



Health impact of handwashing with soap

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Hygiene promotion, together with improved water supply and sanitation, is a key component of intervention programmes which aim to reduce the burden of diarrhoeal diseases in developing countries. However, the impact of hygiene promotion, and the washing of hands with soap in particular, has wider health implications. This fact sheet gathers the available evidence of the health impact of the promotion of handwashing with soap in developing countries and highlights the gaps in our knowledge.

Hygiene promotion and handwashing

Hygiene is the practice of keeping oneself and one's environment clean and free of infection risk. Though many hygiene practices can assist in preventing disease, the one with the strongest evidence for effectiveness and cost-effectiveness in developing countries is handwashing with soap^{1,2}

Why promote handwashing with soap?

Hands are vectors that can transport disease agents from person to person directly or indirectly via surfaces. Hands that have been in contact with faeces, nasal excretions and other bodily fluids, and not subsequently adequately washed, can vehicle large numbers of viruses, bacteria and possibly other parasites. They can also carry pathogens from contaminated sources such as animal or bird faeces, contaminated foods or domestic or wild animals to new susceptible hosts. Handwashing is likely to be especially important where people congregate (schools, offices), where ill or vulnerable people are concentrated (hospitals, nursing homes), where food is prepared and shared and in homes, especially where there are young children and vulnerable adults.³

In developing countries the biggest killers of young children are respiratory infections and the diarrhoeal disease⁴ and both are preventable via handwashing. Further diseases of public health importance for which the evidence for the impact of handwashing is less strong are helminth and eye infections, especially trachoma. Here we review the evidence for the impact of handwashing on:

- Diarrhoeal disease (which can include shigellosis, typhoid and cholera)
- Acute respiratory infections
- Helminth infections (especially ascariasis)
- Eye infections

What evidence is there for the health impact of handwashing with soap?

a) Diarrhoea

Diarrhoea is a leading cause of childhood mortality in developing countries and as a result the large bulk of hygiene promotion studies have focussed on the impact of hygiene promotion on the number of diarrhoea cases. Different authors have reviewed, with the help of meta-analysis, studies which investigated the impact of handwashing and handwashing with soap on diarrhoea over the last two decades.^{5,6,7,8}

All reviews reported a significant reduction in the risk of diarrhoea as a result of handwashing or handwashing with soap (Table 1). Curtis and Cairncross (2003) estimated further that handwashing with soap alone was able to prevent 0.5 – 1.4 million deaths per year.

Table 1. Summary of the findings of reviews on the impact of handwashing on the risk of diarrhoea

Author		# studies	Reduction in diarrhoea risk
Esrey et al., 1985	Hygiene	6	33%
Huttley et al., 1997	Handwashing	5	35%
Curtis & Cairncross, 2003	Handwashing with soap	19	44%
	Handwashing with soap*	7	47%
Fewtrell et al., 2005	Handwashing	5	44%

*Only intervention studies / good quality studies

A recently conducted randomised control trial in Karachi, Pakistan, further confirmed the findings of the two most recent reviews by finding an average reduction of 45% in diarrhoea incidence when handwashing with soap was practised.¹⁹

b) Acute respiratory infection (ARI) and SARS

ARIs are the leading cause of childhood morbidity and mortality world-wide. There are two possible links between handwashing and ARIs:

1. Respiratory pathogens have been identified on hands and environmental surfaces by microbiological studies.
2. Pathogens, especially enteric viruses, which cause diarrhoea can also cause respiratory symptoms

A recent systematic review and meta-analysis on handwashing and respiratory infections concluded that handwashing could cut the risk of ARIs by 16%⁹. However the 8 studies that were found suitable reported a range from 6% to 44% and the authors reported that the studies were of poor quality, were only conducted in developed countries and only one related to severe disease. They consequently expressed the need for more rigorous studies.

Here we update the results with two further, more recent, studies which when all taken together, give a pooled impact on respiratory infection of 23%^{10,11} (See Figure 1).

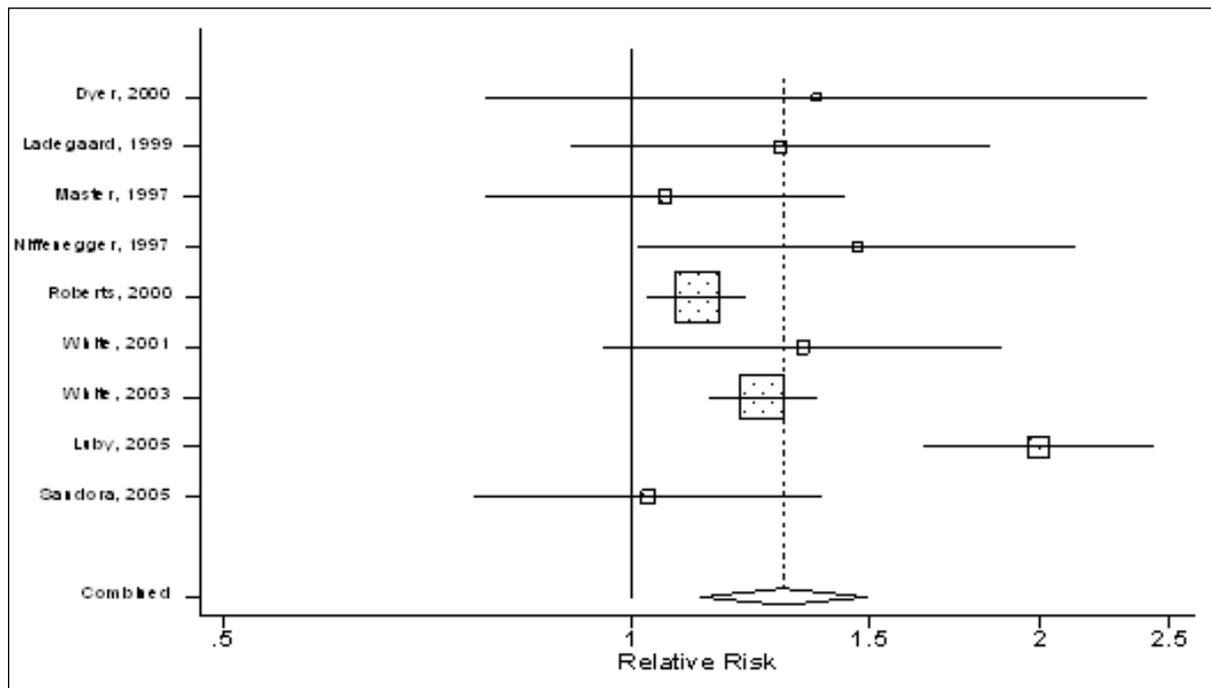


Figure 1. Risk of respiratory infection and handwashing with soap - Rabie and Curtis 2005 review, updates with Luby et al., 2005 and Sandora et al., 2005.

A review of 10 studies conducted during the recent SARS outbreak in South-East Asia found that handwashing after patient care was a protective measure against SARS infection. It needs to be noted though that although all studies suggested a protective effect, the pooled findings were not found to be statistically significant.¹²

c) Intestinal nematode infection

Ascariasis and trichuriasis are two of the most common and wide-spread intestinal nematode infections, affecting almost two billion people world-wide.¹³ Fertile *Ascaris* and *Trichuris* eggs leave humans through stool and are directly infective in very low concentrations (1 egg could in principle lead to an infection). Transmission occurs through ingestion. *Ascaris* eggs have an especially 'sticky' nature and they have been found adhered to money, agricultural produce, cutlery, crockery and hands.

Although an association between ascariasis-trichuriasis and handwashing with soap seems likely and is often suggested only one single study has investigated this.¹⁴ This study showed no difference both in intensity and prevalence of *Ascaris* infection between the two trial groups. The study was however a short trial which did not allow for sufficient time for reinfection, did not control for confounding variables, including household clustering and in general was (too) limited in size. Other studies have included handwashing and/or the availability of soap in the household in their risk factor analysis. The evidence of these studies again suggested a protective effect but were in most cases confounded by sanitation and socio-economic status of the households involved.^{15,16,17,18}

Although there is no evidence that handwashing with soap has an impact on the risk of schistosomiasis, soap is known to be toxic to schistosomiasis cercariae. There is no clear association between hookworm infection and handwashing with soap, as hookworm disease is caused by a larvae which penetrates the skin in contact with contaminated soil.

d) Eye infection

A study promoting handwashing with soap on Lombok, Indonesia, found besides a strong decrease in diarrhoea prevalence also a significantly lower prevalence of infective conjunctivitis.

Limitations of the evidence

The four reviews on diarrhoea and handwashing and the one on handwashing and ARI highlighted that many handwashing studies had methodological shortcomings, especially the older ones. Problems with studies included one or more of the following:

- a) Not an intervention study
- b) Intervention was not randomized
- c) Baseline disease data not provided
- d) No control group selected / no placebo intervention
- e) An unsatisfactory definition of the outcome variable
- f) Compliance not assessed
- g) Inadequate control for confounding variables
- h) Unreliable measure of handwashing
- i) High loss to follow up

In addition some studies tested the health impact of more than one intervention. The recent large randomized control trial in Pakistan showed that household water treatment resulted in a 53-59% reduction in the weekly diarrhoea prevalence and handwashing with soap in a 45% reduction. A combination of both interventions however resulted only in a 50% reduction in diarrhoea.¹⁹ The authors suggested that introducing two interventions simultaneously does not allow their optimal combined use as behaviour change is best achieved through simple messages.

A major limitation of the studies on ARIs and handwashing with soap was that the majority of these were conducted in developed countries and that as a result focussed on colds and influenza. In developing countries severe pneumonias are responsible for the majority of ARI deaths which makes extrapolation of the review findings to developing countries uncertain.

What are the benefits of the use of soap?

The use of soap (or other mediums like sand or ash) has the added benefit that it increases the contact time, facilitates friction and breaks down grease and dirt (which contain the largest concentrations of microbes). The use of soap in addition results in fresh and clean smelling hands, which makes promotion much easier. Trials in Bangladesh and Zimbabwe showed that handwashing with soap was more effective than handwashing with only water to reduce faecal bacteria on hands.^{20, 21}

Two of the most common problems with studies that have investigated the health impact of handwashing with soap are:

- a) The presence of soap in the household has been assessed without assessing actual use of soap. Past surveys have shown that soap is almost universally present in households but its actual use for handwashing is often considerably lower (ranging from 3% to 47%).²²

- b) Handwashing and the use of soap were investigated with the help of a pre-designed questionnaire. The use of questionnaires is likely to result in what the interviewee perceives as the desirable answer and is likely to result in an over reporting of handwashing with soap. Structured observations, although time-consuming and more expensive, are the best way to assess the use of soap for handwashing.^{23, 24}

Knowledge gaps

- There is strong evidence that handwashing with soap can considerably reduce the incidence of diarrhoea and ARIs in children, however, little to nothing is known about its impact on the morbidity and mortality of other vulnerable groups like: the elderly and the immunocompromised.
- Hand washing with soap after defecation is suggested as the key moment, however is this alone sufficient? and what are the added health benefits of handwashing with soap at other moments during the day?
- Is handwashing with soap able to reduce the incidence of skin infections and Trachoma?
- Studies in Ghana and Pakistan have shown that unhygienic handling of food at markets resulted in a significant contamination of vegetables and fruits. This would indicate that handwashing with soap by street vendors and market salesmen could have an impact on food-borne diseases.

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