

Effectiveness of handwashing with soap for preventing acute respiratory infections in low-income and middle income countries: a systematic review and meta-analysis

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04.10.2023

Introduction:

- Acute respiratory infection (ARI) is a leading cause of morbidity and mortality globally, with 83% of ARI mortality occurring in LMICs before the COVID-19 pandemic.
- 2.5 million deaths in 2019 were attributable to ARIs.
- Very young and very old people are at particularly high risk, with an estimated 740000 deaths of children younger than 5 years attributable to ARIs in 2019.
- Handwashing practices at key moments are less prevalent in LMICs compared with high-income countries (HICs) for many reasons, including reduced access to water supply on premises or to handwashing facilities with soap and water.
- **The aim of this presentation:** to estimate the effect of interventions promoting handwashing with soap in domestic, school, and childcare settings on ARI in LMICs.

Reminder :

	lower respiratory infections	upper respiratory infections
the infection's primary location	below the larynx	above it
global disability-adjusted life-years (DALYs)	3.8%	0.3%
e.g	pneumonia and bronchiolitis	the sinuses and throat
symptoms	difficulty breathing and rapid respiratory rate	runny nose (coryza) and a sore throat (pharyngitis)
Pathogens:	can be bacterial or viral.	predominantly viral

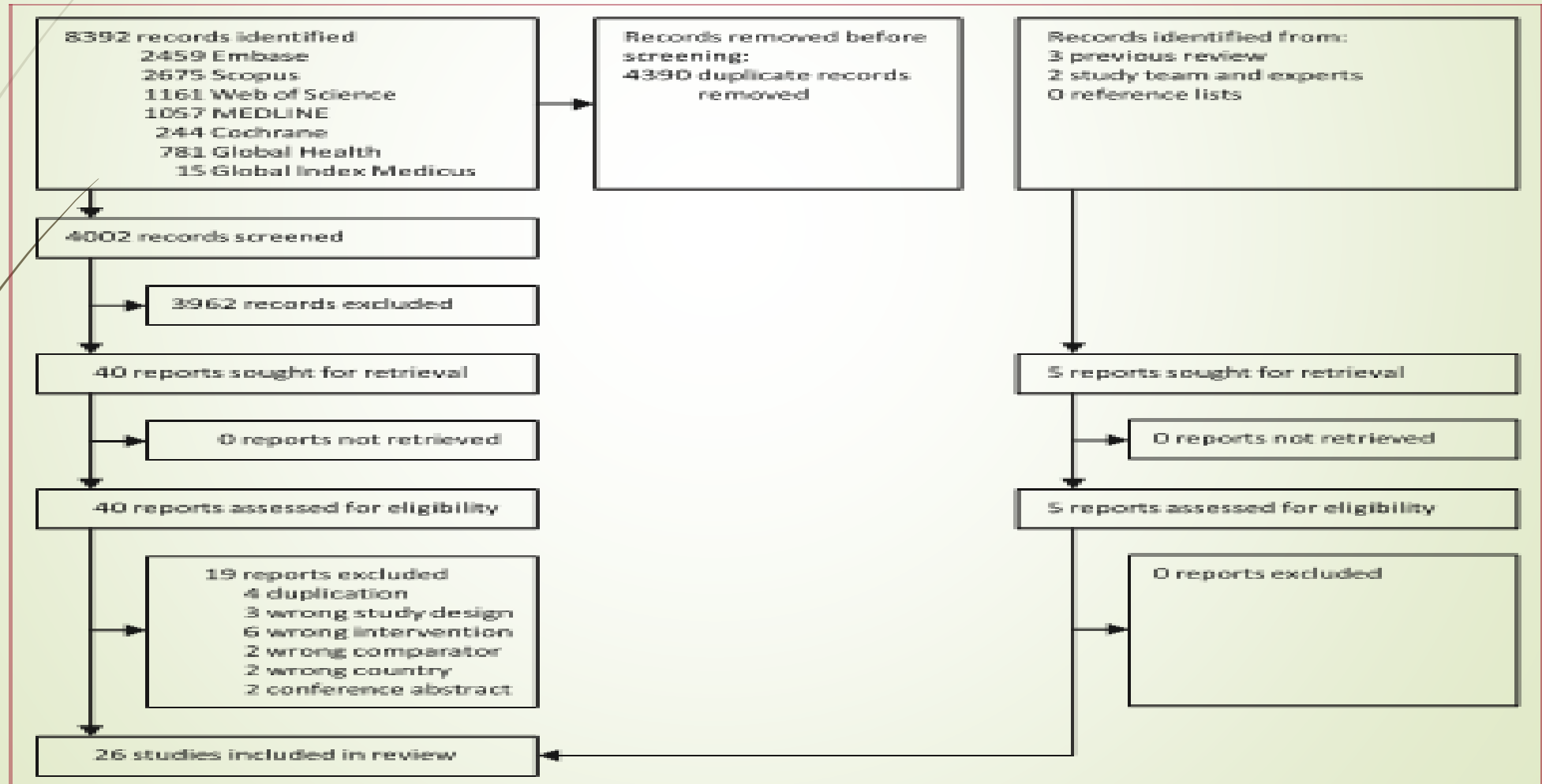
- ARI-causing pathogens can be transmitted via airborne, surface, or person-to-person contact routes. Handwashing with soap can prevent many ARIs by mechanically removing pathogens from hands, and by rupturing many bacteria and viruses.

Methodology :

- **databases searched** : MEDLINE, Embase, Web of Science, Scopus, Cochrane Library, Global Health, and Global Index Medicus
- **Period of the research** : from inception to May 25, 2021.
- **Design of the studies searched** : prospective observational studies
- **primary and secondary endpoints** :
 - The primary outcome was all-cause ARI morbidity
 - secondary outcomes: lower respiratory infection morbidity, upper respiratory infection morbidity, influenza confirmed by diagnostic test, COVID-19 confirmed by diagnostic test, and all-cause mortality

Results :

- **Number of studys** : 26 studies : 13 studies in Asia, 9 in Africa, and 3 in Latin America
- **Total Number of participants** : 161 659 participants
- **Places**: domestic settings, primary school , childcare settings.
- **Risk of biais**: moderate



Years of	Country	Milieu	Study design	Intervention study
Randomisation and Follow-up HWWS within Intervention content study design (months) intervention				
Studies in domestic settings (n=18)				
Arnold et al (2009) ⁴¹				2007 Guatemala Rural Non-randomised (PSM) 3 Majority, HWWS ≥50% Handwashing promotion, alongside household water treatment
Ashraf et al (2020) ³¹	2013–15	Bangladesh	Rural Randomised (cRCT) 24	Majority, HWWS only Handwashing promotion with soap and HWF provision
Chase and Do (2012) ⁴²	2009–11	Viet Nam	Rural Randomised (cRCT) 18	Majority, HWWS only Handwashing promotion domestic
Galiani et al (2015); ³³	2008–11	Peru	Mixed Randomised (cRCT) 36	Majority, HWWS only Handwashing promotion domestic and schools
Huda et al (2012) ⁴⁴	2007–09	Bangladesh	Rural Non-randomised (matched cohort) 24	Minority Hygiene promotion including handwashing, alongside promotion of sanitation and safe collection and storage of drinking water
Humphrey et al (2019) ³⁹	2012–15	Zimbabwe	Rural Randomised (cRCT) 18	Minority Handwashing promotion with soap and HWF provision, alongside promotion of food hygiene, sanitation, and household water treatment
Hussam et al (2019) ^{40*}	2015–17	India	Rural Randomised (cRCT) 8	Majority, HWWS only Handwashing promotion with soap provision
Manaseki-Holland et al (2021) ²⁶	2015–17	Gambia	Rural Randomised (cRCT) 32	Majority, HWWS ≥50% Handwashing promotion with soap provision, alongside food hygiene promotion
Morse et al (2020) ²⁹	2017–18	Malawi	Rural Non-randomised (site-randomised) 18	Minority Hygiene promotion including handwashing, alongside promotion of sanitation and household water management
Najnin et al (2019) ⁴⁵	2011–13	Bangladesh	Urban Randomised (cRCT) 24	Minority Hygiene promotion including handwashing and HWF provision, alongside household water treatment and cholera vaccine
Studies in primary school settings (n=8)				
Bowen et al (2007) ²⁴	2004–05	China	Mixed Randomised (cRCT) 5	Majority, HWWS only Handwashing promotion with soap provision
Chard et al (2019) ⁴⁹	2014–17	Laos	Rural Randomised (cRCT) 24	Minority Hygiene promotion including handwashing, alongside provision of HWF, sanitation, and water supply and treatment
Galiani et al (2015); ³³	2008–11	Peru	Mixed Randomised (cRCT) 36	Majority, HWWS only Handwashing promotion domestic and schools
Mangklakeree et al (2014) ³⁶	2011	Thailand	Rural Non-randomised (CBA) 4	Minority Hygiene promotion including handwashing and cough etiquette, masking, and self-isolation
Patel et al (2012) ³⁸	2007–09	Kenya	Rural Non-randomised 12	Majority, HWWS ≥50% Handwashing promotion with soap and HWF provision, (controlled cohort) alongside promotion and provision of drinking water treatment
Pickering et al (2013) ⁵⁰	2010	Kenya	Urban Randomised (cRCT) 2	Majority, HWWS only Handwashing promotion with soap and HWF provision
Talaat et al (2011) ²³	2008	Egypt	Urban Randomised (cRCT) 3	Majority, HWWS only Handwashing promotion
Trinies et al (2016) ⁵¹	2013–14	Mali	Mixed Non-randomised (matched cohort) 14	Minority Handwashing promotion with soap and HWF provision, alongside provision of sanitation and water
Studies in childcare settings (n=2)				
Ban et al (2015) ³⁷	2010–11	China	Urban Randomised (cRCT) 12	Majority, HWWS ≥50% Handwashing promotion with soap and sanitiser provision, alongside surface cleaning
Liu et al (2019) ³⁰	2015	China	Urban Randomised (cRCT) 6	Majority, HWWS only Handwashing promotion with soap provision

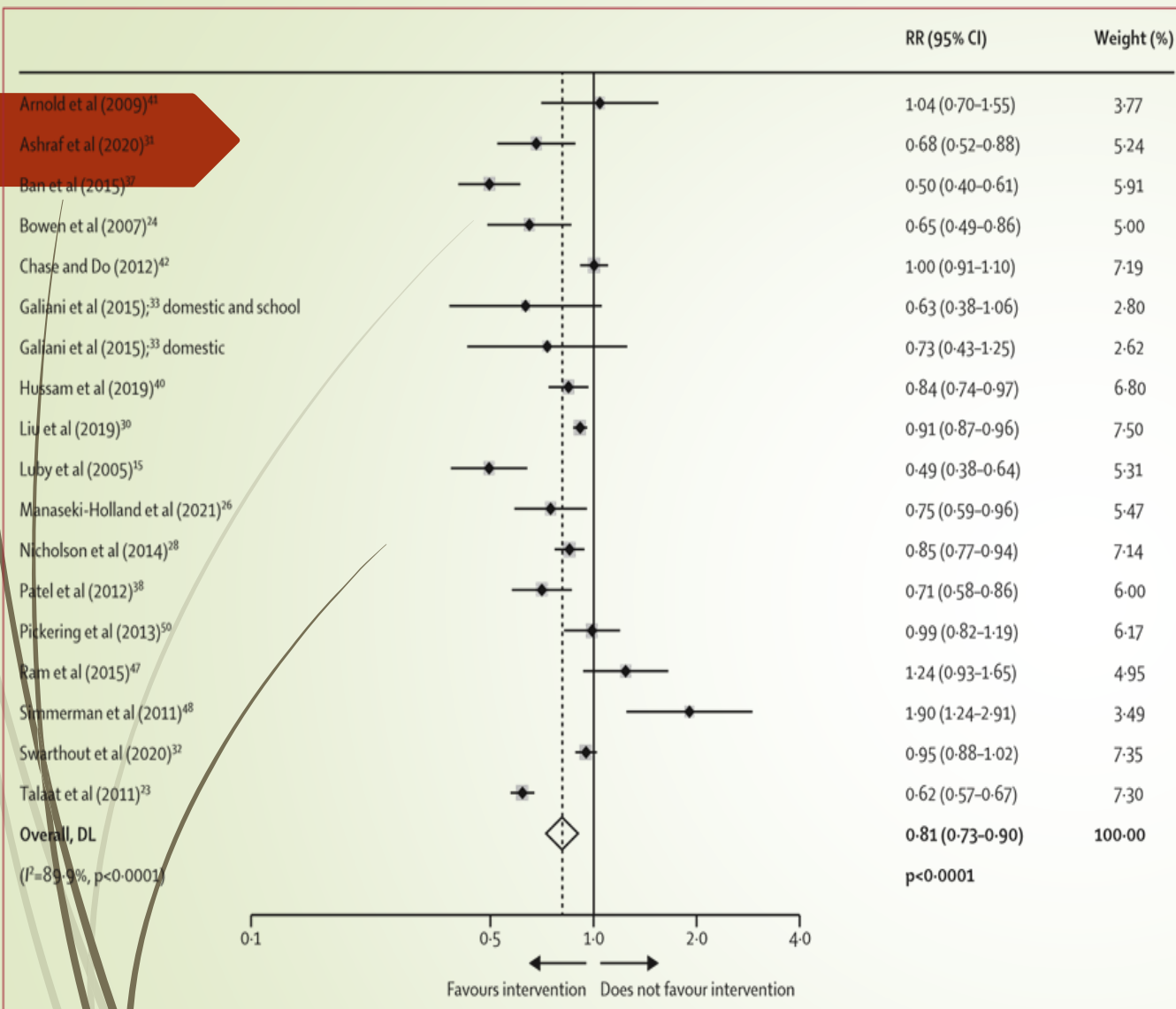


Figure 3: Forest plot of included comparisons for any acute respiratory infection, for which handwashing comprised the majority of intervention content. Weights are from random-effects model. DL=DerSimonian and Laird. RR=relative risk.

	Number of comparisons	Effect size (95% CI)	I ²	p value for heterogeneity
Any acute respiratory infection	27	0.83 (0.76-0.90)	88%	<0.0001
Lower respiratory infection	12	0.78 (0.64-0.94)	64%	0.0010
Upper respiratory infection	7	0.74 (0.59-0.93)	91%	<0.0001
Influenza confirmed by diagnostic test	3	0.94 (0.42-2.11)	90%	<0.0001

Table 2: Pooled estimates of the effect of interventions to promote handwashing versus control for all outcomes

Discussion :

- Interventions promoting handwashing with soap **reduced ARI morbidity** by about 17%.
- Such interventions are therefore an important means of **preventing ARIs in LMICs**.
- this study is the **first meta-analysis** of the effect of handwashing with soap interventions on any ARI **since the 2008** study by Aiello and colleagues.
- A further strength is in **distinguishing between lower and upper respiratory infections**, which previous handwashing meta-analyses have not done

Limitation of the study :

- First, **masking of participants** in handwashing interventions is impossible.
- Second, symptoms included in the primary outcome were typically caregiver-reported or self-reported.
- **Reporting bias** could therefore lead to effects being overstated.
- For effective uptake of handwashing with soap, **complementary investments are required** in water supply and handwashing facilities, which **can be costly** to households and governments. Hand hygiene is best facilitated by a water supply on premises, but 27% of the LMIC population (1.8 billion people) do not have such a service. Furthermore, nearly a third of the global population, almost exclusively in LMICs, does not have a handwashing facility with soap and water at home.



Conclusion:

- As in previous outbreaks influenza, most governments have promoted handwashing with soap during the COVID-19 pandemic.
- However, in comparison with the attention given to handwashing during these epidemics of respiratory disease, handwashing campaigns in normal times are rare.
- This review suggests that the scarcity of such campaigns might be a missed opportunity, and promoting handwashing with soap more broadly could reduce the large endemic burden of respiratory disease