore each thematic area and its implications within the broader context of the study.

Results and discussion

Maternal and newborn health in Pakistan

Maternal and newborn health in Pakistan remains precarious because it is shaped by a nexus of systemic deficiencies, entrenched socio-economic disparities, and cultural norms that govern women's healthcare access and their decision-making processes. As is also the case in other South Asian countries, in Pakistan, maternal and neonatal mortalities persist at distressingly high levels [17]. Pakistan also has persistently high maternal and neonatal mortality ratios, thereby highlighting the stark contrast between its realities and its commitment to Sustainable Development Goal (SDG) 3,

which aims to reduce maternal mortality to fewer than 70 deaths per 100,000 live births by 2023, and neonatal mortality to below 12 per 1,000 live births by the same year [17]. In 2019, Pakistan's maternal mortality ratio stood at 186 per 100,000 births, which is much higher than that of its neighboring countries, with the sole exception of Afghanistan. Meanwhile, its neonatal mortality ratio has fluctuated between 42 and 54 per 1,000 live births over the past decade, thereby far exceeding regional averages, such as those in India and Bangladesh [18].

Additionally, the country's perinatal mortality ratio remains alarmingly high at 70 per 1,000 total births, which is higher than that in many other LMICs [18]. With 63% of all under-five children's deaths occurring during the newborn period (ibid.), Pakistan's commitment to SDG 3 appears to be more rhetorical than actual, as maternal health in this LMIC continues to be shaped by deep-seated infrastructural deficits, gendered hierarchies, and poverty-driven exclusions from access to potentially life-saving biomedical facilities.

We now find it important to note that the structural deficits in Pakistan's healthcare system are undeniable. The national government's resource allocations appear highly inconsistent, with rural and marginalized communities receiving the least financial support from the government [19]. However, it is essential to note that the Lady Health Worker (LHW) program has significantly contributed to expanding women's access to health and maternity care. The LHW program was launched by the government of Pakistan in 1994 as part of a national strategy to increase access to essential primary care services, particularly in remote rural areas and urban slums. This program aims to strengthen health systems at the household and community levels and connect local communities with hospital-based services. The LHWs are responsible for an average of 1,000 people in the communities where they live, providing essential primary health services. However, these lady healthcare workers remain overburdened, underpaid, and constrained by the absence of adequate biomedical emergency obstetric and neonatal care backup services [18,20]. In Pakistan's remote areas, the reliance on untrained birth attendants is not only a cultural preference. However, it is also a necessity in the face of institutional voids in providing skilled birth attendants to pregnant women who need them. This reality manifests in preventable maternal deaths that mainly result from post-partum hemorrhages, eclampsia, and sepsis—outcomes that remain predictable, recurrent, and deeply embedded within Pakistan's maternal healthcare system [18].

Pakistan's structural inadequacies are currently being reinforced by the economic and social determinants that systematically exclude vulnerable women from accessing timely health care. The Pakistani Demographic and Health Survey [21] reported that only 51% of pregnant women receive the biomedically recommended four antenatal care (ANC) visits, cited in [20]. The reasons for these exclusions include inadequate numbers of skilled healthcare providers, fragmented referral mechanisms, and economic constraints. All these reasons conspire to keep many—again, most especially rural—women from being able to access timely biomedical interventions in their pregnancy and birthing processes. Maternal health outcomes thus remain deeply "stratified" [22] along gender, class, and regional lines, where access to effective maternity care is not only a function of government policy but also of economic wealth, a high social position, and gendered autonomy, which are accessible and available to economically wealthy people.

Furthermore, although reproductive outcomes are often stratified by gender, biological evidence suggests that male newborns tend to have worse health outcomes than female newborns [23]. This "male disadvantage" in preterm outcomes appears multidimensional and multifactorial, with hormonal, genetic and immunological differences that play a vital role in affecting these outcomes [24]. In contrast, female newborns generally exhibit greater physiological resilience in early life. However, despite this biological advantage, social and cultural factors—such as gender-based discrimination, unequal access to healthcare, and neglect—can undermine the survival and well-being of female infants in many parts of the world [22]. Therefore, while biology may favor female newborns, structural inequities can still lead to gendered disparities in health outcomes over time.

The weight of cultural expectations bears heavily on maternal health care. For many women, their ability to seek biomedical care is mediated by their male family members, whose decisions reflect embedded patriarchal norms rather than women's medical necessities [20]. Pakistani women's distrust of the care that is provided in biomedical facilities also drives their decisions, as generations

of inadequate service provision and biomedical negligence have reinforced many women's preferences for home births, even when such choices might heighten the risks of obstetric emergencies [18]. The broader question then emerges: How can a healthcare system claim progress when half of its population remains constrained by norms that actively disempower them in matters of both life and death?

In Pakistan, as is additionally the case in many other LMICs, maternal malnutrition remains a silent yet potent threat. The intergenerational cycle of nutritional deprivation is stark—in this country, 37% of pregnant women suffer from iron deficiency anemia, a condition that is directly linked to preterm births, low birth weights, and neonatal complications [25]. Micronutrient supplementation programs exist, yet their reach and impacts remain minimal. Strengthening nutritional interventions requires more than policy documents; it necessitates integration into ANC services, targeted dietary programs, and community-based nutritional education, all of which should be done by Pakistan's national government [20]. The long-term impacts of malnourished mothers giving birth to underweight newborns perpetuate a vicious cycle that remains unbroken in the absence of sustained interventions in Pakistan's extremely inefficient maternal healthcare system.

The gaps in the government policy are glaring, as maternal health initiatives in Pakistan suffer from fragmented governance, limited funding, and the absence of maternity care provider accountability. The rhetoric of maternal healthcare policies does not translate into tangible actions, thereby leading to the weak implementation of such policies and insufficient structural support for and/or for women. By drawing on models of maternity care that have been successfully used in both Bangladesh and Nepal, we strongly suggest that Pakistan's national government must move beyond its piecemeal approach to maternity care and, instead, should adopt community-based maternal healthcare strategies that integrate conditional cash transfers, financially incentivized ANC utilisations, and robust public-private partnerships [18]. Without such an evidence-based approach to maternal health care, the national government's policy efforts will continue to fail those women who need them the most (ibid.).

Climate changes emerge as an ominous force that amplifies the existing maternal healthcare crises in many LMICs, again including Pakistan. Extreme heat, an increasingly prevalent reality in this country, carries significant implications for pregnancy outcomes. Research has consistently linked heat exposure to adverse birth outcomes, including preterm births, stillbirths, and hypertensive disorders during pregnancy [6,26]. A meta-analysis spanning 27 countries had importantly found that, for every 1°C increase in temperature, the risk of preterm birth significantly escalates [6]. The neurological and developmental consequences of preterm births have been well-documented; they have been shown to range from cerebral palsy to impaired cognitive development [27,28].

The maternal health consequences of heat stress are not hypothetical—they are tangible and recurrent. This is because challenged thermoregulation can lead to a range of health issues, including heat exhaustion, heat stroke, dehydration, cardiovascular strain, and impaired organ function [29,30]. Women are more susceptible to heat stress than men under the same physical workload due to differences in body composition, thermoregulation efficiency, and higher relative workload intensity [30]. Furthermore, it can be hazardous for vulnerable populations, such as the elderly, children, and pregnant women, as their bodies may struggle to cope with extreme temperature changes, increasing the risk of serious health complications. In Pakistan, these implications are further multiplied by the country's socio-economic inequities that often systematically marginalize women. Heat exposure has been directly linked to fetuses' congenital anomalies, particularly to cardiac defects, as well as to heightened risks of gestational diabetes, hypertensive disorders, and cardiovascular events during labor [26,31,32]. Yet, these outcomes are not evenly distributed. Women from lower socio-economic backgrounds, who are already struggling with inadequate healthcare access, experience the compounded vulnerabilities of these extremely high temperatures without having the means to mitigate these high temperatures, such as perhaps being able to purchase relatively inexpensive fans and being unable to purchase costly air conditioners, which can only be bought by much wealthier people [33].

The intersections among climate change, gender inequities, and economic deprivations are particularly stark in agrarian economies such as those of rural Pakistan. For another example, Bonell and colleagues [33] had shown that, in The Gambia, pregnant farmworkers must endure extreme heat stress, thereby leading to both maternal and fetal strains. The implications for Pakistan's rural female labor force are striking; women who are engaged in subsistence farming experience severe heat exposures while carrying out their essential tasks, yet are left without adaptive strategies to this extreme heat due to the entrenched patriarchal constraints that prohibit them from developing such strategies. The consequences extend beyond immediate maternal health risks; they also reinforce the vicious cycles of poverty, nutritional deprivation, and intergenerational disadvantages.

Socio-cultural practices further compound Climate-driven maternal health vulnerabilities that restrict women's adaptations to extreme heat conditions. In Sindh Province, the post-partum practice of chilla [8,9]—which involves restricting bathing—clashes with the physiological need for thermoregulation in extreme heat conditions. Women who are already weakened by having recently given birth are further burdened by traditional restrictions that exacerbate the serious risks of heat-induced complications. Electricity shortages and inadequate cooling options leave low-income women with few options to mitigate extreme temperatures, thereby rendering climate resilience a luxury that is entirely inaccessible to the most vulnerable members of Pakistan's population.

Lived experiences of mothers

We begin this section of our article by noting that an international nonprofit organization, the widely-known and highly respected White Ribbon Alliance (WRA) [18], had conducted a study in Sindh on women who were either pregnant or recently post-partum during the 2022 heatwave. Later, the report was released, titled "Birth in a Burning World," wghich contains narratives describing women's lived experiences of bearing the brunt of heatwaves, intertwined with socio-cultural norms and gender inequalities that have greatly exacerbated the impacts of heatwaves on their health and well-being. As the following quotation from the post-partum and breastfeeding woman named Fatima Kamran demonstrates:

[Heat] is a major problem ... it has increased women's workload as we women are supposed to manage each and every thing ... I feel the heat the most during cooking in the afternoon, especially in making chapatis or rotis, and while working in the field. Sometimes, I want to leave everything behind and just rest, but it's not possible as we have to feed our children. Therefore, we cannot rest or stop working. [18].

We can observe the gendered burdens of heat stress, particularly for women residing in Sindh Province, where they are expected to manage both household chores and agricultural labor. These essential labor and chores are why rising temperatures are currently intensifying women's workloads, as they must continue cooking and working in the fields, despite the extreme heat they suffer while carrying out these tasks. Cooking, particularly making chapatis or rotis (handmade bread) over an open flame, exposes women to prolonged heat stress. These words also reveal women's limited agency and their economic constraints, as seen in Fatima's desire to rest, at least for a little while. However, it is neither possible nor practical for such women to cease doing their essential work due to their responsibilities of providing financial support to their children.

Fatima's words highlight how structural inequalities, including gender roles and economic hardships, limit women's ability to adapt to climate change. Her words illustrate the interplays among environmental stressors, biological conditions, gendered labor expectations, and economic necessities, which form a synergistic relationship. These words demonstrate a phenomenon known as a syndemic within medical anthropology, which, as mentioned earlier, refers to diseases and/or health conditions that emerge, co-occur, and interact in various communities and are exacerbated by the socio-cultural, economic, environmental, and political contexts in which they exist.

Several of the women who had participated in the study mentioned above had explained to us that they had experienced fainting spells due to the extreme heat, thereby leading to their hospitalizations for dehydration, fatigue, and a loss of appetite. They had also struggled to balance pregnancy and caring for a newborn with demanding tasks, such as farming, tending livestock, carrying water over long distances, and cooking over an open fire. The respondents in that report shared an increase in domestic chores during heatwaves, as mentioned in the quote above, as well as in the words of



the following respondent. One pregnant woman named Bushra Akmal, who had taken part in the WRA's study, shared the following with us [18]:

Extreme heat is becoming a major issue these days as women's outdoor workload has increased. We are responsible for collecting more water because water consumption has increased due to hot summers. This makes us weak and dehydrated. I do all the household chores, such as cooking, taking care of the children and livestock, and collecting water. Still, I feel the heat the most during cooking as we use firewood, which also increases the temperature.

This quotation reveals that extreme heat disproportionately affects women by increasing their workloads and leading to dehydration and exhaustion. Daily tasks, which include fetching water from an often-faraway well and cooking over an open fire, intensify women's heat exposures and worsen their physical strains and overall well-being. Furthermore, from the quotes of Fatima and Bushra, it can be deciphered that an increase in household chores can be termed as structural violence based on gender identities, which, when combined with other stressors such as elevated heat exposure, may contribute to the cumulative burden experienced by women. Although the WRA report does not directly refer to domestic violence during heatwaves, some studies reveal an increase in intimate partner violence (IPV) during heatwaves [34].

The association between climate change and violence against women and girls were also identified by the UN Intergovernmental Panel on Climate Change (IPCC) [35], citing a growing body of evidence suggesting that extreme weather events are contributing to increased instances of domestic violence. This linkage carries significant global implications, particularly in relation to public health and gender equality. For example, a study conducted in Kenya investigated the impact of extreme weather events on violence against women within households and found that economic strains resulting from flooding, droughts, or extreme heat exacerbate domestic violence. The research, which used satellite and national health survey data, showed a notable 60% increase in domestic violence [36]. Similarly, a mixed-methods global systematic review published in the Lancet also found a rise in gender-based violence during or after extreme weather events [37].

Related to the impact of climate change, doctors in the province report an increase in the number of people seeking care. According to the WRA's report, one female doctor shared that she receives 10 to 15 female patients with heat stroke each month due to working in hot conditions and has observed a general increase in patient numbers during periods of extreme heat [18]. In this regard, Qu and Colleagues have also explored the notion that extreme heat exposure is responsible for increased risks of multiple diseases during pregnancy and increased hospital visits in New York State, USA [38].

Furthermore, mothers often experience increased concern due to the adverse effects of climatic conditions on the health and well-being of their family members. As primary caregivers, they are typically responsible for managing both household needs and the care of dependents, including children, older people, and those with preexisting health conditions who may be particularly susceptible to heat-related stress and other climate-induced risks. These responsibilities, when compounded by limited access to resources and adaptive infrastructure, contribute to heightened psychosocial stress and underscore the gendered dimensions of vulnerability in climate-affected settings. For instance, Aisha Hassan, who is a mother with a baby born in April 2022, stated that her husband has a kidney condition that makes him especially vulnerable to extreme heat. He had once lost consciousness during a heatwave, but they were unable to seek proper medical care due to poverty. Despite his worsening health in high temperatures, she added, he continues to work as a day laborer because they have no other means of livelihood [18].

Conclusion and policy recommendations

In addition to a wide range of immediate health risks, most notably to pregnant women and new mothers, climate change is a growing concern that threatens future generations and leads to long-term consequences with profoundly negative impacts on the health and well-being of women, newborns, and children throughout their lives. Rising temperatures, extreme weather events, and worsening environmental conditions are disproportionately impacting pregnant and breastfeeding mothers, thereby exacerbating the existing health disparities and the social inequalities that continue to exist in Pakistan. Thus, we firmly insist that the impacts of climate change on maternal and child health demand urgent and comprehensive actions that should be taken immediately by Pakistan's national, regional, and local governments. To mitigate these risks, we strongly suggest that Pakistan's national government take proactive steps to support its most vulnerable populations. We also firmly believe that raising awareness about the dangers of extreme heat conditions through public service messages *via* mobile phones can help at-risk communities take preventive measures against the extreme weather conditions that are continuing to occur in multiple LMICs, including Pakistan. Additionally, targeted relief efforts—such as embedding cash transfers within the existing Benazir Income Support Program (BISP)—that is a federal, unconditional cash transfer poverty reduction programme in Pakistan, launched in July 2008.

Well ahead of the arrival of more heatwaves, this could allow families to take time off work if needed or afford essential resources, such as additional water supplies. Beyond providing immediate financial support, structural interventions such as subsidizing solar panels and batteries for power storage, improving access to clean water, and promoting cooling mechanisms like frequent bathing and/or purchasing inexpensive fans can enhance the long-term resilience of Pakistani people against these extreme heat conditions.

However, as we also firmly insist, addressing these challenges requires more than just isolated government policy interventions. The intersections among climate change, gender inequalities, and health vulnerabilities have created a complex web of interconnected crises that demand an intersectional approach that recognizes these interconnected crises and emphasizes the need for integrated solutions to these critical issues. Solving these highly significant problems means not only tackling the direct health risks created by these drastic climate changes but also addressing the socio-economic and structural inequalities that exacerbate these vulnerabilities. By integrating climate adaptation strategies with gender-sensitive health and social policies, national governments and international stakeholders can and should create sustainable solutions that will protect the well-being of women, children, and future generations.

Beyond providing immediate financial support, and as we have previously noted, structural interventions such as subsidizing solar panels and batteries for power storage, improving access to clean drinking water, and promoting cooling mechanisms like frequent bathing can enhance Pakistani women's resilience against these extreme heat conditions. However, addressing these challenges requires more than isolated governmental policy interventions, individual health behaviors, or single issues; instead, it requires a comprehensive, integrated approach that considers the complex interplay of socio-cultural, economic, political, and environmental factors. The intersections among climate change, gender inequalities, and health vulnerabilities create a complex web of interconnected crises that demand a syndemic approach as various factors synergistically influence maternal health in Sindh Province.

Maternal and newborn health in Pakistan remains precarious due to intricate intersectional factors within the health system, socio-economic disparities, gender hierarchies, and cultural structures that influence access to quality healthcare and essential maternity and neonatal services. Despite the policy efforts that have been made by Pakistan's national government, in this country, maternal and neonatal mortalities continue to persist at distressing levels, which are among the highest in South Asia. Until the government addresses its structural healthcare gaps, gender hierarchies, and poverty-driven exclusions that continue to prevent impoverished pregnant women and mothers from accessing the healthcare that they so greatly need, maternal health outcomes will remain dire. We end this article by strongly suggesting that sustainable solutions to these significant problems require integrated policies that Pakistan's national government should create in collaboration with international organizations such as the United Nations, the World Health Organization (WHO), various non-governmental organizations (NGOs) and local people that fully recognize the intersectional nature of climate changes, socioeconomic vulnerabilities of women, women's health, and gender justice. Only through such a holistic and intersectional strategy can maternal health outcomes be significantly improved.



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Author contributions

CRediT: Sadiq Bhanbhro: Conceptualization, Data curation, Validation, Writing - review & editing; Inayat Ali: Conceptualization, Data curation, Formal analysis, Methodology, Validation, Writing original draft, Writing - review & editing.

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