Effect of washing hands with soap on diarrhoea risk in the community: a systematic review

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CRD summary
This review assessed whether washing hands with soap reduces the risk of diarrhoea in the community. The authors concluded that it reduces the risk by around 45%. Most of the studies were of a poor quality. The authors' conclusion is probably correct, but the estimated size of the reduction might not be accurate.

Authors' objectives
To determine what effect washing hands with soap has on the risk of diarrhoeal disease in the community.

Searching
MEDLINE, EMBASE, CAB Abstracts, the Cochrane Library and ISI Web of Science were searched for studies published in English up to the end of 2002; the search terms used were not explicit. Reference lists of relevant studies, review articles and the authors' collections were searched by hand. Attendees at a conference were asked if they had any relevant unpublished data.

Study selection
Study designs of evaluations included in the review
Inclusion was not restricted by study design. The review included randomised and non-randomised trials, cohort studies, case-control studies and surveys.

Specific interventions included in the review
Studies of hand washing were eligible for inclusion. The included studies looked at various types and occasions for hand washing. Most of the studies specified the use of soap. One included study used the presence of soap in the household as an indicator of hand washing.

Participants included in the review
The inclusion criteria were not explicit. The included studies were conducted mostly in developing countries among rural and urban communities. The majority were in children or carers of children but some were in adult or mixed populations.

Outcomes assessed in the review
Studies that reported the risk of intestinal or diarrhoeal disease were eligible for inclusion. Data to calculate the risk and 95% confidence intervals (CIs) had to be reported. The outcome measures in the included studies were described as diarrhoea, severe persistent diarrhoea, Shigella, shigellosis, dysentery, cholera and typhoid. In the analysis, severe was defined as hospitalised cases of enteric infection, cholera, shigellosis, typhoid and death.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The criteria used to assess the methodological quality of the trials were randomised, concurrent control group, placebo comparison, baseline incidence, satisfactory case definition and assessment of compliance. The criteria used to assess the methodological quality of observational studies were adequate control of confounding, reliable measure of hand washing and loss to follow-up. Trials with a concurrent control group and baseline incidence data, and observational studies with adequate control for confounding, were defined as high quality. The authors did not state how many reviewers performed the quality assessment.
Data extraction

The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

The extracted data included the use of soap, the disease outcome measure and the risk measure for disease (with and without hand washing). Data were extracted for each outcome measure if a study reported more than one. Relative risks (RR) were extracted as reported. Odds ratios were treated as relative risks and, where adjusted and unadjusted values were reported, the adjusted value was used. The 95% CIs were extracted as reported or calculated from the data given. If a study reported risk estimates for more than one hand washing practice in the same participant group, the average was taken; measures from different sample groups in the same study were treated as separate studies.

Methods of synthesis

How were the studies combined?
A meta-analysis was used to obtain weighted pooled estimates for the risk of enteric infections (diarrhoeal or intestinal disease) associated with not washing hands. A random-effects model was used to obtain the pooled RR and 95% CI. Pooling of severe outcomes only and shigellosis as the outcome, irrespective of other study characteristics, was also conducted. Studies that reported two different outcome measures were included as separate studies in the analysis. A funnel plot was used to assess publication bias.

How were differences between studies investigated?
Pooling was conducted for all studies together, all high-quality studies, trials only, and all studies that reported the use of soap. The meta-analysis was repeated excluding one study at a time to see if the overall effect changed substantially. Pooling was also done for severe outcomes and shigellosis as the outcome. A statistical test for heterogeneity was applied in the meta-analysis.

Results of the review

Seventeen studies were included: 7 trials (two of which were randomised), 2 cohort studies, 6 case-control studies and 2 household surveys. The authors stated that only two of the trials were effectively randomised. No indication was given of the size of the studies.

Most of the included studies were of a poor quality. There was weak evidence of publication bias.

Pooling 20 outcome measures from all 17 studies showed a significant reduction in the risk of enteric infections associated with not washing hands, the RR was 1.74 (95% CI: 1.39, 2.18). The reduction in risk was 43% (95% CI: 28, 54). The result was similar for studies using soap. There was significant heterogeneity between the studies. The pooled analysis of severe outcomes showed a 48% reduction in risk (95% CI: 35, 66) with significant heterogeneity. The pooled analysis of 2 studies that reported shigellosis as an outcome showed a 59% reduction in risk (95% CI: 38, 73).

The pooled reduction in risk based on the high-quality studies was 42% (95% CI: 31, 51) when combining 6 outcome measures. Pooling only the trials showed a risk reduction of 47% (95% CI: 24, 63), with significant heterogeneity.

Authors’ conclusions

Washing hands with soap can reduce the risk of diarrhoeal diseases by 42 to 47%.

CRD commentary

The review addressed a broad question that might, in part, account for the lack of detail in the reporting of the inclusion criteria. However, it also raises doubts about the study selection process being systematic since there was no description of how decisions about the relevance of primary studies were made. A number of sources were searched, although perhaps not the most relevant for public health interventions. The efforts made to identify unpublished studies do not appear to have been extensive, but the authors acknowledged that the effects reported in the review might have been inflated by publication bias.
There were a number of problems with the meta-analysis that bring into question how reliable the pooled results are. The actual outcomes, as reported in the individual studies, were not shown. In addition, it was unclear whether steps were taken to avoid counting the same control group participants twice when two outcome measures from within a study were pooled as if they were from separate studies. Pooling studies of different designs is highly questionable because of the unknown potential for bias in observational studies, even if they have few known methodological shortcomings. The obvious heterogeneity (differences in effect) between studies makes interpretation of the average effects impossible without a thorough narrative investigation of potential explanations for the differences, which this review did not do. While the direction of effect appears consistent, the quantitative element of the conclusion is probably not reliable.

**Implications of the review for practice and research**

Practice: The authors stated that hand washing promotion may become an intervention of choice if promotion programmes can be shown to be effective and cost-effective.

Research: The authors stated that rigorous trials are needed to determine the impact of hand washing on diarrhoea and other infections in a variety of settings. When hands should be washed, how and how often, and by whom, still needs clarification. The effectiveness of promoting hand washing needs to be measured.

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