The interlinkages between water, sanitation and hygiene (WASH) and nutrition

Undernutrition affects millions of Indian children, and is a consequence of insufficient food intake or inadequate nutrient absorption, and of repeated infectious diseases. **With 38.4% of children under the age of five stunted, India has among the highest number of children who are short for their age in the world, a marker for hampered physical and cognitive growth.** Evidence suggests that availability of sufficient, nutritious food does not necessarily result in improved nutrition. Other health system and environmental factors, including timely access to good quality ante-natal care and poor water, sanitation and hygiene (WASH) access are important nutrition sensitive interventions. Evidence shows that scaling up the ten high-impact nutrition-specific interventions, such as micronutrient supplementation, to 90% coverage in the countries with the highest burden of undernutrition would only reduce stunting by 20% globally[1]. Action across multiple sectors is critical to overcome the underlying and indirect causes of undernutrition and greatly reduce stunting.

India has made tremendous progress to ensure access to safe sanitation for all, with the country poised to declare open defecation free status in October 2019. Drinking water coverage is currently at 81%, with the newly launched Jal Jeevan Mission set to provide piped drinking water to all rural households by 2024. Hygiene, comprising of behaviours such as handwashing with soap at critical times (e.g., before eating, after toilet use), safe water storage and handling, food hygiene, safe disposal of child faeces, and environmental hygiene, lags behind the progress made in improved sanitation and drinking water.

A comprehensive nutrition program has both nutrition specific and nutrition sensitive interventions; this approach is imperative if India is to meet the World health Assembly Resolution 65.6 target of achieving 40% reduction in the number of under five years children who are stunted by 2025, and fulfil its commitment to Sustainable Development Goal 2 (zero hunger) targets related to malnutrition.

GLOBAL COMMITMENTS TOWARDS WASH AND NUTRITION		
Sustainable Development Goal 6: **Clean water and sanitation**	**Target 6.1:** By 2030, achieve universal and equitable access to safe and affordable drinking water for all	**Target 6.2:** By 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
Sustainable Development Goal 2: **Zero hunger**	**Target 2.1:** End hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	**Target 2.2:** By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
World Health Assembly Resolution 65.6 Target	Achieve a 40% reduction in the number of children under-5 who are stunted Achieve a 50% reduction of anaemia in women of reproductive age	

The intersection between water, sanitation and hygiene with nutritional outcomes is multi-faceted and complex. The most widely known and direct connection is through ingestion of faecal pathogens present in drinking water, food, or hands, resulting in repeated infections. Three pathways are important:

1. **Diarrhoea:** When children drink contaminated water, they are at risk for diarrhoea. Repeated episodes of diarrhoea contribute to undernutrition by hindering the body's absorption of nutrients. Children who are undernourished are also at high risk of suffering more frequent and severe episodes of diarrhoea, creating a vicious cycle[2].

2. **Intestinal worms (soil-transmitted helminths):** In the absence of safe sanitation and good hygiene practices, these infections are transmitted via contact with or ingestion of soil contaminated with human faeces that contain worm eggs. An estimated 241 million children in India are at risk for soil-transmitted helminth infections[3]. Such infections can lead to anaemia, poor growth and impaired cognitive development. A systematic review suggests that improvements in sanitation can reduce the risk of infection by approximately 50%[4].

3. **Environmental enteric dysfunction (EED):** EED (also referred to as environmental or tropical enteropathy) is a sub-clinical condition affecting both the structure and function of the intestines to absorb essential nutrients; found to be associated with chronic enteric pathogen exposure and poor WASH conditions[5].

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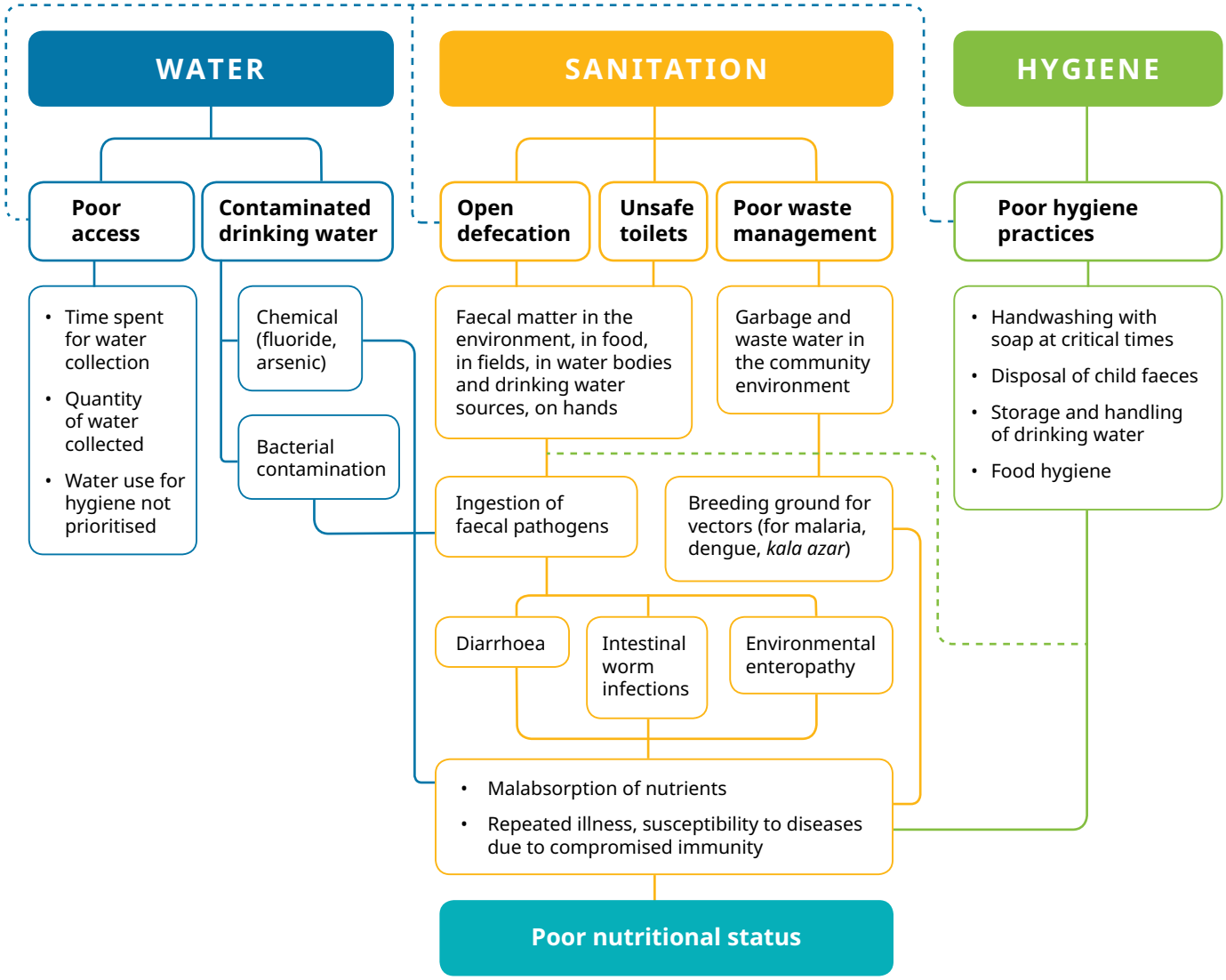

When children suffer from repeated bouts of diarrhoea, intestinal worm infections, their bodies are no longer able to absorb nutrients, leading to stunting – a form of chronic malnutrition in which children are short for their age. Stunting hampers physical growth as well as cognitive development.

Another direct connection between WASH and nutritional status, though less discussed is the consumption of water with high level of chemical contaminants, such as fluoride, that also inhibit nutrient absorption, and consequently affect growth and lead to disabilities. Ground water in 22 States and over 200 districts has fluoride presence beyong the permissible limits, the drinking of which can cause various forms of fluorosis from dental to skeletal fluorosis, causing significant disability and hampering nutrient intake.

Indirect pathways include exposure to an unsanitary environment (e.g., with poor drainage, sewage and solid waste systems) that provide rich breeding ground for several vectors (such as mosquitoes, sand flies) placing the population at risk for diseases like malaria, dengue, leishmaniasis (*kala azar*). These diseases divert essential nutrients need for growth to fight infections. Limited access

WaterAid/Prashanth Vishwanathan

Children washing hands in Padripani Prathmikshala, Kanker, Chhattisgarh.

to safe water services is another indirect contributor. When families spend time to fetch water or have to purchase water, it affects the amounts and quality of water consumed, and the use of water for hygiene practices (such as handwashing). Additionally, the time spent sick with waterborne diseases and in water collection affects health, wellbeing, educational attainment (especially of girls responsible for water collection in their families) and income for the family.

THE EVIDENCE BASE FOR WASH AND ITS IMPACT ON NUTRITION

Research linking water, sanitation and hygiene with nutrition outcomes has been growing over the past few years, and includes:

1) cross sectional or non-experimental studies, systematic review and meta-analysis;

2) experimental studies (randomised control trials).

RESEARCH	KEY FINDING
The London School of Hygiene & Tropical Medicine through the Cochrane Collaboration conducted and published the first systematic review of the available evidence of the effects of WASH on childhood undernutrition in 2013[6].	The systematic review found suggestive evidence of "a small benefit of WASH interventions (specifically solar disinfection of water, provision of soap, and improvement of water quality) on length growth in children under five years of age". In a sub-group analysis, the biggest effect on height growth was found in children younger than 24 months. Most of the studies included used point-of-use water treatment, and did not examine water supply or sanitation.
Global burden of childhood diarrhoea and pneumonia, published in The Lancet in 2013[7].	Quarter of cases of stunting can be attributed to the occurrence of five or more episodes of diarrhoea during the first two years of life.
Econometric analysis on the association between open defecation and stunting[8].	Econometric analysis of cross-sectional data from 65 countries found that open defecation explains 54% of international variation in children's height. This link is even stronger when population density is high, in countries like India. Although the analysis is not evidence of causality, it suggests that in places characterised by wide spread open defecation and high population density, children may be at increased risk of stunting.
Research suggests that handwashing with soap at critical times has tremendous benefits for children, and is a highly cost effective public health intervention. However, research shows that handwashing with soap at critical times is poor and inconsistent.	Washing hands with soap at these moments is estimated to reduce diarrhoeal diseases by 47% and respiratory infections by 23%, having tremendous health benefits for children[9]. A cross-sectional study on handwashing knowledge and practices in four Indian states found high rates of handwashing after defecation (99.3%) and before eating (91.9%), but lower rates at other critical times related to childcare activities, particularly when feeding infants and young children (26.3%), and disposing of child faeces (16.7%). Soap was the preferred cleansing agent for activities that involved contact with faecal matter, that is, after defecation, washing a child's bottom and disposing of child faeces. For activities that did not involve such contact, between two-fifths and a half of the respondents used water alone to clean their hands[10]
Global and India focused research on child faeces disposal suggests that safe disposal is not commonly practiced, and that unsafe practices enhance a child's risk for diarrhoea.	Young children's stool is commonly perceived to be less harmful than adults' faeces[11,12] and is often buried or discarded in open[13,14]. Children whose stools were disposed of in an unsafe manner are at a greater risk of diarrhoea than children whose stools are safely disposed in latrine[15,16,17]. Children whose stools were not disposed properly had 11% greater odds of diarrhoea as compared to children whose excreta was appropriately handled[18].
The **WASH Benefits** trials in Bangladesh and Kenya are cluster randomised trials that investigated whether WASH and nutrition interventions alone or in combination lead to better improvements in linear growth during the first two years of life.	**In both Bangladesh and Kenya studies, there was no additive benefit of integrating water, sanitation and hygiene with nutrition on linear growth and stunting.** In both Bangladesh and Kenya, there was a small improvement of the nutrition intervention and the combined nutrition and WASH intervention on linear growth (in line with previous child nutrition studies). In Bangladesh, the trial found small, statistically significant effects of the nutrition intervention (0.24; 0.13 – 0.36 LAZ) and WASH+Nutrition (0.13; 0.02-0.24) with an effect size in line with previous child nutrition studies. In Bangladesh, there was a reduction in diarrhoea across all arms, except the water only arm.
Need for evidence and guidance on the following:	• The intervention approaches to effectively integrate WASH into nutrition programs • WASH and nutrition indicators that can help track integration efforts

IMPROVING NUTRITION THROUGH IMPROVED WASH

Integrating action on water, sanitation and hygiene into nutrition policy and programs can be done at several levels from co-locating and co-targeting the same populations, to more concerted efforts to assimilate WASH interventions into nutrition programs and finally joint planning and implementation. To begin with, a focus on the 1,000-day period (conception till 2 years of age) offers an ideal window of opportunity for integrated programming. The first 1,000 days is critical from a nutrition perspective, with maternal nutrition during pregnancy and nutritional intake by children during the early years shaping physical and cognitive growth of a child. Research also suggests the importance of improved water, sanitation and hygiene services, and the promotion of hygiene behaviours during this significant development phase to prevent diarrhoea, repeated infections, environmental enteropathy, and susceptibility to other infections and diseases (e.g., pneumonia). Further, in areas that have high levels of chemical contamination, ensuring safe drinking water, along with improved nutrition and essential health services will complement disease prevention and treatment efforts. In the case of fluorosis, for instance, providing communities with safe drinking water (free from fluoride) alongside a diet rich in Vitamin C, calcium, iron and antioxidants can help lessen the pervasive negative effects of skeletal fluorosis.

When integrating WASH into nutrition interventions, all three components must be incorporated - safe sanitation, clean drinking water, and hygiene infrastructure and promotion. A singular focus on sanitation alone will not yield intended results given the intersections with water and hygiene practices. Given that large scale programs on sanitation under the Swachh Bharat Mission have been implemented intensively from 2014-19, and safe drinking water supply will be the focus under the Jal Jeevan Mission from 2019-24, hygiene promotion is a critical component that can be meaningfully integrated into ongoing nutrition programs.

The table below highlights a continuum approach to integrating nutrition and WASH through a programmatic lens.

WHAT AND HOW OF INTEGRATED PROGRAMMING FOR NUTRITION AND WASH	POTENTIAL AREAS OF WORK (ILLUSTRATIVE)
Co-targeting and co-locate- overlap delivery of WASH and nutrition activities in the same geographical area, with the same populations towards a common objective, but with separate implementation Sharing information across programmes and ministries – involves some coordination and sharing of information or data to inform planning and targeting of services. **Who to target**– targeting programmes in the first instance on the basis of nutrition vulnerability, including pregnant women, mothers, adolescents and children under five (especially the 1,000-day window from conception to two years of age), but ensuring an approach to reach universal access. Targeting is more important for water and hygiene interventions; however, universal sanitation in a community will be critical for nutrition impact. Areas with poor water supply or high chemical contamination in ground water.	Health and nutrition interventions focused on the first 1,000 days, targeted at those communities that have poor health and nutrition outcomes. Sanitation and drinking water interventions focused in communities that lack such services.
Enhancing the sensitivity of programs to the links between WASH and nutrition Incorporate elements on WASH in nutrition programs (e.g., handwashing). WASH interventions targeting child risk factors and behaviours (e.g., emphasis on hygiene behaviors related to health and nutrition such as handwashing, safe disposal of child faeces, safe drinking water).	1. Mid-day meal programs emphasise and facilitate handwashing before meals 2. National de-worming days where information is also provided on hygiene practices in addition to mass drug administration 3. WASH interventions that institute infrastructure for safe sanitation, clean drinking water, and hygiene facilities in schools, health facilities, and anganwadis 4. Targeted interventions that provide solutions for safe drinking water in areas with high levels of contamination (e.g., bacteriological or chemical contamination) 5. Hygiene promotion interventions in schools that promote handwashing at critical times and latrine use
Integrated and joint programming • Embedding hygiene promotion (handwashing, food hygiene, safe disposal of child faeces, environmental hygiene) in the delivery of nutrition programs at various levels (individual, household, community, institutions) • Nutrition programs ensuring access to safe water and sanitation services to target populations through close collaboration with relevant departments.	1. POSHAN Abhiyan that lays emphasis on WASH as a critical component, and meaningfully incorporates hygiene promotion 2. In areas with high chemical contamination in groundwater (e.g., flourosis), deliver a comprehensive intervention that includes a robust nutrition component and sustainable supply of safe drinking water to communities. Case example: Nalgonda Collaborative: Tacking a complex regional fluorosis issue[19]

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