

EFFECT OF CLIMATE-RELATED RESOURCE SCARCITY ON MATERNAL HEALTH IN LAHORE METROPOLITAN

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Abstract

Climate change has increasingly affected environmental conditions in urban areas, leading to growing concerns about resource scarcity and its impact on maternal health. Pregnant women are considered a particularly vulnerable group because their health depends heavily on adequate nutrition, hydration, and a safe environment. This study examined the effect of climate-related resource scarcity on maternal health outcomes in Lahore Metropolitan. A quantitative cross-sectional research design was used to collect primary data from 385 women who were pregnant and in second or third trimester. Data were collected using a structured interview schedule measuring effects of climate-related resource scarcity and maternal health outcomes. Descriptive statistics, cross-tabulation, and linear regression analysis were conducted using SPSS to analyze the data. The results indicate that climate-related resource scarcity significantly predicts maternal health outcomes. Regression analysis revealed that higher levels of resource scarcity are associated with poorer maternal health conditions. These findings highlight the growing influence of climate stressors on maternal well-being in urban settings. The study emphasized the importance of integrating climate-related factors into maternal health policies and healthcare planning. Addressing issues such as water availability, nutrition, and environmental conditions can help reduce health risks among pregnant women in climate-vulnerable cities like Lahore.

INTRODUCTION

Climate change has been established as one of the greatest global societal health issues in the 21st century. Millions of people worldwide are undergoing increasing temperatures, water scarcity, food insecurity and environmental degradation (Intergovernmental Panel on Climate Change [IPCC], 2021; World Health Organization [WHO], 2021). Not all populations are equally impacted by these changes in the climate. Some groups are more susceptible to stress of the environment especially the pregnant women because of biological, nutritional, and physiological factors.

The period of pregnancy is vital in the life of a woman. The body changes significantly during

pregnancy and becomes more demanding in terms of nutritional requirements, hydration demands, and general sensitivity to the environment (Chersich et al., 2020; Sorensen et al., 2018). Mother health may be disrupted by exposure to the climate stressors like heatwaves and water and food insecurity. Such factors can lead to the risk of dehydration, anemia, gestation complications, premature birth, and low birth weight (Bekkar et al., 2020; Watts et al., 2019).

The climate change has augmented scarcity of resources in most developing countries. Issues of uneven rainfall, temperature increase, and reduction in water resources, food supply issues have become more frequent in cities (United

Nations Children's Fund [UNICEF], 2023). The problem of the lack of resources can directly influence the nutrition and hydration of households, which is vital in the context of keeping mothers healthy during pregnancy. Lack of access to safe drinking water, healthy food and condition of the environmental conditions can pose health hazards to pregnant women.

The study highlights the fact that the distribution of environmental risks is uneven among societies, with disadvantaged or low-income groups of people usually being more susceptible to climate-related problems. Women who are pregnant and reside in urban centers with low economic status might also have extra problems accessing proper nutrition, clean water and safe living conditions during the times of the environmental pressure. These social inequalities may build up the effects of climate-related scarcity of resources on maternal health outcomes. Thus, when analyzing maternal health in the framework of social vulnerability and resource allocation, it is relevant to how the interaction of environmental change and the social structure affect the level of health (Arif et al., 2019; Watts et al., 2019).

Lahore is a city located in Pakistan as one of the largest metropolitan cities and has been facing mounting environmental pressures over the last ten years. The city has been struggling with extreme heat, decreased water levels in the ground, air pollution, and other environmental issues (Pakistan Meteorological Department, 2023). These environmental factors have had an impact on the availability of some of the basic resources including clean water and healthy food. Such environmental stressors can also predispose pregnant women in a crowded city, thereby adding to the vulnerability.

Past researches have established that environmental conditions such as excessive heat and air pollutants that are caused by climate change have the potential to harm human health. These environmental stressors have been linked to the role of increased risks of cardiovascular diseases, respiratory diseases, and poor pregnancy outcomes (Dadvand et al., 2013; Watts et al., 2019). Nonetheless, not much empirical research is available into the influence of climate-related

resource scarcity on the maternal health outcomes in urban Pakistan.

In Pakistan, maternal health is a significant social health issue. The World Health Organization (WHO, 2023) defines maternal health as the health of women in the course of pregnancy, birth, and the postpartum phase. In spite of the gains that have been observed in the provision of maternal healthcare services, a considerable number of women in urban and peri-urban regions are still exposed to health hazards because of environmental and structural factors.

It is thus important to understand the interrelationship between the scarcity of resources related to climate and maternal health. The health and well-being of pregnant women could be affected by climate related stressors like lack of water, access to healthy food, and quality of the air. The study of these associations can be useful in determining the primary risk factors on the health of mothers in urban settings.

Methodology

The research design used in this study was quantitative to investigate the impact of resource shortage of climatic cause on the health outcomes of the mothers in Lahore Metropolitan. The method employed to gather data was a cross-sectional survey, conducted at one time only but among women who were pregnant. The cross-sectional research methods are commonly applied when studying social science research due to the necessity to investigate the connections between climate related exposures and the health outcomes in a well-defined population (Setia, 2016; Wang and Cheng, 2020).

The research was carried out in Lahore Metropolitan which is one of the biggest urban centers in Pakistan. The city has suffered growing environmental strains in the past few years which include rising temperatures, water scarcity, food insecurity and extreme pollution of the air. These climate problems associated with climatic factors may have an impact on accessibility of fundamental resources like clean water, healthy food and good living conditions which are vital towards maternal health in pregnancy.

The targeted group was that of women living in various regions of Lahore Metropolitan who were pregnant and in second or third trimester. The study used a total sample of 385 respondents. A Cochran formula of large population was taken to calculate the sample size as it is commonly applied in social science studies to provide the adequate level of statistical reliability (Cochran, 1977). Random sampling was used to choose the respondents in various residential areas of Lahore. At the initial level, a number of urban areas of Lahore Metropolitan were determined. At the second phase, residential neighborhoods in these zones were chosen. The last stage involved going to the community areas and healthcare facilities to invite the eligible respondents to the survey.

The main variables of the study were measured with the help of a structured interview schedule comprising of close-ended questions which were used to collect primary data. The interview schedule also contained questions based on the shortage of natural resources in relation to climate, e.g., the access to water, food, or air pollution. It also incorporated questions that assessed maternal health states during the period of pregnancy such as the perceived health status, complications of pregnancy, and maternal well-being in general. Age, educational background and residential background were also taken as demographic data. Responses were measured using a three-point Likert scale (agree, neutral, disagree), which is commonly used in social science research to assess attitudes and perceptions (Joshi et al., 2015).

Before the main data collection, the questionnaire was pilot tested to ensure clarity, reliability, and consistency of the survey items. The internal consistency of the measurement scale was evaluated using Cronbach's alpha, which is widely used to assess reliability in survey-based research

instruments (Taber, 2018). Ethical considerations were also maintained throughout the research process. Participation in the study was voluntary, and respondents were informed about the purpose of the research before completing the questionnaire.

The collected data were entered and analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics such as frequencies and percentages were used to summarize respondents' perceptions regarding climate-related resource scarcity and maternal health outcomes. To examine the relationship between environmental resource scarcity and maternal health conditions, the Chi-square test of independence was applied. The Chi-square test is commonly used in public health research to analyze associations between categorical variables in cross-sectional datasets (McHugh, 2013). Statistical significance was determined at a confidence level of 95 percent ($p < 0.05$). Through these statistical procedures, the study aimed to identify whether climate-related resource scarcity has a significant effect on maternal health outcomes among women in Lahore Metropolitan.

Results

1. Description of Composite Variables

Table 1 presents the overall response distribution of the main study variables. Around 40% of respondents agreed that climate-related resource scarcity affected their nutrition and hydration during pregnancy. Approximately 40% of women perceived that climate change negatively affected their maternal health. These findings indicate that a considerable proportion of pregnant women in Lahore experience climate change and financial stress during pregnancy.

Table 1

Description of Composite Variables

Composite Variables	Agree (%)	n Neutral (%)	n Disagree (%)	n
Climate-Related Resource Scarcity Affecting Nutrition & Hydration (6 items – average %)	152 (39.5%)	109 (28.2%)	124 (32.3%)	
Perceived Maternal Health Impact of Climate Change (6 items – average %)	155 (40.3%)	106 (27.5%)	124 (32.2%)	

Table 1 presents the descriptive summary of the key constructs. Approximately 40% of respondents agreed that climate-related resource scarcity affected their nutrition and hydration during pregnancy. Similarly, 37.5% reported experiencing socioeconomic challenges due to climate-related disruptions. Around 40.3% perceived that climate change negatively impacted their maternal health. These findings indicate a substantial level of environmental and socioeconomic vulnerability among pregnant women in Lahore.

2.Exploring the Correlation Regarding Resource Scarcity and Maternal Health Outcomes

To examine the relationship between climate-related resource scarcity and maternal health outcomes, a series of cross-tabulation analyses were

conducted. These analyses help identify whether variations in resource availability, such as water, nutrition, and climate change conditions, are associated with differences in maternal health status among respondents. The results presented in the following tables illustrate the distribution of maternal health outcomes across different levels of resource scarcity and climate related exposure.

H1:

There is a significant relationship between climate-related resource scarcity and maternal health outcomes in Lahore.

To test Hypothesis 1, a Chi-square test was conducted to examine the association between resource scarcity and maternal health outcomes.

Table 2

Association between Resource Scarcity and Maternal Health Outcomes (n = 385)

Resource Scarcity Level	Good Health (%)	n Moderate Health (%)	n Poor Maternal Health (%)	Total n (%)
High Resource Scarcity	34 (23.3%)	37 (25.3%)	75 (51.4%)	146 (100.0%)
Moderate Resource Scarcity	40 (30.8%)	39 (30.0%)	51 (39.2%)	130 (100.0%)
Low Resource Scarcity	50 (45.9%)	27 (24.8%)	32 (29.4%)	109 (100.0%)
Total	124 (32.2%)	103 (26.8%)	158 (41.0%)	385 (100.0%)

Pearson chi square= .001

The table showed a clear pattern between resource scarcity and maternal health outcomes. Among women experiencing high resource scarcity, 51.4% reported poor maternal health, compared to

39.2% in the moderate group and 29.4% in the low resource scarcity group. Similarly, good maternal health was more common among women facing low resource scarcity (45.9%)

compared to those facing high scarcity (23.3%). This indicated that higher levels of resource scarcity are associated with poorer maternal health conditions. The Chi-square test showed a statistically significant association between resource scarcity and maternal health outcomes ($p < .05$), supporting Hypothesis 1.

3. Regression Analysis

A linear regression analysis was conducted to examine the effect of climate-related resource scarcity on maternal health outcomes. Regression

analysis was applied to determine whether changes in the independent variable (resource scarcity) significantly predict variations in the dependent variable (maternal health outcomes). In this study, the composite score of climate-related resource scarcity was used as the predictor variable, while the composite score of maternal health outcomes was used as the dependent variable. This analysis helps to identify the extent to which resource scarcity influences maternal health conditions among pregnant women in Lahore Metropolitan.

Table 3

Linear Regression Analysis: Effect of Resource Scarcity on Maternal Health Outcomes

Predictor Variable	B	Standardized Beta	t	Sig.
Resource Scarcity	0.413	0.265	5.378	0.000
Model Summary: R = 0.265, R ² = 0.070, Adjusted R ² = 0.068 ANOVA: F(1,383) = 28.920, p < 0.001				

Dependent Variable: Maternal Health Outcomes

A linear regression analysis was conducted to examine the effect of climate-related resource scarcity on maternal health outcomes. The results show that resource scarcity significantly predicts maternal health outcomes ($\beta = 0.265$, $B = 0.413$, $p < 0.001$). The regression model was statistically significant, $F(1, 383) = 28.920$, $p < 0.001$. The model explained approximately 7% of the variance in maternal health outcomes ($R^2 = 0.070$), indicating that higher levels of resource scarcity are associated with poorer maternal health conditions.

Discussion

This research has analyzed how the scarcity of resources due to climatic factors affects the health outcome of mothers in Lahore Metropolitan. The study outcomes show that the resource scarcity due to climate conditions is closely linked to the maternal health outcomes. The regression analysis has indicated that as the level of resource scarcity increases, the level of maternal health conditions becomes poorer. These results indicate that environmental stressors associated with climatic change may adversely affect the well-being and health of pregnant women.

This study is similar to the findings of other studies that revealed that water scarcity, food insecurity, and extreme heat are all environmental factors that can be negatively associated with maternal health due to climate. Climate change may decrease the availability of safe drinking water and healthy food, which are necessary to ensure maternal nutrition and hydration during pregnancy (Chersich et al., 2020). Lack of these resources can heighten the chances of dehydration, anemia and other health-related problems associated with pregnancy.

This study also established that climate stressor related has the potential to lead to poor maternal health outcomes. In the past, it has been shown that prenatal exposure to climate related hazards, like air pollution and high temperature can predispose the risk of pregnancy complications, such as preterm delivery and low birth weight (Bekkar et al., 2020). Equally, the international health studies have emphasized the impact climate change has on maternal and reproductive health as it impacts the environment and facilitates access to essential resources (Watts et al., 2019).

Development of cities like Lahore is especially susceptible to environmental forces caused by climate. The problems of water shortages and air

pollution have been exacerbated by rapid urbanization, population increase, and destruction of the environment in the metropolitan cities. Such environmental issues might make the pregnant women more vulnerable particularly in cases where the essential resources are restricted. The Intergovernmental Panel on Climate Change (IPCC, 2021) has stated that climate change will exert more pressure on the environment and resource scarcity in most urban centers especially in developing nations.

Resource scarcity due to climate does not impact any population in a similar manner but rather tends to amplify the effects of climate-related resource scarcity on socially and economically vulnerable populations. The availability of water, nutrition and healthy living conditions can expose pregnant women to environmental hazards in the city like Lahore where there are imbalances in the access to these services. These results influence sociological arguments according to which the environmental issues like climate change are directly interconnected with the tendencies of social inequality and resource distribution (Arif and Ali, 2019; Watts et al., 2019).

The results of the present research indicate the significance of considering climate in the planning of maternal healthcare. Policymakers and healthcare service providers ought to be aware that environmental conditions can be very important in the outcome of maternal health. Access to clean water, nutritious food and clean air could be used to mitigate the health risks associated with urban areas impacted by climate to pregnant women. Besides, programs should be made on climate-related health risks during pregnancy to create awareness among the communities that will make them address and control these problems in the environment.

In general, the present study can be added to the existing literature that associates climate change and maternal health. Although the previous studies have mostly been based on environmental health hazards of the developed nations, this study presents an empirical study of an urban South Asian setting. The interdependence between maternal health outcomes and climate-related resources scarcity can be used to inform the policy

to protect vulnerable groups in the fast-urbanizing city such as Lahore.

Conclusion

This study has explored the impact of maternal health among women in Lahore Metropolitan due to the lack of resources that are climate-related. The results showed that the higher the level of resource scarcity, the worse maternal health status. Low access to basic needs like clean water, good nutrition and healthy environment can make pregnant women prone to health hazards. The regression analysis also supported the fact that the climate-related resource scarcity is an important predictor of the maternal health outcomes.

The findings demonstrate the increased significance of addressing the environmental issues of concern on climate in maternal health policy and initiatives. Enhancing the access to simple resources and reinforcing climate-sensitive health-related actions can contribute to the reduction of the vulnerability of pregnant women in such urban centers as Lahore. In general, the research highlighted the importance of focusing more on climate related aspects when dealing with maternal health problems in third world nations.

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