

REVIEW OF STUDIES ON HAND WASHING AND CHILDHOOD DIARRHEA IN INDIA

By

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INDIA: CHILD SURVIVAL CHALLENGE

India contributes to 30% of all diarrhea deaths in the world.

19.2% of children in India suffer from diarrhea

INDIA: CHILD SURVIVAL CHALLENGE

Birth Rate: 24.1 (2004)

**27 million neonates
annually**

(ref..60)

- **U5MR 95 (1998-99)**
- **2.5 million die before year 5.**
- **Globally India accounts for 23% of all under 5 deaths.**
- **Infant Mortality Rate: 57**
- **1.6 million die before completing 1 year**

(ref. 60)

CAUSES OF UNDER-5 DEATHS IN INDIA

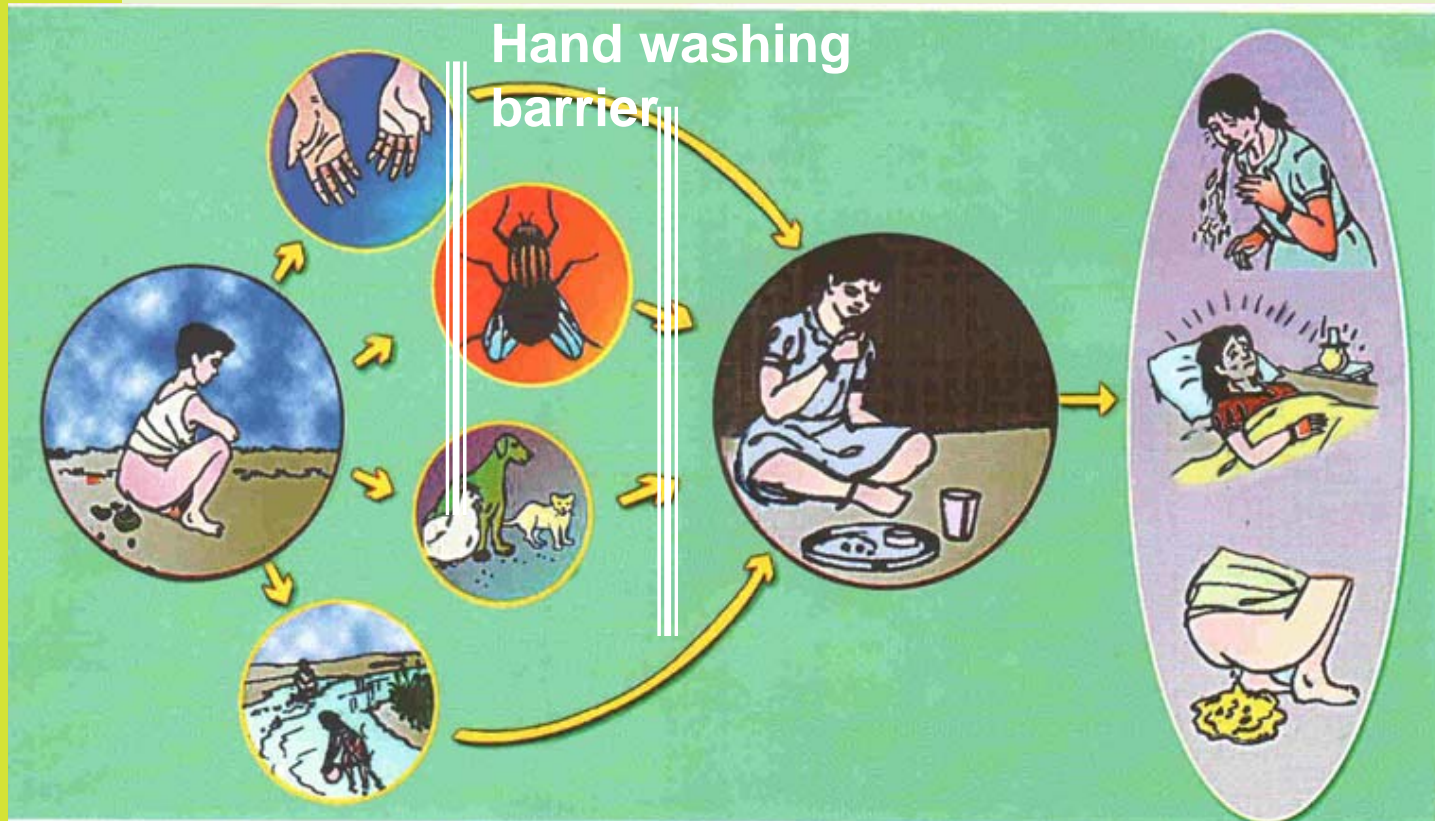
(ref.48)

Disease	Under-5 deaths (in 000) 2000	% of total under-5 deaths	Preventable under-5 deaths (in 000)	Preventable under -5 deaths
Diarrhoea	557	23%	506	91%
Pneumonia	544	23%	360	66%
Measles	14	1%	14	100%
Malaria	3	0%	3	94%
HIV/AIDS	20	1%	10	48%
Neonatal	863	36%	470	54%
Birth asphyxia	250	10%	97	39%
Prematurity	207	9%	119	57%
Severe infections	216	9%	205	95%
Tetanus	60	3%	49	81%
Other	130	5%	0	0%
Other	388	16%	0	0%

DIARRHEA

- Diarrhea is a symptom of infection caused by a host of bacterial, viral and parasitic organisms.
- Some diarrheas may be caused by metabolic errors, chemical irritation or organic disturbances (ref. 5).
- The vast majority of diarrheas are caused by infectious pathogens that reside in feces and employ a variety of routes to reach to a new host.
- Fecal oral route is most common for pathogen transmission.
- Public health importance of hand washing is historically known. Very little importance has been given this issue not only in India and other developing countries but also globally (ref. 12).

Diarrheal Disease Transmission

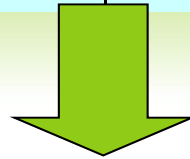


Hand washing is an effective barrier to transmission

Research Review Strategy

Title review of 1324 titles identified from searches from database, organizations, National Medical Library, and communication with the researcher.

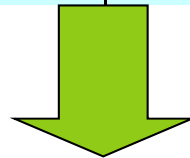
Communication with medico and non medico researchers (66), organizations (17) and people working for hygiene programs (23).



Review against Inclusion Criteria

Abstract review of 152 papers with full text copies obtained for 71 studies.

Full text copies, information about hand washing initiatives and expert opinion about need for hand washing initiatives obtained .



Studies/feedback included

59 studies from searches and feedback from experts included in the research review.

Impacts of WASH interventions

% reduction in diarrhea morbidity
2009 review from developing countries (ref.12)

	%	ES (95%CI)
1. Hygiene and HW Interventions	31%	0.69 (0.61-0.77)
2. Sanitation Interventions	37%	0.63 (0.43,0.93)
3. Water Supply Interventions	12%	0.98 (0.89,1.06)
4. Water Quality Interventions	42%	0.58 (0.50,0.67)
5. Multiple WASH Interventions	38%	0.62 (0.46,0.83)

Existing Hand Washing Studies

Author	Parameter	Studies	Diarrhea morbidity reduction
Esrey et. al. 1985	Hygiene <small>Secondary review</small>	6	33%
Huttley et. Al. 1997	Hand washing <small>Secondary review</small>	5	35%
Curtis & Cairncross 2003	Hand washing with soap <small>Secondary review</small>	19	42-47%
WEDC factsheet (Jeroen Ensink)	HWWS (only intervention good quality studies) <small>Secondary review</small>	7	47%
Fewtrell et. Al. 2005	Hand washing <small>Secondary review</small>	11	23-48%
Feachem 1984	Hand washing <small>Secondary review</small>	3	32-43%
Sircar et. al. 1987	Hand washing <small>Primary study</small>	1	33%

WHAT HAND WASHING RESEARCH HAS BEEN DONE IN INDIA?

1. Hand washing and diarrhea morbidity reduction: 14 studies
2. Hand washing and neonatal mortality: 2 Studies (1:Nepal)
3. Hand washing and KAP: 10 Studies
4. Hand washing and under nutrition/nematode infection: 5 Studies (1: Int'l)
5. Hand washing and mother perceptions: 4 Studies
6. Hand washing indicator: 1 Number
7. Impact of hygiene and soap promotion program: 4 Studies (1:Pakistan)
8. Hand washing and type of disinfectant: 4 Studies (1:Pakistan)
9. Hand washing and nosocomial Infection: 8 Studies
10. Hand washing and fomites :4 studies
11. Hand washing and eye infection: 2 Studies
12. Hand washing and ARI :1 Study

HAND WASHING AND DIARRHEA MORBIDITY KEY FINDINGS FROM 13 INDIA STUDIES

- 13 Indian studies found linkages between diarrhea reduction and hand washing (ref.1 -13).
- Shigellosis causes 80% deaths in children under two, and 40% under 5, hand washing significantly reduces infection (20%-30%) (ref.5 ,10,13).
- Diarrhea and ARI contribute to death of 43% of malnourished children (ref. 5).
- Many studies across states (slum/village) clearly showed low diarrhea prevalence where hand washing practice was good (ref. 7,13,53).
- Nearly half (48.9 per cent) of diarrheal deaths in the developing world are caused by the bacteria *Enterotoxigenic Escherichia coli* and *Vibrio cholerae*, both of which are associated with poor sanitation and are common in resource-poor countries (ref . 58) .

KEY RESEARCH QUESTION AND STUDY FINDINGS

Question:

Does hand
washing
reduce
diarrhea
morbidity?

32% India (ref.1,3,12)

31% Developing
Countries (ref. 13)

44% Global Studies

IMPACT OF HAND WASHING AND HYGIENE ON NEONATAL MORTALITY

- The majority of infants in the India are born at home, where mothers receive little or no perinatal care (ref.14)
- Hand washing has been shown to reduce the risk of shigella transmission, diarrhea, typhoid, pneumonia, and nosocomial infections in neonates (ref. various studies).
- Indian study shows diarrhea reduction by 62% through good hygiene and home based care (ref. 14).
- Recent study in Nepal study demonstrated that maternal hand washing reduces the risk of neonatal death by 64% among infant born in homes without latrine. (ref.15).

DOES HAND WASHING LINK WITH MALNUTRITION?

- Malnutrition is one of the major underlying causes of death of among 0-5 in India (ref. 17)
- Review of 38 studies (International) shows dietary interventions only are not adequate to combat malnutrition (ref.16).
- Tropical enteropathy, caused by fecal bacteria ingested in large quantity, is a subclinical disorder that leads to malnutrition (ref.16).
- Probability of stunting (24 month age) increases by 2.5% per diarrhea episode. Weight for age and length of age Z scores of children drop under unhygienic conditions (ref.17).
- 4-37% decrease in stunting in rural and 20-45% in urban with improved sanitation and hygiene (ref.17).

DOES HAND WASHING LINK WITH EYE INFECTION?

- ③ Study promoting hand washing with soap on Lombok, Indonesia, found a strong decrease in diarrhea prevalence and also a significantly lower prevalence of infective conjunctivitis (ref 20).
- ③ Prevalence of ocular infection was greater in children who did not wash their hand before meals (27.4%) compared to those who did wash (22.3%) (ref.21).
- ③ Significant evidence not available from India (knowledge gap).

DOES HAND WASHING LINK WITH SKIN INFECTION?

- ◎ Impetigo is an infection of the skin caused by bacteria; hand washing is the best way to prevent the spread of Impetigo, especially after contact with an infected person.
- ◎ Significant evidence not available from India (knowledge gap).

DOES HAND WASHING LINK WITH ARI?

- ③ Pathogens, especially enteric virus, which cause diarrhea can also cause respiratory symptoms (ref. 20,4).
- ③ Meta-analysis of six case-control studies suggested that physical measures are highly effective in preventing the spread of severe acute respiratory syndrome (ref. 22).
- ③ Significant evidence not available from India (knowledge gap).

WHAT EVIDENCE EXISTS ON LINKS BETWEEN INTESTINAL NEMATODE INFECTION AND HAND WASHING?

- *Ascariasis* and *Trichuriasis* are two of the most common and wide-spread intestinal nematode infections (Ref. 19).
- Two studies from India indicate that the prevalence of intestinal parasitic infection was 17.8% and 30-50% among school going children's (6-14 years) having poor hand washing practices (Ref. 18,59).

HAND WASHING, DIARRHEA AND FOMITES: FINDINGS FROM 3 STUDIES

Fomite is any inanimate object capable of carrying infectious pathogens. A fomite can be anything like a cell phone, pen, desk, cloth, toys etc.

Three studies across various states of India clearly marked the link between the phone, pen and other fomites with the pathogen presence and nosocomial infection.

- Both respiratory and enteric pathogens are often transmitted on surfaces
- 75% cell phones from HCW and Non-HCW grew at least one potentially pathogenic organism (ref. 23).
- Out of 75 pens studied, 26 (34.6%) were contaminated with bacteria (ref.25).
- The presence of e.coli on a handset may indicate poor compliance with hand washing guidelines (ref.24).
- Hand washing is the only barrier to prevent transmission of bacteria from hospital caregiver to child.

HAND WASHING, DIARRHEA AND NOSOCOMIAL INFECTION: FINDINGS FROM 9 STUDIES.

Nosocomial infections are a result of treatment in ICU, but secondary to the patient's original condition.

- Nosocomial infections are a significant problem in pediatric ICU, most common include viral upper and lower respiratory tract infections, **nosocomial diarrhea** and bloodstream infections (ref. 31,34).
- Female Health Care Workers long nails and hand rings could be one of the reasons may have high concentration of bacterial counts even after hand wash (ref.35).
- Hand hygiene remains the single most effective measure, infection can be reduced by up to **50% by hand washing** (ref.34).
- Another review of 34 published studies of hand washing adherence among health care worker, rate varied from 5% to 81%, **average adherence rate was 40%** (ref.30).

Eight studies clearly proved the low awareness about hand washing among HCW and its linkage with spread of nosocomial infection among 0-5.

HAND WASHING, DIARRHEA AND TYPE OF SOAP: FINDINGS FROM 4 STUDIES

- A randomized controlled trial of hand washing on child health in Karachi, Pakistan (table below) and another study in Dhaka shows no significant health benefit from use of antibacterial soap and other cleaning agent compared to plain soap. (ref. 37,38).

Intervention group	Pneumonia	Diarrhea
Antibacterial soap	45% (26% 26%-64%)	50% (37% 37%-64%)
Plain soap	50% (34% 34%-65%)	53% (41% 41%-65%)

- Use of plain soap bar not recommended in hospital setting as occasionally plain soaps become contaminated leading to colonization of gram negative bacilli (ref.33).
- Disinfectant which is not exposed to the environment or to the previous user's hands, like liquid soap, single use soap tablet and soap strips or surgical scrubs can be used at hospital and public places (ref. 39).

DO SOAP PROMOTION/GERM AWARENESS PROGRAMS IMPROVE HAND WASHING BEHAVIOR?

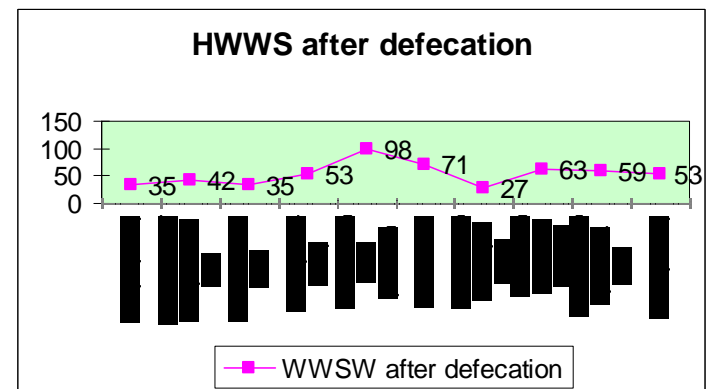
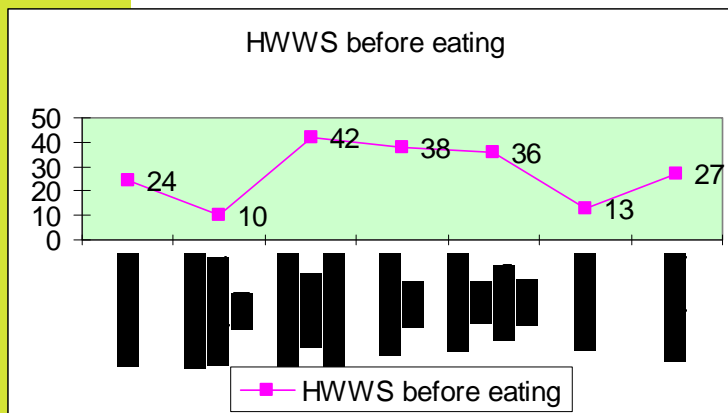
Four studies support that short term interventions are not effective in bringing change in household hand washing practice, HW behavior change requires continuous contact with the program

- Hand washing practice intervention proved scalable and effective in raising hygiene awareness (ref 40).
- Hygiene intervention should be continued until objective is achieved rather than pre-determining the length of project (ref.40,43).
- Use of demonstration tools such as “Glo Germ” powder for contamination awareness is important (ref. 41).
- Structured observation remains the preferred method to assess hand washing behavior (ref.42).

HAND WASHING BEHAVIOR ACROSS VARIOUS INDIAN STATES

10 Studies from Calcutta, Orissa, Uttaranchal, Uttarpradesh, Orissa, Maharashtra, Northeast, Madhya Pradesh indicate HWWS averages (ref.6,49-57),

- Before eating: 27%
- After defecation:53%
- After cleaning child bottom:28%
- Average time : 5 seconds (Ideal time: 15-20 seconds)



METHODS USED TO ASSESS HAND WASHING BEHAVIOR

Following are the commonly used methods to study hand washing behavior:

- Self reporting (by informant) : Cheap, easy but generally unreliable.
- Indirect reporting: Cheap, easy but un-validated
- Structured observation: Current preferred way to assess HWWS, but is costly, time-consuming and can generate respondent bias. Its limitations are prompting the search for new alternatives.*
- Indirect observation: Potentially reliable, technically complex, privacy issue.
- Microbiologic measures: Potentially reliable, large sample size, time-consuming, technically complex, requires cold chain, electricity.
- Research has shown that soap is almost universally present in households but its actual use for hand washing is often considerably lower (ranging from 3% to 47%) (ref.20).

*A promising integrated-measure approach is being developed but not yet available.

CULTURAL BELIEF CAN HINDER HAND WASHING

SUPPORTED BY 4 STUDIES

People's beliefs for the reason for diarrhea are (ref. 44, 47) -

Major:

- Teething
- Kind of food eaten by breastfeeding mothers
- Casting of the "evil eye"

Others:

- Indigestion
- Hot and spicy food
- Ingesting hair
- Mud or mosquitoes

CULTURAL BELIEF CAN HINDER HAND WASHING

Diarrhea is not linked with hand washing and water quality.

- 60% were ignorant about diarrhea cause and prevention (ref.47)
- In many rural areas, babies feces are regarded as "innocuous" (not contaminated) and so adults do not wash their hands after cleaning child's bottom or after handling child feces.

ONGOING WATER, SANITATION AND HAND WASHING PROGRAMS

WATER and WATER QUALITY

- Swajaldhara, Accelerated Rural Water Supply Programme (ARWSP)
- Jawaharla Nehru National Urban Renewal Mission
- Bharat Nirman Programme
- National Drinking Water Quality Monitoring and Surveillance Programme
- Jal Swaraj, Karnataka Municipal Reform Project and the Karnataka UWS Improvement Project,
- Uttaranchal RWSS and Punjab RWSS Project.

SANITATION

- Nationwide rural sanitation program named Total Sanitation Campaign (Hygiene Included)
- Integrated Urban Sanitation Programme

Hand washing (Programs/Project/Alliance/Network): NONE

HAND WASHING PILOTS CAN BE DONE

- **Water saving, low cost and innovative hand washing facilities especially at schools and public places (e.g Tippy Taps).**
- **Evidence based quality research in India to strengthen evidence base between hand washing and child morbidity/mortality.**
- **Reuse of soap from hotels etc (e.g Haiti)**
These soaps undergo two recycling methods: Re-batching and Sterilization. This process completely eliminates the pathogens as verified by Tri-Tech labs, an environmental testing facility in Orlando (FL).
- **Setting up of National Hand Washing Resource Centre (one-point contact for all hand washing support).**

ORGANIZATIONS ACTIVE IN HAND WASHING RELATED ACTIVITIES

Government Programs/Mission

- Total Sanitation Campaign (Department of Drinking Water)
- Sarva Shiksha Abhiyan and Mid Day Meal Program (Department of School Education and Literacy)
- National Rural Health Mission (Ministry of Health)

INGO/Intergovernmental Organizations

- Water Aid
- UNICEF

Regional NGOs

- Gramalaya, Sulabh, Gram Bharti Mahila Mandal, Energy Environment and Development Society, Udyama, Pragati, Madani Welfare Association, Society for Popularization of Science and Progressive Educational Society, NEDSF, North east Social Trust, ASHRAY, Utthaan, Parhit, NESPYM, Haritika etc.

AVAILABLE COMMUNICATION MATERIAL ON HAND WASHING

1. Developed by UNICEF and Department of Drinking Water Supply in 14 regional languages of India (available at state CCDU and UNICEF office);
 - TV spot featuring Sachin Tendulkar (Indian Cricketer)
 - Posters, Badge, T Shirts
 - Health & Hygiene Kits
 - Caps, Stickers
 - Formats for wall writing
 - Teachers Training Module in Hindi and English
(<http://ddws.gov.in/handwash/iecmaterial.aspx>)
2. Health & Hygiene Kit by Sesame Workshop (non-profit organization)
3. Animation (http://healthy-india.org/Hindi/hand_washingpup.html)

KNOWLEDGE GAPS: INDIA STUDIES and PROGRAMS

- Lack of good quality studies and empirical evidence on the impact of diarrhea morbidity and mortality.
- No significant studies about hand washing practices, ARI, eye and skin infection etc.
- No studies on vulnerable groups like: the elderly and immuno-comprised people (Like HIV/AIDS sufferers).
- Quality of most available studies is poor in terms of methodology, sample size and target groups.
- The Govt. of India and other prominent Institutions provide references from international studies only.

KEY EXPERTS/RESEARCHERS CONTACTED

- Dr. Siddhivinayak Hirve, Director, Vadu Rural Health. Program (VRHP), a rural division of the King Edward Memorial Hospital, Pune, Maharashtra, India.
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CONCLUSION

Conclusion 1: Hand washing contributes to a 28- 43% reduction in diarrhea morbidity and improved nutritional status.

Conclusion 2: The country with the 2nd largest population in the world does not have significant evidence, programs and networks to raise awareness about hand washing.

Conclusion 3: There is a strong urgency to focus on hand washing to improve child health and survival in India.