VIEWPOINT

Health Concerns in Urban Slums

A Glimpse of Things to Come?

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Bangladesh, with a population of 167 million, has recently emerged from being classified as a low-income country to a low-middle-income country and has made some progress in poverty reduction. However, in Bangladesh, mortality among children younger than 5 years is 33 per 1000 live births, life expectancy at birth is 72 years, and the most common causes of premature death are neonatal disorders and stroke.¹ The annual per capita income is US \$1316, with approximately 15% of the population living in extreme poverty.¹ Dhaka, the capital, has a population of more than 20 million and is one of the most densely populated cities in the world. Dhaka is also considered one of the most environmentally contaminated cities in the world, yet for some of the increasing population of rural poor, it is a highly attractive place to live. For those living in rural areas, available land is decreasing because of overpopulation and climate change, and for some, the ground water is contaminated with arsenic. Given the struggles in their lives, people come to Dhaka by the thousands each week. With limited education, skills, and financial resources, most of these migrants end up living in a slum. Is this a glimpse of things to come in resource-limited countries?

Urbanization and Slums

The world is becoming increasingly urban, and most of this growth is taking place in low- and middle-income countries. Moreover, the urban slum population is expected to double from 1 billion to 2 billion by 2030.²

There is no clear definition of the word *slum*.² Slums can be "formal" and recognized by the government or "informal" and unrecognized. There are no stated geographical dimensions or population size for

In Dhaka, more than one-third of the population presently lives in congested urban slums, and this is expected to increase to 50% in the coming decades. Slums are typically unhygienic, without formal sewage, safe water, or waste disposal systems. Open sewage and gray water (eg, wastewater from baths, sinks, etc) flow through the slums (Figure 1). Even if drinking water is piped, it is often contaminated with multiple enteropathogens. Infants as young as 12 weeks are often infected with 1 or more pathogens.³ Residents know that they are at risk of infection if they drink well water or tap water but have little choice given that it is too expensive to boil water and chlorinated water is less palatable. As a result of the limited space within slums, a single toilet and washing area is often shared by more than 100 residents (Figure 2). Most slums are built in low-lying areas that are prone to annual flooding. During the rainy season, the open sewage mixes through the slum and further contaminates the drinking source. Local residents are forced to wade through contaminated water, and it frequently invades their home.

Slum Health

Is access to affordable health care a basic human right? If so, what should be provided? Slum dwellers living in unhygienic and overcrowded conditions are susceptible to infection year round. In the slums of Dhaka, there are frequent outbreaks of cholera and other infections transmitted fecal-orally among children and adults.^{3,4} A number of vaccine trials have been conducted in the slums of Dhaka, but the results indicate that a stand-alone strategy of using vaccines against enteric infections may not be sufficient.

A recent cholera vaccine trial (2 oral doses of a bivalent whole-cell inactivated vaccine) conducted in 2015 in Dhaka demonstrated a total vaccine protective effectiveness of 53% against severely dehydrating cholera 2 years after vaccination.⁴ When the vaccine

was combined with behavioral change (ie, handwashing and treatment of drinking water with chlorine) as part of another trial intervention group, the total vaccine protective effectiveness differed little (58%).⁴ The results of a rotavirus vaccine trial for infants conducted in urban Dhaka slums (2 oral doses of rotavirus vaccine at 10 and 17 weeks) showed the vaccine to be far less efficacious (31.5%) than levels of efficacy seen in infants and young children in industrialized settings.³ It is evident that oral vaccination will have to be supplemented with a higher level of access to water, sanitation, and hygiene (WASH) than that achievable with simple behavioral interventions.

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slums. A slum can comprise from as few as 1000 individuals to more than 1 million residents, and can be less than a few hundred meters in radius to several kilometers. Small informal settlements are normally short-lived; in urban Bangladesh approximately 10% to 25% of the population is moving in and out of the slum each year. However, formal slums are typically larger and more stable, with lifetime residents. What package of interventions should be provided for formal and informal settlements? Clearly meeting the needs of slum dwellers requires careful consideration and consultation with local residents, government, and nongovernmental organizations.

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Figure 1. Open Sewage in a Slum in Dhaka, Bangladesh

Photo courtesy of Rabiul Hasan, International Center for Diarrheal Disease Research, Bangladesh

Figure 2. Garbage, Compromised Water and Sewage System, and Washing Station in Dhaka

Photo courtesy of Rabiul Hasan, International Center for Diarrheal Disease Research, Bangladesh

Water, Sanitation, and Hygiene

Is WASH a basic human right? If so, what should be provided? To date, there is no solid evidence to support what improves the health of individuals living in slums.⁵ Very few clinical trials have been conducted in slums, and most WASH programs provided to date are not evidence based or sustainable.^{5,6} If evidence-based health and environmental packages can be identified, are the governments of low- and middle-income countries prepared to act on the findings and bring the programs to scale? Most low- and middle-income countries appear unwilling to invest in major upgrades in water and sanitation given the financial and infrastructure requirements.

The acronym WASH means different things to different people. For example, drinking water can be boiled, filtered, chlorinated, tapped, or taken directly from tube wells. Toilets can be pit latrines, urine-diverting dry toilets, chemical, or flush.⁶ Sanitation can be open or closed with formal sewage lines or septic fields.⁶ Hygiene can comprise handwashing, washing of fruit and vegetables, and removal of rubbish. In sum, there is no clear definition of WASH.

Most slum residents identify access to clean water and hygienic toilets as important. A solar-powered, ultra-filtrated water purifier developed in Kolkata, India, appears to be an attractive option for the contaminated piped water in Dhaka slums. Provision of clean, uncontaminated water via reverse osmosis at the compound level within slums would be a major step forward. One company has developed a solar-powered, self-cleaning electronic toilet. There is

also provision for waste treatment through the use of an on-site anaerobic/aerobic biodegradation system. If this product can be modified for urban slums and deployed at the compound level, this would also be a highly attractive WASH component.

Conclusions

Are slum dwellers entitled to the same basic human rights that most people take for granted? The needs of urban poor populations are growing exponentially, and governments must act to meet those needs. Despite the limited evidence, providing suitable housing, water, sanitation, and basic health care appear paramount. But the reality is that most low- and middle-income countries are not prepared or do not have the resources to provide this basic human right for the poorest segments of their societies. What, then, is the minimum that should be provided to ensure infant survival, proper growth and development of children, and quality of life for families? Should the focus be on the first year of life, children younger than 5 years, or all age categories? Is annual vaccination possible? Is universal health care achievable? What are low- and middle-income countries prepared to invest to make this a reality? More questions remain unanswered than answered. Virtually every UN Sustainable Development Goal has not been met in urban slums around the globe. Clearly, urban slum health must become a global health priority in the 21st century to avoid a humanitarian crisis.

ARTICLE INFORMATION

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