Harvesting health: Indigenous mothers’ resilience in the face of climate change and maternal nutrition challenges in rural Bajaur, Pakistan: A study protocol

Ihsan Ullah
Aga Khan University

Rafat Jan
Aga Khan University, rafat.jan@aku.edu

Dilshad Begum
Aga Khan University, dilshad.begum@aku.edu

Kiran Mubeen
Aga Khan University, kiran.mubeen@aku.edu

Laila Amir Ali Lalji
Texas Women's University, Denton

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Study Protocol

Harvesting Health: Indigenous Mothers' Resilience in the Face of Climate Change and Maternal Nutrition Challenges in Rural Bajaur, Pakistan: A Study Protocol

Ihsan Ullah¹, Rafat Jan², Kiran Mubeen³, Dilshad Begum³, Laila Amir⁴

Abstract

Background: Pakistan's northernmost area Climate change has increased the frequency and intensity of extreme weather events, particularly heavy snowfall and snowstorms, which impacts women's capacity to collect food for their family as primary caretakers. The proportion of food insecurity, malnourishment and anemia increased in women. The World Health Organization (WHO) also emphasized gender, health, and climate change and offered solutions to climate change-related health issues. Climate change affects maternal, baby, and birth outcomes, increasing medical treatment needs. Research explored that extremely low temperatures during pregnancy can raise the chance of birth defects in several climate zones.

Methods and findings: The study will employ a qualitative research design, utilizing in-depth interviews to gather rich and nuanced data from Indigenous mothers in the study region. To recruit participants, a purposeful sampling strategy will be used. Study Population will be from various age groups, socioeconomic levels, and geographic regions within Bajaur. The inclusion of Indigenous women's perspectives is particularly important in this context to provide culturally appropriate insights into maternal nutrition experiences under the influence of climate change. The collected data will be thematically analyzed, ensuring the findings of recurring patterns and topics connected to maternal nutrition and its issues in the face of climate change. The narratives of participants will give light on their knowledge, practices, and views of maternal nutrition, food availability, dietary patterns, and cold weather coping methods. Furthermore, the study will look into potential impediments to proper nutrition and healthcare services for Indigenous mothers during this difficult period.

Discussion: This study holds implications for mother-infant health mainly because poor maternal nutrition may result in low birth weight, premature birth, and developmental issues in babies. Policymakers, healthcare providers, and community stakeholders can hear from climatic experiences of Indigenous mothers to sort out best solution for the cause.

Key Words: Indigenous women, Maternal Nutrition, Climate change, Cold weather

¹Corresponding Author: ihsanullahkmu@gmail.com
1 Master Scholar, Aga Khan University, School of Nursing and Midwifery, Pakistan
2 Professor and Associate Dean, Aga Khan University, School of Nursing and Midwifery, Pakistan
3 Senior Instructors, Aga Khan University, School of nursing and Midwifery, Pakistan
4 RN, RM, BScN, MAEHPIS, current student MSN-FNP at Texas Women’s University, US
Background

Significant global health issues linked to climate change have recently risen to the top of the global health agenda. Numerous studies have established the link between climate change and human health, emphasizing that poverty, food insecurity, isolation from other people and places, and deteriorating social norms are major elements that amplify climate change's adverse effects. Around 1.3 billion individuals live in low- and middle-income countries (LMICs), out of which 70% are females (1). Climate change has adversely affected women's health, particularly in regard to pregnancy, growing fetus, newborn’s health, and maternal and newborn’s nutrition (2).

The northern regions of the world are experiencing an increase in the frequency and severity of extreme snowfall and blizzards, which has impacted women's capacity to search for and gather food for their families as part of their major caregiving obligations in the communities (3). Direct health impact costs related to climate change are predicted to be in the $2 to $4 billion range yearly by 2030. Areas with weak health infrastructure, which is primarily found in underdeveloped countries, will be least able to handle assistance to plan and respond to climate change-related health issues. Just from malnutrition, malaria, diarrhea, and heat stress, climate change is expected to cause an additional 250,000 deaths every year between 2030 and 2050 (4).

Geographical location

Pakistan is located at the boundary of a wet-dry monsoonal system. In general, precipitation is unpredictable and variable in volume across the country. The rainy monsoon winds blow in sporadic bursts, mostly during the summer season. The exact margins of these winds change from year to year. Although they are unpredictable in nature, tropical storms from the Arabian Sea bring precipitation to the coastal regions. Extreme seasonal and daily temperature changes are a feature of Pakistan's central climate. The freezing, snow-covered northern mountains' high elevations change the region's climate (5).

District Bajaur

Bajaur District is located at a high elevation to the east of the Kunar Valley. The location of the Bajaur district is given in Figure 2. Located near Pakistan and Afghanistan border, Bajaur is about 72 km long and 32
km wide land surrounded by rocky hills near Kunar Valley (5). Bajaur has extreme weather. The winter season which is from November to March is extremely cold and freezing. June through August are the hottest months in Bajaur. Fresh water flows from many springs and streams across the area, creating a possible source of irrigation and drinking water. Mostly Extreme winter temperatures create challenges especially for women’s and infant health and malnutrition. These women are unable to avail of health services in heavy rain and snowfall. Few quantitative research has focused on the seasonality of nutrient consumption during childbearing ages. Little is known about the processes through which climatic variation affects food security and nutrition for this population. Climate change-related frequent snowfall and extreme freezing temperatures may result in food shortages and an increase in food prices. This can lead to malnutrition and hunger, which negatively impacts maternal-infant health. This study will investigate and characterize how indigenous women in rural Bajaur are vulnerable to climate change, how these women perceive the environmental effects on seasonal variation and related changes in food security, and the overall effects on maternal-infant health in regard to climate change.

Changes in temperature, precipitation, and extreme weather patterns that have an impact on crop yields, agricultural pests, and diseases are some of the main issues with food security. (6)

Understanding how food security may affect human nutrition and health because of climate change is crucial. Women in low-resource communities are more likely to experience negative health outcomes as a result of climate change (7). For many women in low-resource locations, obtaining optimum nutrition during pregnancy might be difficult due to poor food access and availability. Losses in food security brought on by climate change are also projected to complicate this conflict. It is common knowledge that weather and climate can have an impact on food security, but it is vital to understand the processes and pathways by which these factors operate during the perinatal period (8).

Climate change can directly worsen maternal malnutrition. Unpredictable temperatures and rainfall have a severe influence on farmers’ ability to provide food for their markets and households. The inability to provide nourishing food and the loss of livelihood are two effects of climate-induced migration. Extreme weather conditions and
Figure 1: Map of Khyber Pakhtunkhwa (KPK), a province of Pakistan

(Image source Wikipedia)

Figure 2a: Map of Bajaur district in KPK, Pakistan
FATA/Facebook

Figure 2b: Snowfall in Bajaur Source from Dawn
Agricultural yields have an impact on the average supply of essential minerals, including calcium, folate, thiamine, and pyridoxine, which are crucial during pregnancy (9). For landlocked nations experiencing food shortages, a single extreme weather event can reduce the average annual nutrient supply by up to 76% (10). By upregulating the production of carbon-dense micronutrients like vitamin C at the expense of other minerals like zinc, iron, and protein, elevated amounts of atmospheric carbon dioxide can also alter the nutritional composition of edible plants (9).

Understanding these relationships will be essential to support the mother and child's well-being in a changing environment and supporting climate-changing solutions (10).

Significance of the Study

An extensive literature review has revealed that the issue of climate change-related food insecurity that affects maternal health is less explored in the Pakistani context. This research is significant as it will help to explore the understanding of climate change on the food availability and security that directly and indirectly affects maternal-infant health outcomes. The study will also identify the factors that are obstacles and challenges to women’s health. In addition, the findings of the study will help local health authorities to provide a tangible solution for the current climate change-related food security issues related to maternal and infant health. Furthermore, this research will pave the way for future research studies to further explore and/or mitigate the effects of climate change on maternal health in cold hilly areas of Pakistan where the population is more vulnerable to climate change.

Purpose of the Study

The purpose of the study is to explore the experiences of maternal women regarding maternal nutrition due to climate change in Rural Bajaur, Khyber Pakhtunkhwa Pakistan.

Research Questions

- What are the experiences of indigenous maternal women regarding the effect of climate change (extreme temperature) on food availability during pregnancy in village Pashat Tehsil Salazar, district Bajaur Khyber Pakhtunkhwa? 
- What are the challenges to indigenous rural maternal women regarding the effect of climate change (extreme temperature) on food availability during
pregnancy in village Pashat Tehsil Salarzai, district Bajaur, Khyber Pakhtunkhwa?

**Literature Review**

Climate change increases the frequency and intensity of extreme weather events, including heavy snowfall and snowstorms in the most northern parts of the world, which affects women's ability to find and collect food for their families, as part of their primary caretaker roles in the communities (11). Women were more affected by nutritional deficiencies, such as malnourishment and anemia, due to food insecurity (12) (13) (14). Pregnant women were more likely to experience hypertension, exhaustion, miscarriages, and stillbirths with higher temperatures and food insecurity (15). Additionally, the World Health Organization (WHO) has emphasized the significance of gender, health, and climate change and provided measures for mitigating climate change-related health concerns (12).

The effects of climate change on maternal health also have an impact on birth outcomes and infant health, raising the demand for medical treatment. According to reports, exposure to extremely low temperatures during pregnancy can increase the risk of birth abnormalities in a number of different climate zones throughout the world (16). Climate change-related extremely cold weather adds to rural indigenous women living in mountainous areas where they already have restricted access to health services. Due to societal and cultural issues, women experience healthcare access inequality more often than men globally (3). Women worry more about climatic change and the negative impacts of climate change on the next generation since they typically take care of others (11). Due to absence of educational options, the scarcity of career opportunities, and the lack of participation in financial decision-making, women are more susceptible to climate change related health issues (17). After a thorough literature search, no such study has been done in Pakistan; this will be the first study of its kind. The findings will be shared with the government and relevant authorities to help them plan a road map for mitigating climate change-related maternal and infant health-related food insecurity.

**Theoretical Framework**

Resilience theory will be utilized for this research study. According to Daniel in 2011 the concept of resilience theory determines the persistence of relationships within a system and is a measurement of these systems' capacity to withstand changes in
state, driving variables, and parameters while continuing to function. And the resilience theory has been adopted by environmental health, psychology, philosophy, and others scientific fields. Strengths are emphasized over weaknesses in the resilience theory, and it incorporates important contextual elements into its design. By incorporating resilience theory into the current study, the researcher will be able to determine the consequences of climate change on maternal nutrition in the vulnerable lands of the Pashat Bajaur. It is necessary to focus research in rural Pashat Bajaur which is one of the rural communities in district Bajaur impacted by climate change-related snowfall and heavy rainfall.

**Conceptual framework and approach to research**

Berrang suggested a conceptual framework will be utilized to understand how climate change affects mother-infant health. This concept emphasizes that heavy snowfall, cold temperatures, and heavy rainfall affect agriculture, and crop yield causing food insecurity, which directly affect maternal-infant health (24).

*Fig 3. Conceptual framework highlighting factors affecting climate risk in rural Bajaur.*
Conceptual Definitions

- **Climate change** “Climate change refers to any change in climate over time, whether due to natural variability or because of human activity” (WHO)
- **Food security** “Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (6.)
- **Food availability**: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid) (6).
- **Food access**: Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet (6).

Material and Methods

Study Design

An exploratory descriptive qualitative (EDQ) research design will be used. The study design is considered appropriate to explore and collect in-depth data regarding the perceptions and experiences of women about the effect of climate change on their maternal nutrition during their childbearing ages. Since individuals’ perceptions and experiences vary from person to person, the proposed design helps gain an in-depth understanding of individual experiences (19).

Study Setting

The study will be conducted in a public sector Rural Health Center (RHC) called “Category D hospital” in Pashat, district Bajaur. It is a hilly area of Bajaur where snowfall and seasonal variation badly affect people’s lives. The population of the community is indigenous rural people, which mostly work as a farmer and laborers. The RHC is a 60-bed hospital established in 1995. There is a separate outpatient department (OPD) of Obstetrics and Gynecology (OBGYN) where inpatients and outpatients are assessed regularly. The OBGYN physicians routinely assess nearly about 30-35 patients per day. Outpatient services include antenatal and postnatal care as well as routine neonatal vaccination. In the winter seasons, the proportion of patients coming to OPD decreases because of cold weather and transport issues due to snowfall.

Study Duration

This study will be conducted within six months after the Ethical Review.
Committee Approval from Aga Khan University Karachi.

**Study Participants**

The study participants will be indigenous maternal women who visit routinely the OPD of the RHC. To achieve the aim of the study, a purposeful sampling strategy will employ to recruit eligible study participants. In the qualitative inquiry, the intent of the researcher is not to generalize, but rather to develop an in-depth exploration to understand the phenomenon of interest (20). Following are the inclusion and exclusion criteria for the study participants

**Inclusion Criteria**

- Married women with at least one pregnancy one child and who have experienced food security issues during cold weather and are willing to participate.

**Exclusion criteria**

- Those Mothers, who are mentally impaired, have other diseases or are not willing to participate.
- Those women who have not given any birth.

**Ethical considerations**

The ethical issues in the study regarding anonymity, autonomy, and participant confidentiality will be ensured.

- The study will be conducted only after the Approval of the ERC-AKU, and official permission from the Medical Superintendent (MS) of the Category D hospital in Pashat district Bajaur.
- Written informed consent will be obtained from participants before the data collection and confidentiality will be maintained. The participants will have the right to withdraw from the study at any point in the time of the research.
- Specific code numbers will be allocated to study participants for maintaining their anonymity, throughout the study period. The researcher will also communicate the same to the study participants.
- The collected data will be kept confidential in a secured place and only the primary researcher will have access to it. Furthermore, the data stored in the computer will be secured by using a password. The data will be discarded as per AKU data disposal policy.
Data Collection Process

An in-depth interview guide with open-ended and semi-structured questions will be used to get extensive information from the participant. Researcher will ensure the time and location before collecting the interviews which are convenient for participants. Before conducting an interview, the researcher will obtain permission from the participants and then determine the participant’s degree of comfort (place and time) in conducting the interview. Prior to actual data collection pilot testing of the interview guide will be carried out. Finalized interview guide will be utilized for the interviews. The interview will be conducted face-to-face in the native language Pashto. Each participant will be interviewed for around 40 to 60 minutes. However, if a participant takes more time, then it will be allowed. The total time duration for each interview will be noted to know the variation and to know the average of all the interviews as this data is required for the dissemination of research findings. The data will be audio recorded as well as field paper will be used to record the data.

The sample size will be around 12-16 participants or until saturation is achieved. In qualitative research, data saturation is the gold standard for sample size.

Data Analysis

Data analysis will be done manually and simultaneously along with data collection. The transcript’s interpretation will be done by using the steps of participant analysis given by Creswell steps. Following will be the process for the analysis

Thematic analysis

Thematic analysis is the most standard type of analysis in qualitative research, according to. It underlines identifying, evaluating, and documenting patterns or themes within data. Thematic analysis will be done via six steps. The analysis of the data started first with the organization of the available information collected through in-depth interviews and field notes (22). The interview audiotapes will be listened to several times to understand the participant’s views Creswell 2014. To ensure that accurate data is not lost during the transcription and translation process, the interview guides and transcripts will be translated into English and then back into Pashtu. In case of having no equivalent meanings in English, Pashtu words will be kept and utilized as they are in the recorded data. Familiarization with the data will be carried out by accurately reading and rereading the transcribed data.
as well as the field notes. The verbatim of each interview which gives similar meanings will be labeled with a common code. The next step will be the development of consensus on the categorization of coded data according to emerging common themes and sub-themes similarly, the same categories will be merged into separate themes, to make the data more significant and concise by Creswell in 2014.

Data will be categorized according to the themes and categories. Data interpretation will then be carried out, under the supervisor’s and committee members’ guidance. In the final step, the researcher will display the results in table form, mentioning themes, categories, and enriched quotations of the participants.

Study Rigor

The study will follow the reliability criteria proposed by Lincoln and Guba in 1985 which is composed of credibility, dependability, and conformability and transformability.

Credibility

Lincoln & Guba proposed that Credibility in the qualitative study is to examine the true value of the study. The credibility will be maintained through member checking, in which the researcher will request the study participants to read their transcripts and confirm that whatever information they shared, has been included in the transcripts. Credibility can also be improved by taking an appropriate sample size (23). Moreover, the participant’s non-verbal expressions will also be observed and documented in the researcher’s field notes to ensure the rigor of the study. The study participants will be encouraged to share their perceptions openly, and the questions will be explained in Pashtu language.

Dependability

Dependability refers to assessing the effectiveness and precision of data collection and analysis. Numerous techniques might increase dependability, including peer review, independent data coding, and dialogue among co-researchers. The analysis can be done twice so that the researcher can assess how well the responses addressed the research questions (22).

Conformability

Confirmability is used to determine how well the collected data corroborates the study's findings. The relationship between the data collected and the study results is connected
to the reliability component (20). The confirmability will be maintained through the sharing of, codes, categories, and themes with the supervisor and committee members for verification. Moreover, besides a detailed methodology, an elaborated analysis of the findings will be provided to facilitate the reader to compare themes and participants’ quotations.

**Transferability**

The term “Transferability” refers to how broadly the research's findings can be applied to different contexts and fields. In-depth participant interviews will be conducted, and the researcher will offer a concise overview of the study's conclusions that may be used in situations that are similar (23).

**Ethics approval and consent to participate**

Ethical approval for this study has been obtained from the Aga Khan University, Ethical Review Committee (AKU-ERC) – [2023–8518-24691]. Study Participants are required to sign a written informed consent form to indicate their willingness to participate. Voluntary participation and the right to ask any questions and to decline participation at any time will be tinted during the data collection.

**Authors’ information**

Ihsan Ullah is Master scholar in Nursing at School of Nursing and Midwifery, Aga Khan University. Rafat Jan is Professor and Associate Dean of Outreach and Policy Unit. She is a HEC approved Ph.D. Supervisor, while Kiran Mubeen is a Senior Nursing Instructor at the School of Nursing and Midwifery, at Aga Khan University, she published many research papers in National and International journals, Dilshad Begum is a coordinator of the Clinical Trial Unit at Aga Khan University Hospital, she also published many papers in international journals. Laila Amir is a research scholar in Master of Science in Nursing (MSN-FNP) at Texas Women’s University United States. She also published many research papers in International Journals.

**Authors’ contributions**

Dilshad Begum and Rafat Jan conceptualized and designed the study. Ihsan Ullah prepared the first draft of the manuscript. Rafat Jan, Kiran Mubeen, and Laila Amir reviewed the manuscript several times and provided critical feedback. All authors (IU, RJ, KM, DB, and LA) read and approved the final version of the manuscript.
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Availability of data and materials

The datasets will be collected and analyzed and can be made available from the corresponding author on reasonable request. Interview guides developed for this study protocol are included as additional files.

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