

**Water, Sanitation, Health and Hygiene Interventions in a Northern Pakistani Village: 15 Year Follow-Up of Diarrheal Disease, Pneumonia, Childhood Growth, Water Quality and Latrine Microbiology, with Special Emphasis on Impact Assessment of Pit Latrine (Chukan/Chaksa) Content Used as Agricultural Manure in Gilgit-Baltistan**

**Department:** Community Health Sciences

**Project Sponsors:** Fogarty International Center (NIH), USA

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**SUMMARY**

Diarrheal disease and pneumonia are the major causes of morbidity and mortality in children worldwide. Interventions to decrease these have included water and sanitation (diarrhea), vaccines and smoke in house (pneumonia) and hand washing (both). Diarrhea has been shown to be associated with malnutrition, and later impaired school performance. Interventions for water and sanitation must be specific to local ecological niches and water delivery and source management. In the Northern Areas of Pakistan, water is primarily obtained from glacier melt and sanitation facilities include the use of traditional latrines from which contents are used as agricultural manure. It is necessary to determine the extent of benefit obtained from specific interventions made to improve water quality and sanitation, and whether use of latrine contents is perpetuating a cycle of parasitic infestation and diarrheal disease. A unique opportunity existed to evaluate such interventions in a village namely Oshikhandass near Gilgit, where extensive surveillance of more than 1800 children under age 5 was done from 1989-1996, where water treatment plants have been introduced in 1996 and 2001, and where new latrines have been introduced in 2003. There were also be the opportunity to assess how early childhood diarrhea and pneumonia have affected subsequent growth and academic achievement 15-20 years later.

This research project aimed to determine the change in incidence of diarrhea/pneumonia in children under the age of 5 after 15-20 years (through re-mapping of village, surveillance system over 2 years). It also aimed to determine water quality in the village as a result of the water filtration plants and other measures, such as bleach, used by villagers for water purification (using samples from different areas in village, at different parts of water provision system, at different seasons). The project also observed, if newer latrines are being used in the village and examine microbiology of contents to see if pathogens are persistent with composting (using samples from different areas in village, different types of latrines, at different seasons, also in soil and on vegetables/salad). Accordingly, we will recommend new interventions if needed to reduce diarrheal morbidity and mortality in this particular ecological niche.

Finally, we also aimed to determine the long term health impact of early childhood diarrhea and pneumonia on growth and educational development. For this purpose, we followed-up adults who were seen from birth cohorts from 1989 onwards to determine mortality, growth, and educational status; survey to include demographic information, educational status, logical reasoning, height, weight and blood pressure not only in Oshikhandass but in Karachi, Lahore, Rawalpindi/Islamabad and other parts of Gilgit-Baltistan.

The current study was started in July 2010 and field work was ended on March 31, 2014. Currently data entry is in progress and we will soon be able to share outcomes of our study.