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Articles

Effects of water quality, sanitation, handwashing, and nutritional interventions on child development in rural Kenya (WASH Benefits Kenya): a cluster-randomised controlled trial

Summary

Background Poor nutrition and infectious diseases can prevent children from reaching their developmental potential. We aimed to assess the effects of improvements in water, sanitation, handwashing, and nutrition on early child development in rural Kenya.

Methods In this cluster-randomised controlled trial, we enrolled pregnant women in their second or third trimester from three counties (Kakamega, Bungoma, and Vihiga) in Kenya's western region, with an average of 32 households per cluster. Groups of nine geographically adjacent clusters were block-randomised, using a random number generator, into the six intervention groups (including monthly visits to promote target behaviours), a passive control group (no visits), or a double-sized active control group (monthly household visits to measure child mid-upper arm circumference). The six intervention groups were: chlorinated drinking water; improved sanitation; handwashing with soap; combined water, sanitation, and handwashing; improved nutrition through counselling and provision of lipid-based nutrient supplements; and combined water, sanitation, handwashing, and nutrition. Here we report on the prespecified secondary child development outcomes: gross motor milestone achievement assessed with the WHO module at year 1, and communication, gross motor, personal social, and combined scores measured by the Extended Ages and Stages Questionnaire (EASQ) at year 2. Masking of participants was not possible, but data assessors were masked. Analyses were by intention to treat. This trial is registered with ClinicalTrials.gov, number NCT01590095.

Findings Between Nov 27, 2012, and May 23, 2016, 8246 women residing in 702 clusters were enrolled. No clusters were lost to follow-up, but 2262 households with 2279 children were lost to follow-up by year 2. 5791 (69%) children were measured at year 1 and 6007 (73%) at year 2. At year 1, compared with the active control group, the combined water, sanitation, handwashing, and nutrition group had greater rates of attaining the standing with assistance milestone (hazard ratio 1·21, 95% CI 1·09–1·40) and the walking with assistance milestone (1·32, 1·17–1·50), and the handwashing group had a greater rate of attaining the standing alone milestone (1·15, 1·03–1·31). There were no differences when comparing the other intervention groups with the active control group on any of the motor milestone measures at year 1. At year 2, there were no differences among groups for the communication, gross motor, personal social, or combined EASQ scores.

Interpretation The handwashing and combined water, sanitation, handwashing, and nutrition interventions might have improved child motor development after 1 year, although after 2 years there were no other differences between groups. Future research should examine ways to make community health and nutrition programmes more effective at supporting child development.

Funding Bill & Melinda Gates Foundation.

Introduction

From gestation through age 3 years, the brain undergoes rapid growth and differentiation. Several developmental processes are sensitive to a child's early environmental inputs, including neuronal proliferation; synapse formation, pruning, and function; myelination; axon and dendrite growth; and neuronal apoptosis.[1] The brain architecture built during these years creates the foundation for future development and learning. However, worldwide, nearly 250 million children younger than 5 years in low-income and middle-income countries are at risk of not meeting their developmental potential due to poverty and stunted growth.[2] Children raised in poverty are at particular risk of developmental delays because of the cumulative effects of poor nutrition, repeated and chronic infectious disease, inadequate caregiver capacities and time to invest in childcare, and psychosocial stressors within the home. Early life adversities can have long-term

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Background Poor nutrition and infectious diseases can prevent children from reaching their developmental potential. We aimed to assess the effects of improvements in water, sanitation, handwashing, and nutrition on early child development in rural Kenya.

Methods In this cluster-randomised controlled trial, we enrolled pregnant women in their second or third trimester from three counties (Kakamega, Bungoma, and Vihiga) in Kenya's western region, with an average of 12 households per cluster. Groups of nine geographically adjacent clusters were block-randomised, using a random number generator, into the six

intervention groups (including monthly visits to promote target behaviours), a passive control group (no visits), or a double-sized active control group (monthly household visits to measure child mid-upper arm circumference). The six intervention groups were: chlorinated drinking water; improved sanitation; handwashing with soap; combined water, sanitation, and handwashing; improved nutrition through counselling and provision of lipid-based nutrient supplements; and combined water, sanitation, handwashing, and nutrition. Here we report on the prespecified secondary child development outcomes: gross motor milestone achievement assessed with the WHO module at year 1, and communication, gross motor, personal social, and combined scores measured by the Extended Ages and Stages Questionnaire (EASQ) at year 2. Masking of participants was not possible, but data assessors were masked. Analyses were by intention to treat. This trial is registered with ClinicalTrials.gov, number NCT01704105.

Findings Between Nov 27, 2012, and May 21, 2014, 8246 women residing in 702 clusters were enrolled. No clusters were lost to follow-up, but 2212 households with 2279 children were lost to follow-up by year 2. 5791 (69%) children were measured at year 1 and 6107 (73%) at year 2. At year 1, compared with the active control group, the combined water, sanitation, handwashing, and nutrition group had greater rates of attaining the standing with assistance milestone (hazard ratio 1·23, 95% CI 1·09–1·40) and the walking with assistance milestone (1·32, 1·17–1·50), and the handwashing group had a greater rate of attaining the standing alone milestone (1·15, 1·01–1·31). There were no differences when comparing the other intervention groups with the active control group on any of the motor milestone measures at year 1. At year 2, there were no differences among groups for the communication, gross motor, personal social, or combined EASQ scores.

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February 12, 2018