

Self-reported maternal handwashing knowledge and behaviours observed in a rural hospital in Pakistan

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Abstract

Background: Under-5 mortality remains high in developing nations despite decades of multilateral cooperation to reduce it. Diarrhoea contributes up to 15% of all mortality in this age group. Frequently reported barriers include poor hygiene, lack of sanitation facilities, and negligible public health education on the issue. Interventions such as Water, Sanitation, and Hygiene (WASH) could complement modern public health approaches with renewed vigour in wake of SARS-CoV-II (COVID-19).

Aims: We sought to assess maternal hand hygiene and ability to prepare oral rehydration solution at home.

Methods: In addition to the ability to prepare oral rehydration solution at home, this cross-sectional study, carried out at the Sughra Shafi Medical Complex, Narowal during 2017, compared knowledge, attitudes and behaviours of mothers of children with diarrhoea to those whose children did not have diarrhoea.

Results: 511 (48%) children < 5 years were diagnosed with diarrhoea irrespective of household location. Among 1065 accompanying mothers recruited for this study, only 130 (12%) were able to prepare ORS at home and 288 (27%) qualified as regular hand-washers according to the criteria. Just over half of the respondents consumed untreated water supplied via a nearby canal. Almost 80% of neighbourhoods lacked waste collection.

Conclusion: These findings informed management of frequent child diarrhoea cases presented at the hospital with locally relevant preventive knowledge. They are also expected to be useful in educating mothers on regular handwashing and the preparation of ORS as home-based interventions.

Keywords: childhood diarrhoea, WASH, ORS, hygiene, sanitation

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Introduction

Sustainable development in the World Health Organization (WHO) Region for the Eastern Mediterranean (EMR) has been held back by familiar shortcomings (1,2). A recent review of the Millennium Development Goals (MDGs) depicted the EMR as making patchy progress instead of applying coherent national planning to improve living standards across the board. It cited known limitations to sector-specific development practised during the 20th century as evident in several countries where the burden of childhood diarrhoea (< 5 years of age) has persisted despite decades of multilateral engagement for its eradication (3,4). Analyses of these missed opportunities identified 2 interrelated and well-known factors being ignored. First, the continuously poor state of local sanitation in relation to prevailing diarrhoea. Second, disseminating knowledge of this relationship as a policy. Under 5 (< 5) diarrhoea is now the second biggest killer, causing 15% of total mortality in this age group besides leaving survivors with an array of lifelong disabilities, including malnutrition, developmental disorders, and enteropathies (4–6). Many communities in sub-Saha-

ran Africa have leveraged the aforementioned factors to achieve nearly 66% reduction in diarrhoea-attributed child mortality (3,7). Within the EMR, “low-performing countries” face an uphill struggle (8,9). Tens of millions of children remain at risk of preventable infectious diseases originating from compromised sanitation and hygiene at all levels (10,11). Modern public health paradigms must not ignore, but build further upon, traditional development approaches such as Water, Sanitation and Hygiene (WASH), particularly where basic community services are degraded or nonexistent.

Like many countries in the Region, Pakistan has a long history of implementing the global agenda for diarrhoea control (12). Despite hosting the 3rd International Association for Maternal and Neonatal Health Congress in Lahore to interventions like Control of Diarrhoea Disease and exploring various local treatment options, the country nevertheless continues to experience high < 5 mortality owing to diarrhoeal diseases (13–15). Recently introduced community-driven care models have relied on building coalitions to get greater in-depth perspectives on household hygiene practices (8,16). In 2015, the Expert Review Group ranked Pakistan among

the countries unlikely to achieve MDGs 4 and 5 on the back of structural factors such as inadequate maternal and child care, haphazard development and population displacements (1,10,17). However, some countries in the Region, e.g. Oman and Lebanon, have already met the health benchmarks.

Against this backdrop, we carried out this study at the paediatric department of a philanthropic teaching hospital in the eastern rural district of Narowal (Punjab, Pakistan). We sought to assess maternal hand hygiene and the ability to prepare oral rehydration solution (ORS) at home; these are considered the most impactful prevention and timely management practices for < 5 diarrhoea (18,19). We also contextualized maternal knowledge and behaviours with sociodemographic details along with household status and neighbourhood sanitation.

Our findings were expected to inform institutional protocol for prevention of child diarrhoea with the local situation so that staff could better educate caregivers particularly in wake on ongoing SARS-CoV-II (COVID-19). In addition, the study was expected to generate interest in this topic for future researchers at the institution.

Methods

This cross-sectional study recruited all mothers that accompanied children < 5 years of age at the hospital during July–September 2017. To assess the association of diarrhoeal disease with location (rural or urban) and self-reported maternal ability to prepare ORS, 2 study groups were established: mothers of children with diarrhoeal illness and mothers of children with non-diarrhoeal illnesses. For clinical diagnosis of child diarrhoea, the WHO definition was adopted: “passage of 3 or more loose or liquid stools per day (or more frequent passage than is normal for the individual)” (20).

In the absence of any reliable data from which to establish a baseline, sample-size calculations and the feasibility plan were based on a pilot study involving 65 mothers at an urban teaching hospital (21,22), where 22% of children of regularly hand-washing mothers presented with diarrhoea compared with 30% of the children of non-hand-washers.

Using *OpenEpi*, we calculated a total sample size of 1008 at 95% confidence interval, power of 80, and odds ratio 1.5. An additional 5% were recruited to arrive at final sample of 1065. Pilot testing also refined the response structure so that the analytical strategy could better test maternal knowledge of ORS preparation as being protective against child diarrhoea (21,22). Consecutive sampling was conducted to collect data during each of the 3 daily shifts including weekends.

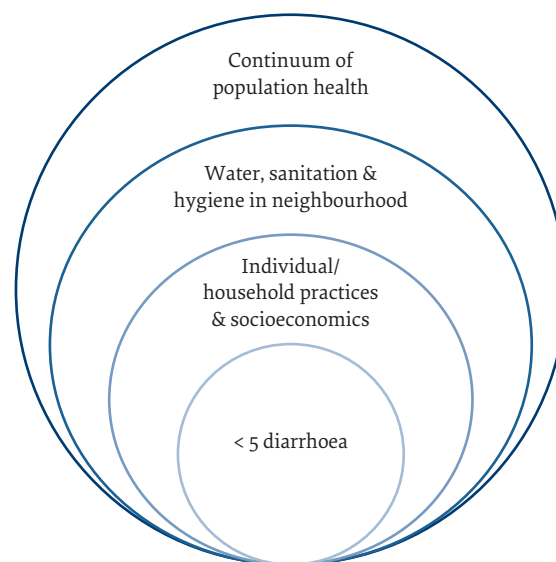
When a child initially presented to the paediatric department with a complaint (s)he was managed according to the established treatment protocol. Later, accompanying mothers were contacted for participation. The rationale of the study was explained to them before recruitment and they were asked to

sign an informed consent form printed in the local language. The mothers were then provided with a self-administered questionnaire in the local language. About 1090 accompanying mothers were invited to the survey out of which 1065 volunteered to participate (response rate 97.7%). Those who could not read and write were given details of the study orally by the investigator in the presence of family members. Informed consent was obtained as a thumb impression on the consent form. They were then interviewed by investigators in the local language to complete the questionnaire. Mothers in distress owing to their sick child and those declining to participate were excluded. All participating mothers were informed that their personal information would be confidential and kept for the period of 5 years. Afterwards, data in all forms would be shredded.

Maternal handwashing frequency was one of the key constructs of this study. Regular handwashing was defined in this study as performed with soap a minimum of 14 times a day after “critical moments” (23,24). These were reported as daily cultural routines comprising women cooking 3 meals and subsequently eating with household members, cleaning up and changing baby diapers, and responding to calls of nature.

The study tool was pre-tested for content validity and reliability. It was drafted in the local language according to the conceptual framework (Figure 1). The initial draft was shared with 2 national experts for comments on validity. Their feedback was incorporated to further categorize response options to match the analytical strategy. Once approved by the reviewers, the final questionnaire comprised 33 response options divided into 5 sections: demographic details; maternal knowledge and behaviours; state of neighbourhood sanitation; household water supply and usage; and access to local lady health workers (LHWs). It was then pilot-tested for

Figure 1 Conceptual framework to observe contextualized prevalence of diarrhoea in children under 5 years in a rural hospital in Pakistan



reliability in another hospital. The decision on its use in the study setting was made on computing the alpha coefficient ~ 0.77 . The final draft was adopted following 94% inter-examiner reliability.

All entries were done by a trained data entry intern under the supervision of the primary investigator. *Stata*, version 14, was used for analyses. Inferential statistics were computed to test the hypotheses for the 2 study groups while descriptive statistics were presented for the entire study sample for highlighting key findings with clarity. The ethical review committee at the constituent medical college approved this study.

Results

Demographic characteristics and the sanitation status of our sample are shown in Table 1. About one third of responding mothers had completed secondary school education. The most frequent source of household water supply was a nearby canal (59.1%). Although 93.7% of respondents reported cleaning their household water storage tanks at least once a year, less than half (44.5%) treated water before drinking and/or cooking.

Table 1 Demographic profile and sanitation status for children < 5 years ($n = 1065$) presenting at paediatric emergency in a rural hospital in Pakistan, 2017

| Characteristic | No. | % |
|--|-----|------|
| Age of child | | |
| Neonate | 44 | 4.1 |
| Infant | 601 | 56.4 |
| 2–5 years | 420 | 39.4 |
| Maternal education | | |
| Never attended | 104 | 9.8 |
| Incomplete secondary school | 324 | 30.4 |
| Completed secondary school | 352 | 33.1 |
| College degree | 236 | 22.2 |
| University degree | 49 | 4.6 |
| Residence* | | |
| Urban | 201 | 19.0 |
| Rural | 855 | 80.3 |
| Annual cleaning of household storage tank | | |
| Yes | 998 | 93.7 |
| No | 67 | 6.3 |
| Source of household water supply | | |
| Tube well | 9 | 0.9 |
| Personal boring | 382 | 35.9 |
| Nearby canal | 629 | 59.1 |
| Don't know | 45 | 4.2 |
| Drinking water treated | | |
| Yes | 474 | 44.5 |
| No | 591 | 55.5 |

*Some data missing.

Table 2 Frequency of conditions reported among children < 5 years ($n = 1065$) to paediatric emergency at a rural hospital in Pakistan, 2017

| Condition | No. | % |
|------------------------------|-----|------|
| Diarrhoea | 511 | 48.0 |
| Anaemia (weakness) | 202 | 19.0 |
| Acute respiratory infections | 170 | 16.0 |
| Skin lesions and trauma | 105 | 9.9 |
| Miscellaneous | 77 | 7.3 |

Of the 1065 children < 5 years old presenting at the paediatric department with their mothers, a total of 511 (48.0%) were diagnosed with diarrhoea (Table 2) according to the WHO definition. After diarrhoea, anaemia or weakness was the second most common presenting complaint (202, 19.0%), confirmed by complete blood count.

Despite the majority of mothers knowing the local LHW personally (data not shown), only 130 (12.2%) were able to prepare ORS at home (Table 3); among these, 69.2% stated the local LHW was their main information source. The majority of the children (80.3%) were from rural areas (verified from hospital records) (Table 1) but the incidence of diarrhoea was independent of residence ($P > 0.05$). The median household income of our sample was rupees 20 000 (US\$ 208) (statistics not included). Almost 70% of respondents spent up to 2% of monthly household income on handwashing soap but only 64% stated they were willing to pay up to 2% (Table 4). However, 33.6% were willing to pay up to 5% of monthly household income on soap compared to 28.6% who reported actually spending this amount.

Almost 95% of respondents had access to at least one household toilet with running water (Table 5) but only 20.9% lived in neighbourhoods with a waste collection system. In accordance with our definition, 27.1% of mothers self-reported as regular hand-washers. Specifically, 17.6% reported washing hands with soap following each daily toilet visit and before cooking and eating.

Discussion

In this study we compared mothers of children < 5 years with diarrhoea to those whose children did not have diarrhoea and found little difference in hand hygiene knowledge, attitudes and practices in relation to sociodemographic details, the status of the household and neighbourhood sanitation.

Childhood diarrhoea was the most frequent condition among children presenting at the study hospital throughout the 3 months of data collection. Extremely low maternal knowledge of ORS preparation (12%) and the predominance of rural representation (81%) in our sample made it unlikely to meaningfully relate these 2 factors with the occurrence of childhood diarrhoea. The study hypotheses could have been better framed if

Table 3 Source of information of for knowledge of preparation of oral rehydration solution reported by mothers of sick children (n = 130) in a rural hospital in Pakistan, 2017

| Information source | Mothers of children with non-diarrhoeal illness (n = 63) | | Mothers of children with diarrhoeal illness (n = 67) | |
|---------------------|--|------|--|------|
| | No. | % | No. | % |
| Knows by profession | 2 | 3.1 | 3 | 4.4 |
| TV/radio | 12 | 19.0 | 18 | 26.8 |
| Hospital staff | 2 | 3.1 | 3 | 4.4 |
| Health worker | 47 | 74.6 | 43 | 64.1 |

a prior baseline for these variables had been available. Nevertheless, our findings might serve as baseline for future research on this topic. In fact, our results identified important thematic areas in health service delivery for researchers since the majority of respondents knew their local LHW personally but were unable to prepare ORS at home. Despite this reported disconnect, LHWs were the most frequent source of information on ORS preparation among those who knew how to do it. Only 5 respondents mentioned hospital staff (physicians, nurses) as their informers on ORS preparation. These findings met the study objective to assess the need for an updated protocol at this hospital to contextualize preventive management of child diarrhoea with household practices and the state of sanitation in the neighbourhood. Follow-up studies are strongly recommended in this hospital to observe the intended impact of educating caregivers/ mothers in relation to future caseloads of < 5 diarrhoea. Institutionalized information on household and neighbourhood factors could partly offset chronic gaps in rural health for non-diarrhoeal illnesses too (17,25).

We identified the frequency of non-diarrhoeal conditions that could be further studied for corresponding strategies. With the very low overall knowledge of ORS preparation reported above, our results showed both radio and television as being the most common source of information on ORS preparation (statistics not included), second only to hospital staff. These findings could

encourage greater use of broadcast media to improve health literacy in similar settings (26,27).

Health and hygiene behaviours represent an emerging frontier of public health that was touched upon here (1,28). Irrespective of nearly all respondents having access to a household toilet equipped with a flush system, less than 50% reported washing hands regularly after toilet visits and only 18% reported maintaining hand hygiene for all of the 3 daily activities. This warrants better understanding of complex behavioural pathways mentioned in the Global Enteric Multicentre Study that aimed to devise policy levers to cut the spread of diarrhoeal illness through curbing oral–faecal transmission (28). In some south Asian countries (Bangladesh, India, Pakistan), it was reported that over 93% households had toilets yet in a significant proportion, human faeces were visible within the house or adjoining yard (28). A study from the hilly region of Swat in Pakistan also reported substantial faecal contamination of drinking water sources (29). Oral–faecal transmission contributes widely to nearly 2 billion annual diarrhoeal episodes in children < 5 worldwide.

In our sample, about one-third of the mothers stated they were willing to pay up to 5% of monthly household income on soap and 28.6% reported actually doing so. Future research should assess the affordability of soap in low-resource, but water-sufficient, communities and the role of income as barrier or facilitator of handwashing. It is important to highlight the relationship between household income and handwashing so that this can be promoted in such communities. Our findings have suggested that a smaller household income is related to a lower willingness to pay for soap.

As is commonplace in global epidemiological data, developing nations carry a disproportionate burden of diarrhoea and its aftermath with chronic institutional incapacities (24,30). It has been feared that continued lack of investment in public services coupled with higher population growth rates could reverse the health gains of past decades in developing countries. These projections warrant a comprehensive response to control oral–faecal spread through improving the quality of existing research into health behaviours. With the abundant data on development history now available for many countries and regions, traditional approaches such as WASH could

Table 4 Comparison of monthly household income spent on soap and willingness to pay for it (reported by mothers of children under 5 years presenting to a rural paediatric department in Pakistan), 2017

| Willingness to pay for soap as percentage of monthly household income (%) | Monthly household income spent on paying for handwashing soap No. (%) | | | | | Total |
|---|---|------------|------------|----------|----------|------------|
| | ≤ 1% | ≤ 2% | ≤ 5% | ≤ 10% | 10% | |
| ≤ 1 | 263 (25.2) | 12 (1.1) | 0 | 0 | 0 | 275 (26.4) |
| > 1 to 2 | 49 (4.7) | 328 (31.5) | 14 (1.3) | 1 (0.09) | 0 | 392 (37.6) |
| > 2 to 5 | 0 | 64 (6.1) | 279 (26.8) | 6 (0.5) | 1 (0.09) | 350 (33.6) |
| > 5 to 10 | 0 | 1 (0.09) | 3 (0.2) | 13 (1.2) | 1 (0.09) | 18 (1.7) |
| > 10 | 1 (0.09) | 2 (0.1) | 2 (0.1) | 0 | 0 | 05 (0.4) |
| Total | 313 (30) | 407 (39.1) | 298 (28.6) | 20 (1.9) | 2 (0.1) | 1040 |

Table 5 Daily frequency of handwashing with soap and sanitation status among mothers (n = 1065) of children presenting to a rural hospital in Pakistan, 2017

| Factor | No. | % |
|---|------|------|
| Maternal handwashing practice | | |
| After toilet use | 488 | 45.8 |
| Toilet use & before meals | 384 | 36.1 |
| After toilet, before meals, before cooking | 187 | 17.6 |
| Infrequent or minimal | 06 | 0.6 |
| Household toilet with water tank & flush | | |
| Yes | 1005 | 94.4 |
| No | 60 | 5.6 |
| Frequency of self-reported handwashing with soap | | |
| ≤ 6 times daily | 125 | 11.7 |
| < 14 times daily | 651 | 61.1 |
| ≤ 14 times daily | 289 | 27.1 |
| Neighbourhood waste collection system present | | |
| Yes | 220 | 20.9 |
| No | 830 | 78.5 |
| Don't know | 09 | 0.9 |

find innovative implementation methods for greater community impact (3,31).

Our sample was limited by time and catchment area served by a solitary teaching hospital; thus we excluded analysis of water, hygiene and sanitation in relation to the prevalence of < 5 diarrhoea according to income group. This may have informed a useful social determinants perspective. Analytical study designs could provide these

missing details since low levels of neighbourhood waste collection and widespread consumption of untreated canal water are often linked to < 5 diarrhoea (3,32). For such undertakings, far more resources and experience in the development sector would have been required such as reflected in large household surveys carried out by international organizations (33). Rates of child diarrhoea reported here could also be inflated due to the concurring monsoon, which creates conditions favourable for the transmission and spread of infections. At facility level, year-round disease registries are suggested as a local surveillance tool. In addition, periodic assessments of staff knowledge and attitudes on prevailing diseases could identify professional training needs for better case management (34,35). Finally, the minimal inter-group differences observed in this study necessitated the presentation of statistics for the entire sample to avoid meaningless comparisons and vague interpretations.

Conclusion

Child diarrhoea was the major reason for hospital admission irrespective of rural or urban residence. Despite residing in neighbourhoods that lacked solid waste collection, few mothers practiced regular hand hygiene. Similarly, maternal knowledge on preparing ORS was very limited despite familiarity with local LHWs. Untreated canal water was widely consumed in households. This information could be useful not only in better treatment for child diarrhoea but also to enable hospital staff to contextualize WASH as a tool for education on prevention for caregivers. Simultaneous studies on impact must be undertaken.

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Competing interests: None declared.

Connaissances autodéclarées des mères en matière de lavage des mains et comportements observés dans un hôpital rural au Pakistan

Résumé

Contexte : La mortalité des moins de 5 ans reste élevée dans les pays en développement malgré les efforts de coopération multilatérale déployés depuis plusieurs décennies pour la réduire. Jusqu'à 15 % de la mortalité totale dans cette tranche d'âge est liée à la diarrhée. Les obstacles fréquemment signalés comprennent les mauvaises conditions d'hygiène, le manque d'installations d'assainissement et l'insuffisance des efforts de sensibilisation sur la question. Des interventions dans le domaine de l'eau, de l'assainissement et de l'hygiène (WASH) pourraient venir compléter les approches modernes de santé publique avec une vigueur renouvelée afin de lutter contre le SARS-COV-2 (COVID-19).

Objectifs : Nous avons cherché à évaluer l'hygiène des mains des mères et leur capacité à préparer une solution de réhydratation orale (SRO) à domicile.

Méthodes : Outre cette capacité, la présente étude transversale, qui a été réalisée en 2017 au complexe médical Sughra Shafi, à Narowal, et se proposait de comparer les connaissances, les attitudes et les comportements des mères d'enfants souffrant de diarrhée à celles dont les enfants n'en souffraient pas.

Résultats : Sur les enfants de moins de 5 ans, 511 (48 %) souffraient de diarrhée, quel que soit le lieu du foyer. Des 1 065 mères accompagnantes recrutées pour la présente étude, seules 130 (12 %) ont été en mesure de préparer une SRO à domicile et 288 (27 %) ont satisfait aux critères leur permettant d'être reconnues comme pratiquant un lavage de mains régulier. Un peu plus de la moitié des répondantes consommaient l'eau non traitée d'un canal situé à proximité. Il n'y avait pas de collecte de déchets dans près de 80 % des quartiers.

Conclusion : Ces résultats seront utiles à la prévention au niveau local et permettront d'améliorer la prise en charge des cas fréquents de diarrhée infantile observés dans cet hôpital. On s'attend également à ce qu'ils soient utiles pour éduquer les mères au lavage régulier des mains et à la préparation des SRO à domicile.

معلومات وسلوكيات الأمهات المبلّغ عنها ذاتياً بشأن غسل اليدين التي شوهدت في مستشفى ريفي في باكستان

شهنور أزهر، مديحة فيصل، عريفة أمان

الخلاصة

الخلفية: لا يزال معدل وفيات الأطفال دون سن الخامسة مرتفعاً في البلدان النامية على الرغم من مرور عقود من التعاون المتعدد الأطراف سعيًا لخفضه. ويساهم الإسهال بنسبة تصل إلى 15٪ من إجمالي الوفيات في هذه الفئة العمرية. ومن بين العقبات المبلغ عنها في كثير من الأحيان سوء النظافة الصحية، والافتقار إلى مرافق الإصحاح، وتجاهل التثقيف الصحي العام بشأن هذه المسألة. ويمكن لبعض التدخلات مثل المياه والإصحاح والنظافة أن تتمم نهج الصحة العامة الحديثة من أجل تحقيق تأثير أكبر.

الأهداف: هدفت هذه الدراسة إلى تقييم نظافة اليدين لدى الأمهات وقدرتهن على تحضير محلول الإمهاء الفموي في المنزل.

طرق البحث: بالإضافة إلى القدرة على تحضير محاليل الإمهاء الفموي في المنزل، قارنت هذه الدراسة المقطعية، التي أجريت في مجمع «صخرة شافي» الطبي في ناروال خلال عام 2017، بين معلومات واتجاهات وسلوكيات أمهات الأطفال المصابين بالإسهال وأمهات الأطفال غير المصابين بالإسهال.

النتائج: شُخصت إصابة 511 طفلاً (48٪) ممن تقل أعمارهم عن 5 سنوات بالإسهال بغض النظر عن موقع الأسرة. ومن بين 1065 أمًا مرافقة اختبرت للمشاركة في هذه الدراسة، لم تتمكن سوى 130 أمًا (12٪) من تحضير محاليل الإمهاء الفموي في المنزل، وتأهلت 288 أمًا (27٪) لمعايير غسل اليدين بانتظام. وكان أكثر من نصف المستجيبات يستهلكن المياه غير المعالجة الواردة من قناة قريبة. ويفتقر ما يقرب من 80٪ من الأحياء السكنية إلى جمع النفايات.

الاستنتاج: وفّرت هذه النتائج المعلومات الوقائية الملزمة للسياق المحلي التي أسهمت في توجيه علاج الأطفال المصابين بالإسهال المتكرر الذين يحضرون إلى المستشفى. ومن المتوقع أيضاً أن تغيد في تثقيف الأمهات بشأن غسل اليدين بانتظام وتحضير محاليل الإمهاء الفموي باعتبارهما تدخلات منزلية.

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