

# Determinants of child health in a rural Karakoram village

Spenta Kakalia<sup>1</sup>, Shaheena Bashir<sup>2</sup>, Arouj Waqqas<sup>3</sup>, Adnan Khan<sup>4</sup>, Rahat Malik<sup>5</sup>, Saba Saif<sup>6</sup>

<sup>1</sup>Assistant Professor, Department of Paediatrics, CMH Lahore Medical College, Abdur Rehman Road, Lahore Cantt, 54810, Pakistan. <sup>2</sup>Associate Professor, Department of Mathematics, Lahore University of Management Sciences, DHA, Lahore. <sup>3</sup>Assistant Professor, Department of Paediatrics, CMH Lahore Medical College, Abdur Rehman Road, Lahore Cantt. <sup>4</sup>Associate Professor, Department of Mathematics, Lahore University of Management Sciences, DHA, Lahore. <sup>5</sup>Professor, Department of Paediatrics, CMH Lahore Medical College, Abdur Rehman Road, Lahore Cantt. <sup>6</sup>Assistant Professor, Department of Medicine, CMH Lahore Medical College, Abdur Rehman Road, Lahore Cantt

**Correspondence to:** Dr. Spenta Kakalia, Email: spenta@gmail.com

## ABSTRACT

**Background:** Mountain communities have unique issues, being generally geographically remote, and politically and socially neglected. The objective was to evaluate the health and healthcare access of children in Tissar, a mountain village in Gilgit-Baltistan.

**Subjects and methods:** This was a cross-sectional study conducted in August 2021, in Tissar, Gilgit-Baltistan (GB), in Northern Pakistan. Interviews were conducted of adults over the age of 18 years, who had at least one child of age 12 years and below, using a convenience sampling method. Descriptive summary statistics were computed using statistical software R version 4.1.2. Poisson regression was used to find potential risk factors associated with diarrhea and pneumonia.

**Results:** Semi-structured interviews were conducted on 400 participants. Although 363 (90.8%) people grew their own food; 203 (50.7%) still needed to purchase food with only 213 (53.2%) receiving up to three meals a day. Access to healthcare was perceived as inadequate, with only 42 (10.5%) satisfied with the healthcare their children were receiving. Up to 268 (67%) needed to borrow money or could not afford healthcare. Annual occurrence of diarrhea and pneumonia was reported in 100% households, most reporting repeated episodes in one year per child. On Poisson Regression, number of meals per day was negatively associated with diarrhea (rate ratio=0.646, 95%CI=0.591-0.706,  $p<0.001$ ), adjusted for weaning. Number of meals per day was also negatively associated with pneumonia (rate ratio 0.529, 95%CI=0.487-0.574,  $p<0.001$ ), adjusting for education and number of children in the family (>6 versus  $\leq 6$ ).

**Conclusion:** Health of Children needs to be addressed in mountain communities in Pakistan.

### Keywords:

Child Health, Karakoram Mountains, Pakistan, Food Insecurity

## INTRODUCTION

Mountain communities worldwide face unique problems; their topography, geography, climate, and remoteness contribute to specific challenges. Gilgit-Baltistan, in Northern Pakistan, is mainly mountainous, being home to 4 of the 14 highest mountains in the world. Malnutrition is common in mountain communities, and mortality from pneumonia is common.<sup>1-3</sup> Malnutrition amongst children in Pakistan is common, with stunting in 38% and severe stunting in 17%; 23% children are underweight and 8% are severely underweight.<sup>4</sup> Causes of malnutrition are manifold, including low birth weight, poor feeding (lack of or insufficient breast feeding and complimentary feeding), lack of maternal education, large family size, lack of vaccinations, poverty, poor sanitation, and infectious diseases.<sup>5</sup> Food insecurity is a growing problem worldwide. In Pakistan, the National Nutrition

Survey 2018 reported food insecurity at 36.9% and severe food insecurity at 18.3%, mainly concentrated in Khyber Pakhtunkhwa (KP), the Federally Administered Tribal Areas (FATA) and Gilgit-Baltistan (GB).<sup>6</sup> Most communities in mountainous areas engage in some form of agriculture, but crop yield is often poor because of the rocky terrain, soil, and seed quality.<sup>7</sup> Because of this, people are not self-sufficient in food. About 13% of the world's population resides in mountain communities.<sup>8</sup> Health of children in these remote communities has not been well represented or studied in Pakistan. The literature has focused on poverty as a theme in mountain communities with a focus on poor nutrition, health, mortality, education, and child labor.<sup>9</sup> Gerlitz and co-researchers examined poverty amongst mountain communities in relation to illness, food consumption and access to healthcare.<sup>10</sup> In Tibet, children living at altitude have high rates of malnutrition.<sup>11</sup> Mountain communities are generally neglected, both politically and socially. Issues like malnutrition, and poor access to healthcare are inadequately addressed.<sup>8</sup> In this study, through interviews in a rural mountainous village, we sought to

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understand health of children, and their access to healthcare. Tissar is a village in Gilgit-Baltistan, *Tehsil* (district) Shigar. There is a metaled road leading to the village, which is a 6-hour drive from the nearest city, Skardu (population 200,000). Tissar is representative of villages that dot the mountain landscape. This study is important for understanding the health of children in these remote areas, in order to identify the specific issues they face.

The Primary objective was to understand common issues that affect the health of children in the village of Tissar. Secondary objective was to assess how access to **healthcare impacts children's wellbeing, who even at baseline are a vulnerable demographic of mountain communities.**

### SUBJECTS AND METHODS

This was a cross-sectional study conducted in August 2021, in the village of Tissar, *Tehsil* Shigar, Gilgit-Baltistan, in Northern Pakistan. The study received ethical approval from the Research and Ethics Board at the CMH Lahore Medical College (#.656/ERC/CMH/LMC, dated 16<sup>th</sup> May 2021). The primary author has travelled extensively through mountainous villages in Gilgit-Baltistan. Based upon conversations with individuals in this region, she identified Tissar as a village typical and representative of many small rural mountainous settlements. Census data for Tissar, like similar villages is not available. Local people estimate population based on number of households, which are anecdotally 650 households in Tissar.

There is a government run dispensary in Tissar and a Basic Health Unit. The nearest tertiary care hospitals are in Skardu. Research Assistants, local to the area, assisted in collection of data. Semi-structured interviews were conducted. The data collection tool was designed by the primary research team, based on literature about the health of children in remote mountain communities. It was reviewed by two physicians, independent of the research team. The Research Assistants were trained by the primary research team prior to the study. The primary research team comprised the primary author who has spent a considerable time in the area being studied, along with the support and expertise of her co-authors. The Research Assistants had a minimum of Intermediate degree, and were fluent in English, Urdu and Balti. An initial pilot study was carried out with five participants, after which appropriate alterations were made. Parents of living child/children under 12 years of age or of

deceased child/children were included in the study. Official census figures for populations in small villages in Northern Pakistan are often unknown. A sample size of 242 was calculated for assumed threshold of 5% margin of error.

Inclusion criteria were participants with at least one child 12 years old or less. Participants under 18 years of age were excluded from the study, as that is the official legal age of consent in Pakistan. After obtaining informed consent, face to face interviews were held in the village, using a convenience sampling method.

Demographic information was collected according to the data collection tool. Education was classified as either no education (never attended a formal school) or any education for people who had received some sort of formal schooling. Employment was assessed as people who had a job. Income was not assessed; most earning is through informal economy and difficult to assess. Family size was classified as either greater than 6 children or less than or equal to 6 children. Details of gender and individual ages of children were not collected.

Health indicators were assessed. As physical examinations were not carried out, health indicators were assessed by inquiring about food intake, vaccination status, and occurrence of common childhood illnesses like pneumonia and diarrhea. Diarrhea was defined as three or more liquid stools per day in any child in the household. Pneumonia was defined as respiratory illness in any child in the household in the past year, diagnosed as pneumonia by a health professional. These responses were recorded as either yes or no. Food insecurity was gauged by asking the interviewees if they felt that food was sufficient to meet the nutritional needs of their child/children. This was also recorded as yes or no. Number of meals being consumed daily was part of the nutritional assessment, with 3-4 meals a day being taken as appropriate meals for a child.<sup>4</sup> Access to health care was gauged by asking questions about road access and affordability. Participants were asked what their first access to medical care is, to see if participants use traditional remedies (defined as herbs and local treatments), or medical care available in the village (a dispensary and a Basic Health Unit), or whether they opt to go straight to tertiary medical care in Skardu. Satisfaction with the overall health system was asked as a subjective question, with a yes / no answer, to gauge overall perception of whether health care needs were being met or not. Number of generations living in a home was also assessed to understand the typical household structure.

## RESULTS

Total 400 interviews were conducted. Basic demographic data is presented in Table 1. The study participants were primarily women, 342 (81%). Table 2 is a summary of the health indicators of the children in the village. Diarrhea and pneumonia were reported as occurring in at least one child in the household,

**Table 1. Demographic characteristics of participants**

Characteristics	Frequency (%)
Gender (females)	324 (81%)
Education	42 (10.5%)
Employment	70 (17.5%)
Child / children attend school	384 (96%)
No. of children in family (>6)	362 (90.5%)
No. of earning members in a family	
No earner	13 (3.2%)
1 earner	238 (59.5%)
2 earners	119 (29.8%)
3 earners	30 (7.5%)
Number of generations living in a home	
1 generation	128 (32%)
2 generations	124 (31%)
3 generations	148 (37%)

**Table 2. Health indicators of the children**

Health Indicator	Frequency (%)
<b>First access to medical care</b>	
Traditional medicine	211 (52.8%)
Local medical care	168 (42%)
City (Skardu)	21 (5.2%)
<b>Access to Skardu</b>	
Public transport	382 (95.5%)
<b>Affordability</b>	
Could afford the health care	21 (5.2%)
Cost was a huge stress on family resources	111 (27.8%)
Needed to borrow money or could not get necessary healthcare	268 (67%)
Infant mortality (mean, SD)	1.98 (2.3)
No. of abortions (mean, SD)	1.88 (2.15)
Grow own food (Yes)	363 (90.8%)
Need to purchase food?	203 (50.7%)
Are three meals eaten daily	213 (53.2%)
Is food adequate	40 (10%)
<b>Vaccination complete</b>	
No	51 (12.8%)
Yes	344 (86%)
Don't know	5 (2.1%)
<b>Water source</b>	
Tap	30 (7.5%)
Chashma	24 (6%)
Tubewell	45 (11.2%)
Irrigation ( <i>pull</i> )	300 (75%)
Other	1 (0.2%)
<b>Water treated before drinking</b>	
Nothing	396 (99%)
Boil	3 (0.8%)
Other	1 (0.2%)
<b>Health Information source</b>	
Television	44 (11%)
Medical facility	208 (52%)
Friends / family	148 (37%)
<b>Satisfied with the health system</b>	42 (10.5%)

\*Number (total) = 400

amongst 100% households. Majority of participants, 362 (90.5%) had more than six children. On Poisson regression, number of meals a day was negatively correlated with pneumonia (rate ratio 0.529, 95%CI=0.487-0.574,  $p<0.001$ ), while adjusting for education and number of children in the family (>6 versus  $\leq 6$ ). Number of meals a day was also negatively correlated with diarrhea (rate ratio=0.646, 95%CI=0.591-0.706,  $p<0.001$ ), while adjusting for weaning (at <1 year or  $\geq 1$  year). No statistical association was found between the water consumed and the incidence of diarrhea and pneumonia.

## DISCUSSION

In this study interviews were conducted to explore health, and access to healthcare amongst children in a rural mountainous part of Pakistan. The most significant finding of this study was the inverse relationship between adequate food and the occurrence of pneumonia and diarrhea; less than three meals a day correlated significantly with episodes of diarrhea and pneumonia.

The second Sustainable Development Goal (SDG) is to end hunger (and thus food insecurity) by the year 2030.<sup>12</sup> Food insecurity, a growing problem worldwide, is when a person or community cannot meet nutritional needs, whether it is number of meals or the nutritional content of the meals. Severe food insecurity is when an entire day's food intake is absent, moderate food insecurity when the number of meals must be decreased because of lack of access to food, or food that is available lacks appropriate nutritional content.<sup>12,13</sup> Food insecurity has increased worldwide: in 2014, it was 22.6%, in 2019 26.6%, and in 2020, during the COVID-19 pandemic, it rose to 30.4%.<sup>13</sup> Food insecurity and subsequent malnutrition are important issues in Pakistan. Pakistan has a high incidence of low weight, and stunting. In Pakistan, the estimated rate of underweight under 5 years is 23%, and severely underweight is 8%; 38% are stunted, and 17% have severe stunting.<sup>4</sup> Mountainous areas, although largely unstudied in Pakistan, have shown higher rates of malnutrition. In a study conducted in pastoral communities along the Wakkhan Corridor in the Karakoram and Pamir mountains, results showed that 17% children were underweight and 14.2% severely underweight; 28.5% were stunted and 34.2% severely stunted.<sup>1</sup>

Pakistan used to be self-sufficient in some basic food items, including wheat, rice, sugarcane, and milk. However, this is no longer true; Pakistan does not

produce sufficient wheat, a staple in the diet of Pakistani households.<sup>14</sup> Recent floods in the country will worsen this situation as crops have been destroyed.<sup>15</sup> The poorest and most remote remain hungry and insecure about food and nutrition intake. In Pakistan, according to the national nutrition survey, 36.9% are food insecure and 18.3% are severely food insecure. According to the 2017-18 Demographic and Health Survey (DHS), the minimum meal frequency of 3-4 meals per day in children of ages 6-23 months, is only met by 63%.<sup>4</sup>

Food insecurity is a repeated cause of malnutrition amongst children in developing mountainous communities.<sup>7</sup> Up to 90% of mountainous population live in rural underdeveloped areas. They are especially susceptible to food insecurity; in 2017, there were 346 million people living in mountainous areas who faced food insecurity.<sup>16</sup> In the present study, in Tissar, although 90.8% were growing their own food, it was not enough to feed the family; 50.7% still needed to purchase food. Only 53.2% children were eating the recommended three meals a day and only a dismal 10% thought that their children were getting adequate food to eat. These numbers are low, despite Tissar being serviced by a metaled road, offering round the year access. Mountain communities in other developing countries, like Nepal and Tibet also suffer from food insecurity and poor nutrition.<sup>11,17</sup>

Villages dot the mountain landscape in Pakistan. Tissar is representative of other villages. Today, most villages are serviced by a metaled road. Although most families grow some crops for personal use, the majority still supplement with food items purchased from the marketplace. There is also an informal economy, with most families relying on seasonal employment. Most males work as porters for expeditions travelling to the high Karakoram Mountains. This work is mainly in the summer months, further exacerbating the problems of food insecurity.

Kruetzman writes about sustainable development in Northern Pakistan.<sup>18</sup> Increased mobility because of better road access has resulted in a decrease in famines and starvation in mountainous communities. However, crops have never been enough to meet the food needs of the local people. Wheat subsidies from the Government of Pakistan help, with a constant supply of wheat from the rest of the country. Cash is in short supply in mountain communities, making it difficult for them to purchase food items needed. Rasul and Husain have explored the multiple reasons for food insecurity in Pakistan's mountainous communities;

underutilization of crop planting, environmental challenges, climate change and the typical topography, and rising food prices.<sup>7</sup> A large proportion of Pakistan is food secure, with Punjab and Sindh producing excess staple products. However, about half the people who live in Pakistan's mountainous areas, in GB and FATA face food insecurity. Basic staples like wheat and lentils, which constitute about half the nutritive intake, must be largely brought from other provinces.<sup>7</sup>

In this study, when asked about health of children, the most significant findings were that at least one child in the household in the past year had suffered from pneumonia and or diarrhea.

Pneumonia is a common health problem in children worldwide, accounting for 14% of deaths amongst children under 5 years of age; mortality in 2019 was 740,180 children.<sup>19</sup> The UNICEF estimates that a child dies from pneumonia every 39 seconds. In 2019, 11.5% deaths in children in Pakistan were caused by pneumonia.<sup>20</sup> In Pakistan, the DHS 2017-18 estimates symptoms of acute respiratory infection in 14% children under 5 years of age in the 2 weeks prior to the survey.<sup>4</sup> A study in the urban settings in Karachi found that 38.6% children had 2 episodes of acute respiratory infection in the 8 weeks studied. Pneumonia in children living in mountainous communities in Pakistan has not been extensively studied. Khan et al. reported an incidence rate (in 100 child years of observation) of 29.9 for pneumonia. Incidence was found to increase with altitude, young age and male gender.<sup>3</sup> Pneumonia is exacerbated by lack of immunizations, inadequate nutrition, and environmental factors.<sup>19</sup>

Risk factors for diarrhea are similar to those of acquiring pneumonia. The risk of getting diarrhea is increased by poverty, unsafe drinking water, lack of vaccinations, and poor nutrition. Ullah and coworkers examined factors exacerbating diarrhea and pneumonia, in rural Bangladesh, collecting data on pneumonia or diarrhea in children less than 2 years of age, in the past 6 months. Food insecurity was found to be an important cause of increased incidence of pneumonia and diarrhea.<sup>23</sup> Chakraborty and associates conducted a study in low resource households of New Delhi amongst 8-12-year-old children. In families with moderate to severe food insecurity, 36.9% and 52.4% participants had at least one episode of diarrhea or pneumonia respectively, in the past one year. The odds ratio of having diarrhea was 4.74 (95% CI 2.12-11.24,  $p < 0.001$ ), and the odds ratio for pneumonia was 3.28 (95% CI 1.64-6.75,  $p < 0.01$ ).<sup>24</sup> Food insecurity in a

Brazilian study on children less than 5 years old showed a link between less food and the incidence of cough (adjusted OR 1.79) and diarrhea hospitalizations (adjusted OR 2.55); however, there was no association between food insecurity and pneumonia.<sup>25</sup>

Besides highlighting the issue of food insecurity in Tissar, this study also offers a snapshot of life in the village, including access or the lack thereof to healthcare. Innumerable similar villages dot the Karakoram and western Himalayan landscape of North Pakistan. There is little literature about the life of the people who live in their villages, especially with a focus on children.

Life in mountain villages is hard. In Pakistan, men work mainly as porters for expeditions in the high Karakoram Mountains. In the non-tourist season, they may find employment as manual laborers. Government jobs are highly coveted but hard to come by. This was exacerbated by COVID-19. Women work mainly as teachers in the local schools, otherwise tend to their homes, children, and fields. In our study we had an overwhelming proportion of female interviewees (81%). Women have traditionally been expected to either work as teachers or as health care providers, besides taking care of homes and children.<sup>26</sup> Of the women interviewed, only 17.5% were employed, and only 10.5% had some education. In contrast to this, 96% of the children were attending school. This is reflective partly of the presence of government schools in Tissar, and the increasing awareness of the importance of education seen by the villagers. “....education is important, especially for the women. Men can do menial jobs and the work of laborers...” [Personal communication]. This is reflective of the value placed by families on education in GB, a constant theme in the grey literature.<sup>26</sup>

The average number of children per family, according to the DHS, is 5.3, this number decreasing to 4.7 at the time of their survey, reflecting infant and child mortality.<sup>4</sup> Large families are looked upon as an economic strength for the future. In contrast, large family size is a risk factor of poor child health, especially poor nutrition. Despite efforts to encourage people to have less children, averages around 4 children per family are sought after.<sup>27</sup> In our study, 90.5% participants had greater than 6 children. It is reflective that there was food insecurity, and that at least one child in each household had had an episode of diarrhea and pneumonia in the previous year.

As the focus of this study was child health, the authors tried to understand what happens when a child

is unwell in such areas. There is a small dispensary in the village. The nearest tertiary care hospital is in Skardu, which is about a 6-hour drive away. As a first line, most people, 211(52.8%) relied on local traditional medicines, like local herbs and remedies, 168(42%) used local services, and 21(5.2%) went to Skardu. Access to a metaled road does not guarantee vehicular transport, and when available, is expensive, especially for an already cash-strapped population. A 6-hour road journey is arduous with a sick child. Only 10.5% were satisfied with the local health care. “...there is a dispensary but they only ever give us paracetamol...”, “...if a child is *really* ill, we have to travel to Skardu for any medical care..” Cost was cited as a major impediment; with 67% people either needing to borrow money for their child’s healthcare costs or could not afford the healthcare required. Immunizations were understood to be important, with 86% of children fully vaccinated, higher than the national average of 66%.<sup>4</sup> Of the people dissatisfied with the healthcare system, most of them echoed the words, “...we need hospitals, medicines, specialists...”. Access to clean drinking water is essential to good health. We could not find any statistical association between water intake and prevalence of disease. Most children 300 (75%) were drinking water from the ‘*pull*’ (irrigation channels), and 24(6%) from ‘*chashma*’ (mountain springs). Only 3(0.8%) were boiling water prior to use. The water for irrigation channels is from melting glaciers.

## CONCLUSION

Villages that dot the mountainous landscape, known for their natural beauty, have their unique problems. There must be political and social will to invest in mountain communities. Local expertise should be utilized. This study highlights the hardship faced by residents of mountainous landscape of Pakistan in everyday life and their impact on child health. Health determinants like malnutrition, with interlinked diseases like pneumonia and diarrhea need to be studied further and addressed. Mountain villages are disproportionately affected by food insecurity, leading to potentially very serious health problems. Improved agriculture, a renewed look at the informal economy, healthcare and access to healthcare are areas which policy makers need to take a renewed look at.

There were three limitations to this study: 1). The data has been collected based on interviews; 2). When we refer to poor nutrition, each child should have a physical examination, including anthropometric measures to determine malnutrition accurately; and 3).

We have not divided the children by age. All children under the age of 12 years were included.

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