

(Published in the Lancet 2005; 366: 185-187)

Commentary

Clean hands reduce the burden of disease

Each day, more than 27,000 children under the age of five die, most from preventable infectious diseases, and almost all in countries with limited resources.¹ Three-quarters of these deaths occur in sub-Saharan Africa and South Asia; among the leading causes are pneumonia and diarrhoeal disease.

In today's *Lancet*, Luby and colleagues report the results of a trial to evaluate the impact of hand hygiene promotion on leading childhood infectious diseases in a low-income population living in the squatter settlements of Karachi, Pakistan. The intervention consisted of weekly visits by field workers to distribute free soap and educate households to encourage handwashing.² During the first two months, neighbourhood meetings including slideshows, videotapes, pamphlets illustrating health problems related to dirty hands and specific handwashing instructions, were held several times weekly with mothers. Control households were supplied with educational material for children (books, pens and pencils), but with no relation to infectious disease prevention or hand hygiene.

Soap and education decreased impetigo by 34%, diarrhoea by 53%, and pneumonia by 50%. Diarrhoea reduction² was remarkably consistent with prior pooled estimates (47%, CI₉₅ 24-63%).³ Disease duration was shorter, thus probably reducing the duration of infectiosity for household contacts.² Children were 56% less likely to consult a health care practitioner for diarrhoea and 26% less likely to be hospitalised.² The

overall incidence of respiratory diseases was markedly reduced, in particular during the winter months when it was expected to be more frequent, as indeed it was in the control group.

Poor nutrition increases the risk of infection. As expected, the more severe the malnutrition, the higher the incidence of diarrhoea² and pneumonia in the study; handwashing promotion was very effective, with consistent impact on both disease incidence among all groups of children, independent of nutritional status.

Plain and antimicrobial soap was also compared in a blinded, randomised fashion in the intervention group; both were equivalent with impact estimates similar to previous reports, confirming high consistency. Thus, promotion efforts and resources should better concentrate on education and behavioural modification rather than on product development.

The impact of hand cleansing with soap and water is biologically plausible.⁴ The rubbing of hands together physically removes viral and bacterial pathogens, as well as parasites, that may have caused the diseases under study. Although compliance with hand hygiene practices was not directly measured, average soap use, a possible surrogate marker,⁴ increased more than three-fold.² The water used for drinking and handwashing in these communities is heavily contaminated with faecal organisms,⁵ but hand cleansing with soap improves mothers' hand cleanliness even when contaminated water is used⁶ or hands are dried on clothing,² thus signifying that suboptimal hand cleansing is still effective.⁶ Clearly, direct contact between households is an important mode of transmission, even for diseases resulting in part from droplet transmission. Thus, household hand cleansing interrupts transmission of pathogens sufficiently to markedly

reduce both diarrhoea and respiratory diseases among infants unable to clean their hands. A higher effect could have been expected if mothers would have been encouraged to wash infants' hands, but this was not part of the intervention. Such a strategy is recommended by some experts in health care settings to reduce the risk of cross-transmission in populations with a low degree of comprehension, in particular infants and geriatric patients.^{4,6}

The study was not powered to demonstrate a possible reduction in childhood mortality from diarrhoea or pneumonia. Preventing mild upper respiratory illness reduces the risk for subsequent lower tract infection and pneumonia, whether viral or bacterial in origin, or bacterial superinfection, a major complication of influenza and measles in low income countries. Undoubtedly, reducing the incidence of pneumonia and severe diarrhoeal disease would save millions of lives on a larger scale, at least in high risk populations.³ In Karachi, the death rate from diarrhoea² was almost 80% lower than the diarrhoea-specific death rate for children in similar communities.⁷

Promotion of appropriate hand hygiene is complex.⁸ Recent studies revealed that successful promotion in health care settings requires system change, education and motivation of caregivers, leadership and administrative support, and, in some instances, patient empowerment.^{4,8,9} Similar to other strategies to modify behaviour, multimodal interventions have more chance of success than programmes focusing on a single element only and were the only ones with sustained effect.⁸⁻¹⁰ The Karachi intervention was multimodal with intensive ongoing education and encouragement, distribution of free soap, and possibly, focused group discussion.

Cost-effectiveness and sustainability are elements of paramount importance of any hand hygiene promotion strategy.^{4,8,9} As emphasized by the authors, and observed for healthcare workers,⁸ changing hand cleansing habits and behaviour takes time. The effectiveness of hand cleansing promotion on diarrhoeal diseases was only apparent after eight weeks, but remained obvious later.² Whether the induced behavioural change will resist the test of time remains to be seen. The relatively low cost of soap in Karachi settlements (equivalent to US\$ 0.17-0.25 per bar, around US\$ 1 per week) should be viewed in the context that almost 50% of the population studied had a weekly household income of less than US\$ 15. Whether buying soap would be considered as a priority over other vital items remains unknown.

Another limitation of the Karachi intervention is that it was conducted in settlements where access to water was not problematic.² The recent WHO Water for Life 2005-2015 initiative makes access to water and sanitation an international priority (<http://www.un.org/waterforlifedecade/> accessed 22 April 2005); effective alternatives to soap and water handwashing deserve further research.^{4,6}

Quite apart from whether the described intervention would be cost-effective or not, and whether it will prove to be sustained, medicine and public health need “proof of concept”. Improvement in hand cleansing habits does reduce infection and impacts on the burden of disease. The current challenge is that it must last, cost less, and reach millions of individuals worldwide. It also raises the issue of the public-private partnership approach successfully used in The Central American Handwashing Initiative to reduce diarrhoeal disease among children (www.basics.org/ accessed 22 April 2005). Hand hygiene is also an intrinsic part of three of the six targets of the US Institute for

Healthcare Improvement's high-profile "100,000 Lives" campaign

(www.ihl.org/IHI/Programs/Campaign/ accessed 22 April 2005). "Clean Care is Safer Care" is the slogan of the first Global Patient Safety Challenge, a core component of the WHO World Alliance for Patient Safety launched in 2004; it targets on the prevention of health care-associated infections worldwide and features hand hygiene improvement as its major focus (www.who.int/patientsafety/en/ accessed 22 April 2005).

In Boston, it was shown that hand hygiene decreases respiratory illness transmission at home in families with young children attending day care centres.¹¹ In child nurseries in developed countries, hand hygiene reduces respiratory and gastrointestinal diseases; in classrooms, the rate of absenteeism; in hospitals, morbidity, mortality, antimicrobial resistance spread, and use of health care resources,^{4,8-10} and in Karachi and similar resource-poor settings, it might save lives.

The time has come to "shout from the roof tops" that hand hygiene promotion should be considered a worldwide priority for both public health and health care, and I call upon policy-makers, in particular health ministers, medical and nursing schools, chief medical and executive officers, as well as all healthcare workers and community members with a potential to be a role model,¹² to help highlight, support, prioritise, and fund research and intervention to improve hand hygiene behaviour.

Professor Didier Pittet, MD, MS

Director, Infection Control Programme, Hôpitaux Universitaires de Genève et Faculté de Médecine, Geneva, Switzerland, and

Chair, Global Patient Safety Challenge, WHO World Alliance for Patient Safety

Legend to the Figure: Soap and water for all (kindly provided by Florian Pittet)

References

1. Black R, Morris S, Bryce J. Where and why are 10 million children dying every year? *Lancet* 2003;**361**:2226-2234.
2. Luby SP, Agboatwalla M, Painter J, Altaf A, Billhimer WL, Hoekstra RM. Effect of intensive handwashing promotion on childhood diarrhea in high-risk communities in Pakistan. A randomized controlled trial. *JAMA* 2005;**291**:2547-2554.
3. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *Lancet Infect Dis* 2003;**3**:275-281.
4. Boyce JM, Pittet D. Guideline for Hand Hygiene in Health-Care Settings. Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. Society for Healthcare Epidemiology of America/Association for Professionals in Infection Control/Infectious Diseases Society of America. *MMWR* 2002;**51**(RR-16):1-45.
5. Luby S, Agboatwalla M, Raza A, Sobel J, Mintz E, Baier K, et al. A low-cost intervention for cleaner drinking water in Karachi, Pakistan. *Int J Infect Dis* 2001;**5**:144-150.
6. WHO Guidelines on hand hygiene in health care; Executive summary – available at www.who.int/patientsafety/challenge/en/
7. Marsh D, Husein K, Lobo M, Ali Shah M, Luby S. Verbal autopsy in Karachi slums: comparing single and multiple causes of child deaths. *Health Policy Plan* 1995;**10**:395-403.
8. Pittet D. The Lowbury lecture: behaviour in infection control. *J Hosp Infect* 2004;**58**:1-13.

9. Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvan V, Touveneau S, et al. Effectiveness of a hospital-wide programme to improve compliance with hand-hygiene. *Lancet* 2000;**356**:1307-12.
10. Pittet D, Boyce JM. Hand hygiene and patient care: pursuing the Semmelweis legacy. *Lancet Infect Dis* 2001(April):9-20.
11. Lee GM, Salomon JA, Friedman JF, Hibberd PL, Ross-Degnan D, Zasloff E, et al. Illness transmission in the home: a possible role for alcohol-based hand gels. *Pediatrics* 2005; **115**:852-860.
12. Pittet D, Simon A, Hugonnet S, Pessoa-Silva CL, Sauvan V, Perneger TV. Hand hygiene among physicians: performance, beliefs, and perceptions. *Ann Intern Med* 2004;**141**:1-8.