Focus on Home Hygiene in Developing Countries

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1. Why is home hygiene important?

The link between hygiene and sanitation, water supply and other basic infrastructure services is now well recognised in developing countries; public health authorities now realise that, until hygiene is properly practised, both at home and in the community as a whole, the desired impact of improved water and sanitation services in terms of community health improvement, cannot be realised. Importantly, research is also now showing that hygiene promotion can act as the means to create demand for sanitation and thereby increase coverage; thus hygiene promotion not only has the potential to increase the health impact of WASH programmes (Water, Sanitation and Hygiene)\(^1\), but also increase sanitation coverage in line with MDG targets\(^2\). The 2002 World Health Report states that unsafe water, sanitation and hygiene ranks 3rd of the 10 leading risk factors responsible for the overall disease burden in developing countries.\(^3\)

Infectious diseases are known to cause around 13 million deaths annually – one in 2 deaths in developing countries. Globally, diarrhoeal disease is a leading cause of death and illness, with approximately 2 million deaths and 4 billion cases annually, 96% of deaths occurring in the developing world\(^4\). Children suffer the most from diarrhoea; 90% of diarrhoea deaths are borne by children under five, WHO estimates that 94% of diarrhoeal cases are preventable through modifications to the environment, including interventions to increase the availability of clean water, and to improve sanitation and hygiene.\(^5\)

Reducing the unacceptable burden of diarrhoeal disease is not the only reason for renewed concern about hygiene. There is increasing evidence that hygiene plays a part in reducing risks of respiratory tract infections. Acute respiratory tract infections (ARIs) cause up to 4 million deaths a year.\(^4\) They are the leading cause of childhood morbidity and mortality in the world, and the biggest cause of disability-adjusted life years lost (DALYs). More than 150 million episodes of pneumonia are estimated to occur every year among children under five in developing countries. More than anything, however, it is the outbreak of SARS and the concerns about the possibility of a flu pandemic which has raised awareness of the potential role of hygiene in mitigating the spread of respiratory tract infections.\(^6,7\) Indirect evidence that measures such as hand hygiene, as well as public health measures, can be effective in reducing spread of respiratory tract infections came from the 2003 SARS outbreaks in Hong Kong, which coincided with the latter part of influenza season, when it was observed that, as extensive personal and community public health measures took place, reported influenza case numbers fell significantly, more so than usual for the time of year.\(^8\)

WHO estimate that, taken together, diarrhoeal disease and ARIs are responsible for two thirds of child deaths.

Trachoma is the world’s leading cause of blindness, but is completely preventable through hygiene; face washing breaks infection cycle. It is estimated that 92 million people suffer from trachoma and eight million are visually impaired or blinded as a result of the disease. In addition, up to 600 million individuals live in endemic areas and are at risk for contracting the disease.\(^9\)

Another concern, both in the developed and developing world, is the rising proportion of the population who are more vulnerable to infection.\(^10\) At risk groups in the home and community include not only the newborn, whose resistance to infection is not fully
developed, but also the increasing elderly population whose immune system is declining. It also includes family members who are immune-compromised as a result of malnutrition, underlying disease, or treatment with immuno-suppressive drugs. All of these groups, together with those who carry HIV/AIDS, are increasingly cared for at home by a home carer who may be a family member. Worldwide there are now more than 33 million people living HIV/AIDS. A recent intervention study of 50 HIV-positive patients in California showed that the relative risk of gastroenteritis was 3.34 times lower in an intervention group who applied home water treatment using a filter and UV light than in a control group which did not.

Put together, these concerns are a powerful argument for greater emphasis on hygiene. It is clear however that, to be effective and sustainable, responsibility for implementing hygiene measures must be shared by the public and the community. Developing a strategy for building hygiene practice into the daily life of urban and rural communities in developing countries represents a big challenge. Indications are however, that hygiene can prevent the spread of infectious disease at a fraction of the cost of other health interventions; a recently published analysis carried out as part of the of the “Disease Control Priorities Project” has shown that, in developing countries, for the “high burden” diseases (such as HIV/AIDS, malaria, diarrhoea disease and TB), hygiene promotion is the most cost effective intervention in terms DALYs averted (up to $3.35 per DALY averted due to diarrhoea disease compared with, for example, up to approx $1,000 per DALY averted by anti-retroviral treatment of HIV/AIDS.

2. What is home hygiene?

Fundamental to developing infection prevention is the need to recognise the home as an environment where all human activities occur. Whereas most people recognise that hygiene means “handwashing”, there is some confusion as to what else is involved. In reality, it includes all of the following:

- Hand hygiene and personal hygiene
- Food hygiene (cooking, storing, preventing cross contamination)
- Ensuring safe water at “point of use”
- Safe disposal of faeces (both human and animal)
- General hygiene (laundry, surfaces, toilets, baths, sinks)
- Disposal of solid waste
- Control of wastewater and rainwater
- Situations where there is more risk
  - Care of those who are infected
  - Care of those who are more vulnerable to infection

The International Scientific Forum on Home Hygiene (IFH) believes that one of the key needs, in developing and promoting home hygiene, is to ensure that we look at home hygiene from the point of view of the family and the range of actions which they need to undertake in order to protect themselves from infectious diseases. We need to recognise the family as the cornerstone. This makes sense since all of these actions are interrelated, and some activities like handwashing are central to all of them. Unfortunately, at the present time, in most countries, the various measures which make up home hygiene are dealt with by separate agencies. This means that the hygiene advice that the family receives is often fragmented. Advice on household water treatment and safe storage, for example is given quite separately,

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1 The International Scientific Forum on Home Hygiene (www.ifh-homehygiene.org) is a not-for-profit, non-government organization which is working to raise awareness of the importance of home hygiene and to develop and promote home hygiene based on the scientific evidence base.
and by a different agency, from advice on handwashing or on handling of food. In some cases advice on different aspects of hygiene may conflict. It also means that, the community (and those involved in actioning water, sanitation and hygiene intervention programmes) have little overall concept about how infectious diseases are being spread in the home. Understanding of hygiene practices is almost entirely rule-based. This makes it difficult for hygiene knowledge to be adapted to meet local needs or respond to new infectious disease threats.

3. The causal relationship between hygiene and infectious disease transmission

Although ideally all aspects of home hygiene should be promoted, hygiene promotion programmes are more likely to be successful in changing behaviour if they focus on a small number of activities at a time. This means understanding how infectious diseases are being transmitted, and prioritising those practices which carry the greatest risk:

- For respiratory tract infections such as colds and flu, infection results either from inhalation of infected droplets, or “inoculation” of the nasal mucosa or conjunctiva of the eye by direct contact with contaminated hands.
- For diarrhoeal diseases, infection can result from direct hand to mouth contact, or by ingestion of contaminated food or water.
- For skin and eye infections, the hands are probably major route of spread of infection.

Identifying critical practices also means understanding where the pathogens which cause these infections come from, i.e. what are the main sources of infection. In the home, the main sources of infection are people (including those who are “healthy carriers” of pathogens, as well as those who are ill), pets and domestic animals, food, water, and to a limited extent also insects. Pathogens are “shed” in large numbers from these sources in faeces, vomit, skin scales, or by e.g. placing contaminated meat or poultry and a clean surfaces. Home hygiene is about intervention in order to break the chain of transmission between an infected source and a health family member.

Establishing the relative impact (and thus relative importance) of different hygiene interventions such as hand hygiene or food hygiene, requires examination of the evidence related to a range of criteria which include the strength, consistency and temporality of the association, together with relevant data on plausibility etc. Aiello and Larson\(^\text{12}\) recognise that, although a single factor such as the hands may be a “sufficient cause” of infection transmission (from faeces to hands to mouth), spread of infection frequently involves a number of interdependent “component causes” (settling of contaminated vomit onto a hand or food contact surface, which is then transferred to food via the hands) which, together or independently, work to determine the overall risk. Because of the close interdependency of the various component causes, identifying the relative importance of each component is extremely difficult.

3.1 Hand hygiene

Based on plausibility, and supported by microbiological data, indications are that the hands are probably the single most important route for infection transmission in the home and community, since they come into direct contact with the mouth, nose and conjunctiva of the eyes and are thus a, or the, key last line of defence in preventing exposure to pathogens. They can also come into contact with food or water which is then consumed. A whole range of intervention studies have been carried out which indicate a strong and consistent causal link between handwashing and gastrointestinal infection, and a significant link between handwashing and transmission of respiratory infections.

From a systematic review of handwashing intervention studies carried out in developing country situations (Table 1), Aiello et al found that, the range of reduction in the incidence of gastrointestinal infections was -13% to 79%. Of the studies that were statistically significant (8/11), reductions in gastrointestinal infections ranged from 26% to 79%. Based on
community-based interventions (i.e. excluding health care-related and military settings) the range of reduction in respiratory tract illness was 5% to 53% although only 2/6 of these studies were statistically significant.  

Table 1. Summary of data from intervention studies on the impact of hand hygiene on respiratory and gastrointestinal infections

<table>
<thead>
<tr>
<th>Type of infection</th>
<th>Area of study</th>
<th>Risk reduction from Handwashing with soap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal</td>
<td>Developing</td>
<td>-13% to 79% 7/11 (26% to 79%) 42-47% 44%</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Developed and developing</td>
<td>5% to 53% 2/6 studies (20%-51%) 16% -</td>
</tr>
</tbody>
</table>

The strong causal relationship between hand hygiene and infectious disease risk was also demonstrated by meta-analysis studies of community-based interventions. Curtis, Cairncross and co-workers estimated a 42 to 47% reduction in diarrhoeal diseases associated with handwashing and a 16% reduction in the risk of respiratory infections associated with handwashing and/or use of waterless hand sanitizers. Fewtrell et al showed a 44% reduction in diarrhoeal illness associated with handwashing and a 28% reduction in diarrhoeal illness associated with hygiene education.

3.2 Safe disposal of faeces

An indication of the reduction in risk of diarrhoeal disease which can be gained by ensuring safe faeces disposal can be obtained from intervention studies carried out to assess the impact of improved sanitation. Based on analysis of intervention studies in developing countries published in 1991 (Table 2), Esrey et al estimated that the risk reduction associated with provision of improved sanitation was between 22 and 36%. Based on a study which included more recent data Fewtrell et al calculated a risk reduction of 32%.

Table 2. Estimated relative reduction in risk of diarrhoeal disease associated with water and sanitation interventions

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<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Sanitation</td>
<td>22-36%</td>
<td>32%</td>
<td>-</td>
</tr>
<tr>
<td>Water supply</td>
<td>19-22%</td>
<td>25%</td>
<td>-</td>
</tr>
<tr>
<td>Household water treatment</td>
<td>39%</td>
<td>50%</td>
<td></td>
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</tbody>
</table>

3.3 Household water treatment and safe storage

WHO/UNICEF estimates that up to 1.1 billion people still do not have access to improved sources of water for drinking and other essential purposes and, even for the remaining 5.2 billion people who have access to an “improved water source”, a significant proportion are drinking water which is grossly contaminated. This can occur where a substandard water distribution systems leads to reintroduction of faecal contamination. Alternatively water can become contaminated by unsafe consumer storage and handling practices at the household
level. This can happen when water has to be collected from a communal source for domestic use or water has to be stored for significant periods in the home. In these situations, promotion of household water treatment and safe storage methods can produce significant reduction in the incidence of gastrointestinal infection.

Household water treatment includes a wide array of treatment and storage techniques that are applied primarily at the point-of-use. Examples of household water treatments include boiling, filtration, chemical, solar and UV lamp disinfection, flocculation for the removal of turbidity, and other techniques. Safe storage refers to techniques that minimize the risk of recontamination, including the use of narrow-mouth, screened, and covered containers, as well as dispensing devices such as taps or spigots.

The 2005 systematic review by Fewtrell concluded that diarrhoeal episodes can be reduced by 25% through improving water supply and by 39% via household water treatment and safe storage. A more recent (2006) Cochrane review of randomized controlled trials confirmed the key role that point-of-use water quality interventions could play in reducing diarrhoea episodes, reporting a reduction in diarrhoeal disease morbidity by roughly half, on average, with some studies resulting in disease reductions of 70% or more.18

3.4 Food Hygiene

Although, there is good evidence that handling of food, either during preparation in the kitchen, or at mealtimes, with hands contaminated by faecal pathogens, is a significant cause of gastrointestinal infection, infection can also arise from pathogens which enter the food chain during preparation for retail sale. A study in South Africa, for example, showed that 19.2 and 32.3% respectively of poultry products purchased from retail outlets were contaminated with Salmonella and Campylobacter. This means that adequate storage and handling of foods in the home to prevent cross contamination to ready to eat foods, together with thorough cooking, are important to reduce risks of food poisoning.

Unlike developed countries where surveillance data focuses on foodborne infection, there is little data for developing countries to indicate the extent to which food poisoning arising in the home results from foods which are contaminated before they reach the home. In low income communities, however, it is likely that although gastrointestinal infections arise in this way, this mode of infection is “overshadowed” by infections arising from “faecal:food” transmission which occurs after food has entered the home. On the other hand, in homes where there is adequate water and sanitation, it is likely that this is an important route of transmission relative to other modes of spread.

3.5 The home environment

Although, in some cases, the hands alone may be “sufficient cause” for transmission of an infection, in other cases transmission may involve a number of component causes (e.g. from contaminated food, to a food contact surfaces, to hands, to the mouth of a recipient). Risk assessment indicates that the major “critical control points” or “component causes” of infection transmission in the home are the hands, together with hand and food contact surfaces and cleaning cloths. Clothing and household linens may also be involved.

What this means is that the risk of transmission of infection in the home also depends on the extent to which these surfaces become contaminated with pathogens during normal daily activities i.e. the risk of hand to mouth, or hand to food transfer will be increased if extensive transfer to household surfaces (e.g. from food to food contact surfaces or from latrines to latrine surfaces) also occurs. However, defining the risk reduction associated with hygiene practices such as surface and cloth hygiene relative to handwashing other hygiene practices through intervention studies is impossible because of the close interdependence of these factors.
Although most pathogens are unable to find a permanent home outside the human or animal body or food, field studies show that most pathogens can survive for significant periods, not only on hands but also on environmental surfaces; survival times can be relatively short (mins to hours) for some pathogens (e.g. flu virus) whilst for others (e.g. norovirus, *S. aureus* or *C. difficile*) survival times may be days or months. Microbiological data also shows that pathogens from infected or contaminated source are readily spread around the home via contaminated surfaces such that family members are regularly exposed to these organisms in numbers which may be sufficient to cause an infection.

### 3.6 The peridomestic environment

A whole range of activities and events take place in the environment immediately surrounding the home, which have the potential to increase the risk of spread of infection. These can include:

- Housing of domestic animals and pets
- Accumulation of animal and human faeces
- Accumulation of rain water, sullage and waste water
- Disposal of household refuse
- Children’s play area

All of these activities offer frequent opportunities for transmission of pathogens, either directly (e.g. by children coming into direct contact with faeces or contaminated refuse whilst playing), or by indirect transfer (e.g. from faeces or refuse being brought back into the home, via flies, cockroaches or rodents).

Home hygiene must therefore also include the immediate surroundings of the home and the activities which take place in this setting, if transmission of diarrhoeal and other faecal-oral diseases are to be prevented. People are often reluctant to take responsibility for hygiene outside their immediate home area. Hygiene promotion programmes should aim to educate communities about the importance of the peridomestic area, and empower communities to collectively take responsibility for this important aspect of hygiene.

### 3.7 Setting Priorities

Although, as stated above, ideally all aspects of home hygiene should be promoted, it is recognised that hygiene promotion programmes work best if they focus on a small number of activities. It must also be borne in mind however, that, by promoting a single practice, such as handwashing, people can come to assume that this practice alone can prevent the spread of infection. In developing programmes, IFH suggests that, ideally, a key stage programme should be adopted, in which hygiene practices are incorporated into programmes in stages. Stage 1 means focusing on practices which carry the greatest risk of transmitting disease.

**Fig. 1** Developing a key stage programme for hygiene promotion in the home
Fig 1 suggests a key stage programme for developing country situations. At the present time, it is generally accepted that priority (key stage 1) should be given to promoting 3 interventions:

- Safe disposal of faeces
- Handwashing at critical times
- Ensuring access to adequate safe water at point of use

Once these components are “in place”, stage 2 followed by stage 3, and so on, can be introduced. It must be borne in mind however that this key stage programme is based on assessment of the available data on relative risks from different interventions. It is recognised that this data is far from complete, particularly in relation to food hygiene, surface hygiene and hygiene related to the peridomestic environment. The “ranking” of risks may also vary from one community to another e.g. in some communities risks associated with poor food hygiene may be greater than those associated with poor household water quality.

4. Developing a strategy for promotion of home hygiene

As stated previously, developing strategies for building hygiene practice into the daily life of urban and rural communities in developing countries is a significant challenge. Although there is awareness amongst public health professionals about the importance of increased emphasis on hygiene promotion, this does not necessarily translate into commitment to action by national and international government and non-government departments/agencies. We need to persuade governments and funding agencies to invest in hygiene promotion. Since measuring the health impact of hygiene promotion is difficult compared with measuring the success of programmes to increase water and sanitation coverage, this makes hygiene promotion programmes inherently less attractive to funding agencies, in the current situation where “accountability” has become a key factor. If hygiene promotion is to be effective two main aspects need to be addressed:

4.1 Building infrastructure for hygiene promotion

As stated previously, one of the problems in actioning effective hygiene promotion programmes which centre on the family and what they know, understand and need to know, is that the separate aspects of hygiene are often dealt with by separate agencies, with little integration. This means that families can receive fragmented, and sometimes even conflicting hygiene advice. Effective hygiene promotion requires a lead agency in each country, and proper infrastructure at national, district and local level for actioning a co-ordinated hygiene promotion programme.

4.2 Building capacity for hygiene promotion at local level

Overall it is well recognised that a significant barrier to progress is “insufficient capacity for hygiene promotion at the district and local level”; if programmes are to be successful, there must be sufficient numbers of trained field workers who are responsible for, and committed to, hygiene education and motivation at community and family level. Community workers and/or teachers are the persons best placed to understand the community or school and its needs and constraints, and are thus also best placed to develop appropriate hygiene programmes. It is only by combining their knowledge of local conditions, local needs and constraints, with an understanding of the means to prevent infection through hygiene practice that hygiene behaviour can be improved. For hygiene education and/or hygiene promotion to be successful community workers need to have 3 basic skills:
4.2.1 Understanding infectious disease transmission
Although the basic rules of home hygiene are the same for all homes in all communities (i.e. the potential sources of germs, routes of spread of germs, and the means of prevention are the same) hygiene promotion needs may differ significantly from one community to another. This is because the relative importance of different sources (food, water, etc) and routes of transfer (e.g. faecal:oral versus person-to-person transmission) is different in different communities and the basic facilities (e.g. water sanitation etc) needed to put hygiene into practice may or may not be available. Community workers can only adapt hygiene promotion programmes appropriately to meet the needs of each community if they have some basic understanding of how diseases occur and how they are spread.

4.2.2 Understanding hygiene practice
It is important that hygiene promotion is focussed on those practices in the home and community which carry the greatest risk of transmitting disease such as household water. To be able to identify what are “risky practices” community workers need to first understand what is “good practice”. This knowledge can then be used to develop appropriate hygiene messages.

4.2.3 Understanding hygiene promotion
In recent years a significant amount of work has been carried out to evaluate methods for achieving hygiene behaviour change. Whereas those who manage hygiene improvements often choose to promote hygiene by “top down” approaches, which e.g. “lecture” and threaten disease, one of the lessons which has been learnt is that traditional approaches can raise awareness, but do not necessarily achieve the desired effects. Key to hygiene promotion is communicating the target audience in a way that will motivate behaviour change. Two approaches are currently being pioneered for achieving hygiene behaviour change in developing countries:

4.2.3.1 Social marketing
“Health in your Hands” is a global campaign which is being developed by the “Global Public Private Partnership on Handwashing. This approach involves the use of industrial marketing techniques to promote “socially useful products” (in this case, handwashing with soap) though generation of demand. The concept of ”Health in your Hands” is to get private industry and the public sector to work together with other partners to develop programmes to promote handwashing. The programme is based on marketing of a small number of simple messages on the key times to wash hands (after defecation, after changing a baby, before eating, and before feeding children), and how to wash hands correctly. The messages are marketed through various communications channels including the mass media (print, television etc) and direct communication (community interaction activities). The programme is currently supported by the World Bank, London School of Hygiene and Tropical Medicine, and the private sector, in collaboration with USAID, UNICEF, and the Bank-Netherlands Water Partnership. Partnerships have been established in Ghana, Nepal, Peru, and Senegal and are also under development in a number of other countries.

4.2.3.2 Community mobilisation
This approach is being pioneered in Africa, most particularly in Zimbabwe, and focuses on health promotion through community health club (CHC) membership. Training material consist of sets of illustrated cards and a ‘membership card’ which provides an outline of the syllabus of health and hygiene topics. Weekly meetings, over 6-8 months, of CHC members are led by trained local Environmental Health technicians with each meeting focussing on one topic. Through repeated interaction, a strong and informed leadership, elected by the members, emerges in most clubs. ‘Homework’ is agreed at each session, with members pledging home improvements and behaviour changes to be effected by the following week. These changes included e.g. a cover for the drinking water, or construction of a garbage pit or a hand washing facility. Observations from a 2 year study in 2 districts in Zimbabwe
showed that, in one intervention area, latrine coverage rose to 43% compared with only 2% in the control area and club members’ hygiene was significantly improved (p < 0.0001) from a control group regarding 17 key hygiene practices including hand washing.

Although participatory methods are more labour intensive they have the advantage that, by involving the community, they develop a sense of commitment to, and ownership of, the project, thereby having the potential for sustainability. Cairncross and Waterkyn have also shown that the approach has the effect of creating demand for sanitation.²

**Supporting resources for hygiene promotion programmes**

As part of its work to develop and promote home hygiene in developing country situations IFH has produced a “teaching self learning resource”. The resource is written in sample practical language and is aimed at giving community workers an understanding of how infections are transmitted in the home and community and how to reduce the risks of transmission through good hygiene practice.

**Conclusions**

- Infectious disease is still one of the most important causes of morbidity and mortality in the developing world.
- Much of this disease is preventable through modifications to the environment, including interventions to increase the availability of clean water, and to improve sanitation and hygiene.
- Hygiene can prevent spread of infectious disease at a fraction of the cost of other health interventions.
- Hygiene must be a shared responsibility between government and the community. To achieve this, we need to look at it from the point of view of the family, and build on what they understand know and need to know in order to protect themselves from infection.
- Hygiene promotion requires an integrated approach co-ordinated by a single lead agency in each country, and proper infrastructure at national, district and local level for actioning hygiene promotion.
- Building capacity for hygiene promotion at local level is key to hygiene promotion. Community workers and/or teachers who understand the community and its needs and constraints, are best placed to develop hygiene programmes.
- Hygiene promotion can act as the means to create demand for sanitation; thus hygiene promotion not only has the potential to increase the health impact of WASH programmes, but also increase sanitation coverage in line with MDG targets.

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