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Chronic nutritional deficit resulting in multiorgan disease presentations in remote Pakistan: case reviews from natural disaster settings

Hadia Aslam[1,*]

[1]Disaster Medicine and Dentistry Consultancy and Training Organization, Bradford, England, UK

***Corresponding author:** Hadia Aslam, Disaster Medicine and Dentistry Consultancy and Training Organization, Bradford, England, UK; Tel.: +44-(0)7572774916
E-mail: hadia.aslam@disastermedicineanddentistry.com

Abstract
The aftermath of monsoon rains that fell in Pakistan from June to November 2022 were catastrophic as millions of people were affected, water systems were damaged, and agricultural production was affected. The floods aggravated the already existing nutrition crisis which largely increased children's vulnerability. Disaster Medicine and Dentistry (DMD), a UK-registered consultancy organization, provided support to the affected households in Dera Ismail Khan through the provision of water pumps, food rations, and climate-resistant houses. It also established a mobile medical unit that provided medical services to affected households. All the children that came for consultation were far below the expected height or weight range for their age, thus showing signs of chronic malnutrition. They also presented with multiorgan diseases as a result of the chronic malnutrition, and DMD's onsite and remote consultants managed them all. We took a wholistic approach to managing the nutrition crisis and the floods, which significantly improved the health outcomes of the affected individuals and households.

KEYWORDS
malnutrition, natural disaster, multiorgan disease, Pakistan, disease presentation

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1. INTRODUCTION

From mid-June to November 2022, Pakistan experienced extreme monsoon rainfall, which ultimately caused floods. The floods affected at least 33 million people [1] and killed approximately 2,000 people. Half of the people that were affected were children, making them more vulnerable [2]. Most water systems were damaged, forcing more than 5.4 million people to rely on contaminated water sources and exposing them to risk of disease outbreaks [1]. Making the situation even more difficult, the floods submerged one-third of the country [3], destroying approximately 4 million acres of agricultural land and more than 150,000 acres of land with standing crops, thereby causing significant shortages in food production and supplies [4]. About 13% of the health facilities were also destroyed [5], deepening pre-existing inequities and disparities in health whereby more than 50% of the

population do not have access to health services. On average, 40.2% of under-5 children are stunted, 28.9% are underweight, while 17.7% suffer from wasting [6]. The floods aggravated the nutrition crisis in the affected districts to an average malnutrition rate, thereby impacting over 3.5 million children. However, due to poor documentation and a large number of unreported cases, malnutrition is underreported.

Dera Ismail Khan (DI Khan; located in Khyber Pakhtunkhwa, in Pakistan) is one of the districts that were hugely affected by the 2022 floods. The district is one of the largest in Pakistan, spreading over 7,326 sq. km and bearing a population of 1,627,132 people [7]. The area's main economic stream is agriculture, which was heavily affected. Disaster Medicine and Dentistry (DMD), a UK-registered consultancy organization, provided support to the affected households.

We, herein, delve into the challenging reality of malnutrition in the remote villages of DI Khan, Pakistan. We highlight the struggles faced by malnourished children, and how DMD's onsite and remote consultants made an impact.

2. METHODS

Using our networks in the humanitarian field, we collaborated with independent volunteers in the grassroot sector in the area. The aim was to provide direct health care and support to affected households. In order to increase medical healthcare coverage in the area, we deployed a mobile medical service unit that reached out in different villages within DI Khan. We accentuated on history taking in our patients so as to help diagnosis. All these data were documented in patient files and retrospectively retrieved for analysis. We also provided climate resistant housing to some households (built on higher ground), enhanced access to clean water by installing water pumps, educated families on basic water purification methods, and delivered food rations, including ready-to-use therapeutic food (RUTF) sachets, to vulnerable families. We then ran six-month follow-up clinics to ensure proper management of the children. Finally, we conducted a retrospective data analysis of the data we collected from some of the cases we managed in DI Khan.

3. RESULTS

The average age of the under-5 children that presented with issues at our mobile health unit was 3.5 years, with an average height of 62.8 cm, and a weight of 9.6 kg. Individually, all the children were far below the expected height or weight range for their age. Through their history, all children showed signs of chronic malnutrition as they presented with sunken eyes, bowed legs, swollen belly, lethargy, osteoporosis, skin issues, and brittle nails among other sign of malnutrition, in addition to infections. Their guardians also showed signs of malnutrition as some of them came frail. The majority claimed to have lost their houses, their food, and crops, and that explained the micronutrient deficiencies, infections, insect bites, shock, and fear.

The climate-resilient houses we built for the households reduced the stress levels and shock that the families faced, as they now had a secure place to stay. It further demonstrated the possibility of resilient communities, and provided less exposure to contaminants and insects (therefore providing protection). Fortified rice, lentils, and oil provided the much needed nutrients and energy to the households, thereby reducing the risk of disease, while RUTF helped the children to recover from the acute malnutrition, promoted rapid weight gain, restored depleted nutrient stores, and supported their overall growth and development. In addition, the access to safe, clean water contributed to the prevention of waterborne diseases such as cholera, typhoid fever, and dysentery. This wholistic approach we took to managing the flood situation significantly improved the health outcomes of the affected individuals and households.

4. DISCUSSION

The findings of our intervention revealed signs of chronic malnutrition which have a profound effect on the body, leading to multiorgan diseases and complications. During the early stages of growth and development, chronic malnutrition can lead to cognitive deficits, developmental delays, and learning difficulties, which all are linked to neural damage. Some children that presented in our clinics with osteoporosis, weakness, and decreased mobility, all showed signs of musculoskeletal system impairment which is also a result of chronic malnutrition. The skin issues due to the lack of vitamins A and C, also revealed a linkage between the damaged integumentary system and chronic malnutrition.

5. CONCLUSION

Disasters have been associated with negative health outcomes that greatly affect the most vulnerable parts of a population (such as the children). Rapid response and collective actions to reduce the occurrence of outbreaks resulting from poor water, sanitation and hygiene, and lack of

food that comes along with natural disasters is essential. In children, malnutrition because of disasters is inevitable. However, addressing malnutrition needs a comprehensive approach that focuses on improving dietary intake, promoting nutritional education, and addressing underlying environmental, economic, and social factors, as it can also lead to multigenerational malnutrition. During pregnancy, inadequate maternal nutrition can lead to low birth weight, stunted growth, and increased risk to infections in newborns, which constitutes intergenerational malnutrition. In addition, it is believed that maternal malnutrition can induce epigenetic changes in the developing foetus, thereby creating a cycle of subsequent generational malnutrition.

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CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest.

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