Determinants of Handwashing at Critical Times Among Mothers/Caregivers of Children Under-Five Years Old: Panel Data Evidence From Rural Afghanistan

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Source: Environmental Health Insights, 18(2)

Published By: SAGE Publishing

URL: https://doi.org/10.1177/11786302241274485

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Environmental Health Insights
Volume 18: 1–10
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DOI: 10.1177/11786302241274485

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ABSTRACT

BACKGROUND: Very few studies have used panel data regression models to estimate the determinants of handwashing with water and soap at critical times in a developing country.

OBJECTIVE: To analyse the predictors of handwashing with water and soap at critical times among mother/caregivers of children under-5 years in rural Afghanistan.

METHOD: This study used data from 1208 mothers/caregivers of children under-5 years who were selected and interviewed at baseline and endline in 7 provinces using systematic probability proportional-to-size sampling method.

RESULTS: Mother/caregivers with access to handwashing facility with water and soap had 1.20 higher odds of washing hands at 5 critical times. Treatment at public facility, an indirect proxy of health education and having children under 2 years was associated with 1.07 and 1.05 higher odds of washing hands at 5 critical times. Access to handwashing with water and soap, treatment at public facility and children under 2 years were significant and robust to alternative specification of handwashing at least 3 times. Mothers/caregivers who reported contracting infectious diseases in the past 6 months had 1.04- and 1.52-times higher odds of handwashing at 5 critical times and at least 3 times respectively.

CONCLUSION: Access to handwashing facility with water and soap, health education, children under 2 years and occurrence of infectious diseases were the predictors of appropriate handwashing behaviour. Therefore, there is need to improve the availability of handwashing facilities with clean water and soap to promote appropriate handwashing behaviour at critical times. In addition, there is need to promote activities that increase disposable income for households to purchase soap and handwashing facilities. There is need to promote healthcare seeking behaviour for mothers to access medical treatment and health hygiene education at public facilities vital for prevention of infectious diseases.

KEYWORDS: Afghanistan, children under-five, critical times, handwashing, mothers, soap, water

RECEIVED: April 11, 2024. **ACCEPTED:** July 1, 2024.

TYPE: Original Research

FUNDING: The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This article uses data from baseline and endline evaluation of Lifesaving Humanitarian Response to support crisis-affected households meet their multisectoral basic needs across Afghanistan funded by USAID Bureau for Humanitarian Assistance Award Number: 720BHA23GR00029. The authors received financial support for the publication of this article.

DECLARATION OF CONFLICTING INTERESTS: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Introduction

Hand washing with soap and water (HWWS) at 5 critical times in an important public health behaviour meant to reduce infectious and water borne diseases.[1-3] Hand washing at 5 critical times includes washing hands with water and soap[4] before cooking, before eating, before feeding the child, after defecation and cleaning the child's bottom/perineal care – washing the genital and rectal areas of the body.[1,4-6] The most common indicator used to measure appropriate handwashing is percent of respondents who washed their hands with soap at 5 critical times. Inadequate water supply, limited access to soap, and lack of information are some of the major challenges preventing mothers/caregivers in adopting appropriate hand washing behaviour at all 5 critical times with water and soap in many developing countries.[3,6] Owing to these challenges, most mothers/caregivers in many developing countries partially wash their hands at 5 critical times. To effectively measure partial handwashing behaviour, most development agencies use an additional indicator to measure partial handwashing behaviour. The indicator for partial handwashing behaviour used by many development agencies include percent of respondents who washed their hands with soap or ash in at least 3 out of 5 critical times.[7]

Acute respiratory infections and diarrhoeal diseases are the main causes of mortality and morbidity among children under the age of 5 years in areas lacking adequate sanitation and hygiene[4] including Afghanistan.[8,9] Mothers/caregivers play a vital role in improving children's health[4] through appropriate handwashing provision of clean water, safe disposal of waste and children faecal matter, and use of improved latrine. Poor water, sanitation, and hygiene (WASH) is one of the leading causes of diarrhoea and respiratory diseases.[4,10] According to

GBD Diarrhoeal Diseases Collaborators,[11,12] it is estimated that around 500 000 under-5 children die globally from diarrhoea-related diseases every year. Furthermore, about 60%, 13%, 80% of diarrhoea, acute respiratory infections and malaria in low- and medium-income countries is linked to inadequate and poor water, sanitation and hygiene.[10] Yet, a significant proportion of infectious diseases and other water borne diseases can be prevented through adequate water, sanitation and hygiene.[4,13]

The major faecal-oral transmission routes through which disease-causing pathogens can reach children have been identified as food, flies, fingers, fluids and fields.[4] Breaking these faecal-oral transmission routes remains one of the aims of proper WASH interventions. Handwashing with water and soap (HWWS), household hygiene, safe disposal of waste, drinking clean water and use of improved latrine are some of the most effective methods of preventing the spread of these micro-organisms that cause infectious and water borne diseases.[1,5,6,14] Recent meta-analyses evidence show that HWWS has the potential of reducing diarrhoeal diseases by about 40%.[15] Despite handwashing being cost-effective, its practice remains quite low in many developing countries.[1,16,17] For example, washing hands with soap after contact with faecal matter remains relatively low at 22% in low and medium income countries[17] and 19% globally.[15]

Infectious diseases including diarrhoea, acute respiratory infections, typhoid, and cholera are a major public health concern in Afghanistan, where nearly three-fifths of child deaths are noted per 1000 live births.[18] According to[8,9]diarrhoeal and acute respiratory diseases are the major diseases causing excess morbidity and mortality among children in Afghanistan. As a result, appropriate hand washing behaviour at critical times by mothers/caregivers is crucial to prevent the spread of infectious diseases among children.

In their systematic review,[15,19]identified various studies understanding the determinants of appropriate handwashing in South East Asia and Africa, with the bulk drawn from Bangladesh, India and Kenya, and less is explored on this topic in Afghanistan. Some of the major determinants of appropriate handwashing identified in literature include access to handwashing materials and resources including soap and water,[3,4,17,19,20] health education,[19,21] and having younger children in the household.[17,22] Most of these studies on determinants of appropriate handwashing are based on cross-sectional data and less on panel data regression analysis.

To our knowledge there are no or very few studies that have been done to understand the determinants of handwashing behaviour using panel data regression models that provide robust estimates compared to cross section research design. Afghanistan is good case study as it has one of the highest prevalence of infectious diseases including acute respiratory infections and diarrhoea.[8,9] The novelty of this study is that it utilised panel data regression to rigorously estimate the determinants of handwashing at critical times among mothers/caregivers of under-5 children in Afghanistan. In addition, the study used 2 indicators of handwashing behaviour – handwashing at 5 critical times and at least 3 times.[4,7,21] This study aims to fill the gap in the literature, as there is to-date, limited empirical studies that have used panel data analysis methods to examine determinants of appropriate handwashing behaviour in a developing country context. Therefore, the article addresses the following key research questions:

1. What factors influence handwashing at 5 critical times among mother/caregiver of children under-5 years?
2. What factors influence handwashing at least 3 times among mother/caregiver of children under-5 years?

Three hypotheses are formulated for our investigation to answer the research questions, particularly on the factors influencing HWWS. First, we anticipate that access to handwashing materials and resources including soap and water is closely related with handwashing at critical times.[3,4,17,19,20] Second, we expect that mothers/caregivers having younger children adopt appropriate handwashing behaviour given that they are regularly in contact with their children when feeding them and removing faecal matter.[17,22] Finally, we expect that health education is positively associated with HWWS. A strong link between health education and HWWS has been discovered in several studies.[19,21]

Methods

Programme interventions

Save the Children, International Medical Corps, and Concern Worldwide implemented the Lifesaving Humanitarian Response Programme in Afghanistan in 2022 funded by USAID. About 1 195 054 beneficiary households received either multi-purpose cash assistance, food assistance, and WASH assistance or a combination in selected districts and villages across 7 provinces (Faryab, Jawzjan, Nangahar, Sar-e-Pul, Balkh, Kandahar, and Badakhshan).

Multipurpose cash assistance (MPCAs): The MPCA transfer amount, set by Afghanistan Cash and Voucher Working Group, ranged between $97 and $125 which was intended to cover approximately 80% of non-food items a 6-person household may need. The MPCA beneficiaries would receive 3 to 4 times transfer. Households were selected to participate in the cash assistance programme based on a pre-set vulnerability targeting criteria. Vulnerability criteria considered for this programme included indicators such as food insecurity, income, asset ownership, and receipt of remittances from abroad. Transfers were given to the head of household.

Unconditional food assistance: The unconditional food assistance was given to vulnerable households especially households headed by women, the elderly, people with disabilities and pregnant and lactating women (PLW) were prioritised.

Table 1. List of interventions by provinces.

PROVINCE	MPCA (15 000 HHS + 20 400 HHS)	FOOD ASSISTANCE (750 HHS)	WASH SERVICES	AGRICULTURE MPCA FOR AGRICULTURE (306 HHS) CASH FOR ANIMAL FEED
Faryab	(4 rounds): 1st = $101; 2nd – 4th = $97	Yes	Yes	3 Rounds MPCA: 1st = $101; 2nd – 3rd = $97. 1 round of cash for animal feed ($140)
Sar-e-Pol	(2 rounds) Each $125	Yes	Yes	1 round of cash for animal feed ($140)
Jawzjan	(2 rounds) Each $125)		Yes	None
Nangarhar	4 rounds MPCA:1st = $101; 2nd– 4th = $97		Yes	None
Balkh	None		Yes	None
Badakhshan	None	Yes	Yes	3 Rounds MPCA: 1st = $101; 2nd– 3rd = $97
Kandahar	4 rounds MPCA :1st = $101; 2nd– 4th = $97		Yes	

Water, Sanitation and Hygiene (WASH): Save the Children, International Medical Corps, and Concern Worldwide provided WASH services to vulnerable beneficiary households and communities. The WASH services included water trucking, chlorination and rehabilitation of existing water points, construction of safe water points, distribution of WASH kits and hygiene promotion activities. Hygiene promotion activities focused on COVID-19 misconceptions, other viruses and water borne diseases and rumour management, modes of transmission, hand and surface hygiene, and appropriate prevention measures, including handwashing with soap. Table 1 show the provinces receiving MPCA, Food Assistance, and WASH services. The main hypothesis is that receipt of WASH interventions should translate into appropriate handwashing behaviour.

Data source

The data used in this article is drawn from quantitative baseline and endline surveys for the Lifesaving Humanitarian Response Programme funded by USAID in Afghanistan. The baseline data was collected before the interventions in March 2022 and endline survey data was conducted after the interventions were implemented in December 2022. The sample size in each district was calculated based on the population proportions in each district and systematic probability proportional-to-size (PPS) sampling method. Primary caregivers (or mothers) of the children in the household, aged 18 years and above, who were able to respond to the questions about household conditions (WASH, nutrition, and health) and information on their children particularly those below 2 years, maternity diet and access to health care and nutrition services. Each survey targeted around 1208 mothers/caregivers across the 7 provinces (Faryab, Jawzjan, Nangahar, Sar-e-Pol, Balkh, Kandahar, and Badakhshan) drawn from the beneficiary registration lists. The final sample for each province, which provided a 95% confidence interval, and 5% margin of error is shown in Figure 1. This sampling was sufficient and representative of households with infants 0 to 5 months and young children aged below 2 years.

The percentage of the population living in dwellings with a safe source of drinking water (handpump, protected spring and well, public tap/standpipe, piped water into dwellings or into compound) are different across the province. According to Ref.,[23] these include Faryab (43%), Jawzjan (62%), Nangarhar (84%), Sar-e-Pul (26%), Balkh (61%), Kandahar (71%) and Badakhshan (78%).

Data quality management

The baseline and endline survey data were collected using KOBO Toolbox and administered face-to-face by enumerators, in the local language either Pashto or Dari. Relevant skip logics and constraints were included in the KOBO Toolbox to ensure data consistency and minimise errors. Enumerators and supervisors were trained were trained to ensure that they understood the survey goal, data collection procedure and ways to engage the respondents so that they feel free to answer questions. The questionnaire was pre-tested and final version was adapted to the local context. Daily supervision and consistency checks were done by supervisors to ensure data validity and completeness.

Study variables

The main dependent variable was handwashing at 5 critical times by mothers/caregivers, and this ranged from 1 to 5.

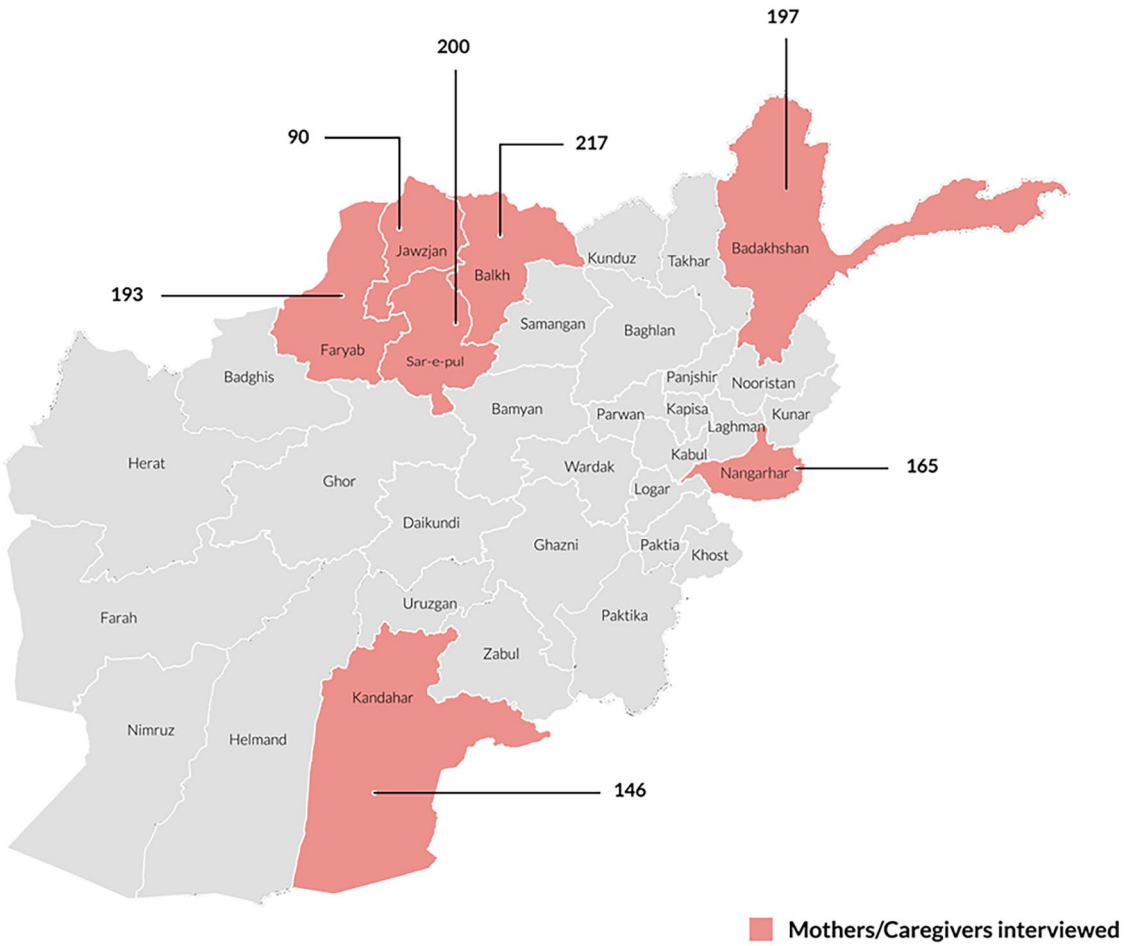

Figure 1. Sample size per province for baseline and endline survey.

Mothers/caregivers self-reported their handwashing behaviour. In further analysis, the other dependent variable was handwashing at least 3 out of 5 critical times to wash hands, either before eating, after defecation or using toilet, before preparing food, before feeding an infant or after changing or cleaning child's bottom. The independent variables were access to hygiene promotion education, access to handwashing facilities with soap and water, medical treatment from public health facility, clean water source, head age, head gender, head literate, household size, children below 2 years, distance to water source, host community, household has person with disability and provincial dummy variables to control for spatial variations.

Data analysis

Data analysis was performed using STATA 18. Descriptive statistics were presented first to show respondent demographics factors, handwashing behaviour and WASH information. To identify the determinants of handwashing practices at 5 critical times, a random effects poisson regression analysis was performed to determine the association between independent variables to handwashing at 5 critical times. For robustness check, random effects logit model was used to determine the association when the outcome variable was handwashing at least 3 times. For model fit diagnostics, the Hausman test statistic was used to determine the choice of using random effects regression over fixed effects panel models.

Results

Descriptive analysis

Table 2 shows the descriptive statistics for sociodemographic factors at baseline and endline. At endline mothers/caregivers washed hands with water and soap at 3.31 critical times and this is significantly higher compared to baseline. At endline, 74% of mothers/caregivers reported practicing at least 3 out of 5 critical times to wash hands, either before eating, after defecation or using toilet, before preparing food, before feeding an infant or after changing or cleaning child's bottom, compared to 62% at baseline. About 60% of mothers/caregivers reported having access to clean water source at endline and this was significantly higher compared to baseline.

Over 2 in 3 households (68.8%) reported receiving hygiene promotion in the past 12 months. Figure 2, show that the most reported promotion activities received by the households were knowledge sharing about COVID-19 misconceptions (41.9%), followed by promotion activities related with appropriate prevention measures including hand washing with soaps (38.3%);

Table 2. Descriptive statistics for sociodemographic factors at baseline and endline.

VARIABLE	DESCRIPTION	ENDLINE	BASELINE	DIFFERENCES
HWWS	Washing hand using soap and water at 5 critical times	3.31	2.97	−0.34***
HWWS at least 3 times	Wash hands at least 3 out of 5 critical times (%)	74	62	−13***
Hygiene promotion	Access to hygiene promotion education	69	38	−31***
Hand washing space with water and soap	Hand washing space with water and soap (%)	22	14	−8***
Clean water	Clean water source (%)	60	51	−9***
Water source time	Time to water source in minutes	23.67	31.08	7.41***
Infectious diseases	Household member contracted infectious disease in past 6 months (number of diseases)	1.76	-	-
Public health facility	Sought medical treatment at government health facility (%)	67	76	9***
Household head gender	Household head is female (%)	15	13	−2
House head age	Household head age (years)	43.96	43.16	−0.80
Head illiterate	Household head illiterate (%)	79	71	−8***
Household sizes	Household size	9.13	9.26	14
Children 2 years	Household has children 2 years old and below (%)	67	65	−2
Disability	Household has a member with functional disability (%)	26	23	−3
Host	Household is host community (%)	89	89	0.0
Observations		1208	1208	

Independent samples t-test. *$P < .10$, **$P < .05$, ***$P < .01$.

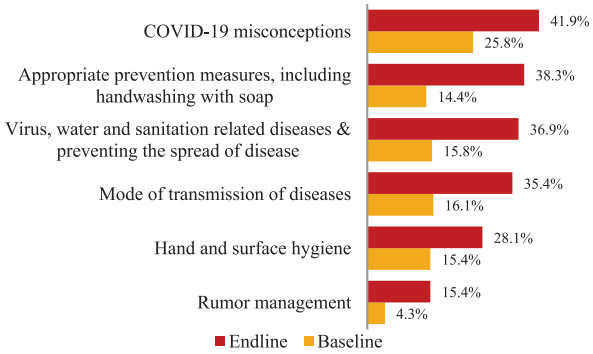

Figure 2. Proportion of respondents receiving hygiene promotion activities.

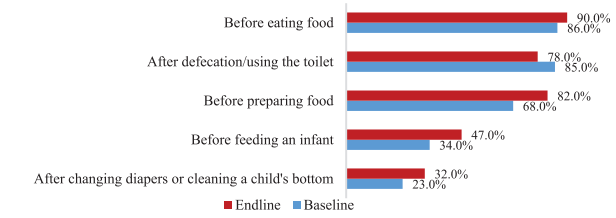

Figure 3. Critical times of handwashing practiced by mother/caregivers.

information sharing about virus, water sanitation related disease and prevention measure to avoid the spread of diseases (36.9%); information about mode of transmission of diseases (35.4%) and hand and surface hygiene promotion activity (28.1%).

At endline, the proportion of mothers/caregivers that reported washing their hands on different critical times had generally increased compared to the baseline, except for 'after defecation or using the toilet' which dropped from 85% to 78% (Figure 3). The proportion of mothers/caregivers who highlighted that they washed hands before preparing food increased from 68% at baseline to 82% at endline.

There was an increase in the proportion of households reporting having a designated handwashing station. Over half of households (55.5%) had a designated handwashing station at home at endline and this was significantly higher compared to 31.6% at baseline. About 34.8% of households at endline were mentioned that hand washing facility in their homestead that was equipped with water only (without soap), having increased by 11.1% from baseline. At endline, only 22% of households were reported to have a designated hand washing facility that was equipped with water and soap, although it increased slightly from the baseline report (14%).

Table 3. Determinants of handwashing at 5 critical times using random effects poisson regression.

VARIABLE	FIXED EFFECTS		RANDOM EFFECTS	
	IRR	CONFIDENCE INTERVAL	IRR	CONFIDENCE INTERVAL
Hygiene promotion	1.05	0.98-1.13	1.04	0.99-1.09
Handwashing facility with soap and water	1.20***	1.10-1.32	1.20***	1.13-1.28
Clean water	1.08**	1.00-1.16	1.02	0.98-1.07
Time to water source	1.00	1.00-1.00	1.00	1.00-1.00
Time to water source squared	1.00	1.00-1.00	1.00	1.00-1.00
Medical treatment at public facility	1.13***	1.04-1.21	1.07**	1.01-1.13
Household head gender	1.01	0.91-1.12	1.00	0.93-1.07
Household head age	1.00	1.00-1.00	1.00	1.00-1.00
Household head literacy	0.97	0.89-1.05	0.96	0.91-1.01
Household size	1.00	1.00-1.01	1.00	1.00-1.01
Children below 2 years	1.07	0.99-1.15	1.05*	1.00-1.11
Household has member with disability	0.95	0.85-1.05	0.95	0.90-1.01
Host community	0.97	0.86-1.09	0.97	0.89-1.05
Provinces: base Faryab				
Jawzjan	1.00	1.00-1.00	0.99	0.90-1.10
Nangarhar	1.00	1.00-1.00	0.91*	0.83-1.00
Sar-e-Pol	1.00	1.00-1.00	1.22***	1.13-1.32
Balkh	1.00	1.00-1.00	0.93	0.86-1.02
Kandahar	1.00	1.00-1.00	0.71***	0.64-0.79
Badakhshan	1.00	1.00-1.00	0.94	0.87-1.02
Lnalpha			0.00	0.00-5.40e+60
Observations	2264		2340	
Log-likelihood	−1517		−3923***	

Exponentiated coefficients: *P <.10, ** P <.05, *** P <.01.

Econometric analysis

Determinants of handwashing at 5 critical times. Table 3 show the results of factors determining handwashing at 5 critical times using panel poisson regression model. The Hausman test statistic for model selection was 12.55 (P=.403) and not significant and therefore a random effects poisson regression is appropriate over fixed effects model.[24,25] Therefore, the study proceeds and interprets results from the random effects regression (columns 4 and 5). As compared to mothers/caregivers without access to handwashing facility with water and soap, those who had access had 1.20 (IRR = 1.20; 95% CI: 1.13-1.28) times increased likelihood of washing hands at 5 critical times. Mothers/caregivers who sought medical treatment at public health facility were 1.07 (IRR = 1.07; 95% CI: 1.01-1.13) times more likely to wash hands at critical times than those not seeking treatment from these institutions. The odds of washing hands at 5 critical times were higher among mothers/caregiver who had children below 2 years old compared to those who did not have. Mothers/caregivers who had children below 2 years 1.05 (IRR = 1.05; 95% CI: 1.00-1.11) times more likely to wash hands at critical times than those not owning.

Determinants of handwashing at least 3 times. The Hausman test for model selection was 11.86 (P=.457). Given that the Hausman statistic is not significant the random effects panel logit regression is used for estimation (Table 4). The study revealed that mothers/caregivers with access to handwashing facility with water and soap were 1.73 (OR = 1.73; 95% CI: 1.32-2.27) times more likely to practice handwashing at least 3 times

Table 4. Determinants of handwashing at least 3 times using random-effects logit regression.

VARIABLE	FIXED EFFECTS		RANDOM EFFECTS	
	ODDS RATIO	CONFIDENCE INTERVAL	ODDS RATIO	CONFIDENCE INTERVAL
Hygiene promotion	1.31**	1.01-1.69	1.15	0.94-1.39
Handwashing facility with soap and water	1.80***	1.25-2.59	1.73***	1.32-2.27
Clean water	1.27*	0.96-1.66	1.06	0.88-1.29
Time to water source	0.99**	0.97-1.00	0.99**	0.98-1.00
Time to water source squared	1.00**	1.00-1.00	1.00***	1.00-1.00
Medical treatment at public facility	1.61***	1.19-2.17	1.49***	1.21-1.83
Household head gender	1.05	0.70-1.57	0.93	0.71-1.22
Household head age	1.00	0.98-1.01	1.00	0.99-1.00
Household head literacy	0.98	0.71-1.35	0.92	0.74-1.14
Household size	1.03*	1.00-1.07	1.01	0.99-1.03
Children below 2 years	1.28	0.94-1.74	1.24**	1.01-1.52
Household has member with disability	0.95	0.60-1.50	0.82*	0.65-1.03
Host community	0.80	0.51-1.24	0.95	0.69-1.29
Provinces: base Faryab				
Jawzjan	1.00	1.00-1.00	0.49***	0.33-0.73
Nangarhar	1.00	1.00-1.00	0.48***	0.32-0.70
Sar-e-Pol	1.00	1.00-1.00	1.53**	1.05-2.22
Balkh	1.00	1.00-1.00	0.46***	0.33-0.64
Kandahar	1.00	1.00-1.00	0.19***	0.13-0.28
Badakhshan	1.00	1.00-1.00	0.63***	0.44-0.88
lnsig2u			0.00	0.00-1.17e+09
Observations	1044		2396	
Log-likelihood	−333***		−1389***	

Exponentiated coefficients: *P <.10, **P <.05, ***P <.01.

compared to those without access. We incorporated time required to get water from source as one of the variables. Accordingly, mothers/caregivers with water sources that were far away based on time were 0.99 less likely to wash their hands at least 3 times (OR = 0.99; 95% CI: 0.98-1.00) compared to counterparts with nearer water sources. Mothers/caregivers that sought medical treatment from public health facilities were 1.49 (OR = 1.49; 95% CI: 1.21-1.83) times more likely to practice handwashing at least 3 times compared to those not seeking medical treatment from these facilities. Having children less than 2 years old was also a significant determinant of handwashing at least 3 times. Mothers/caregivers with children less than 2 years had 1.24 (OR = 1.24; 95% CI: 1.01 -1.52) higher odds of practicing appropriate handwashing behaviour compared to their respective counterparts. The odds of washing hands at least 3 times were lower among mothers/caregiver from households having a member with disability.

Does occurrence of infectious diseases predict appropriate handwashing behaviour. According to literature, contracting infectious diseases is one of the major determinants of handwashing behaviours.[26,27] The variables measuring the occurrence of infectious diseases (acute respiratory infection, tuberculosis, diarrhoea, cholera malaria, skin infection and COVID-19) were only collected at endline. Table 5 show the regression estimates on the role of occurrence of infectious diseases on handwashing behaviour using endline data. Respondents who reported contracting infectious diseases in the past 6 months were more likely to practice handwashing at 5 critical times (OR 1.04; 95% CI 1.01–1.07). The article revealed that mothers/caregivers

Table 5. Role of infectious diseases on handwashing at 5 critical times and at least 3 times.

VARIABLE	POISSON REGRESSION HANDWASHING AT 5 CRITICAL TIMES		LOGIT REGRESSION HANDWASHING AT LEAST 3 TIMES	
	IRR	CONFIDENCE INTERVAL	ODDS RATIO	CONFIDENCE INTERVAL
Hygiene promotion	1.00	0.93-1.08	0.59***	0.42-0.84
Handwashing facility with soap &water	1.11**	1.02-1.21	1.71**	1.12-2.60
Clean water	0.96	0.89-1.03	0.73*	0.53-1.01
Time to water source	1.00	1.00-1.00	0.97***	0.96-0.99
Infectious diseases	1.04***	1.01-1.07	1.52***	1.31-1.76
Medical treatment at public facility	1.01	0.94-1.08	1.45**	1.04-2.04
Children below 2 years	1.06	0.98-1.14	1.46**	1.05-2.03
Household has member with disability	0.91**	0.84-0.98	0.54***	0.38-0.77
Other covariates as in Table 3	*Yes*		*Yes*	
Provincial dummies	*Yes*		*Yes*	
Observations	1208		1208	
Log-likelihood	−2040***		−580***	

Exponentiated coefficients: *$P < .10$, **$P < .05$, ***$P < .01$.

from households with a member who suffered from infectious diseases in the past 6 months were 1.52 (OR = 1.52; 95% CI: 1.31-1.76) times more likely to practice handwashing at least 3 times compared to those not.

Discussion

This study was undertaken, to assess the determinants of handwashing at 5 critical times and at least 3 times among mothers/caregivers of children under-5 years in rural areas of Afghanistan. About 22% of households had a designated hand washing facility equipped with water and soap at endline, suggesting the need for increased hygiene promotion particularly on washing hands with water and soap complemented by promoting greater access to soap and water. The proportion of mothers/caregivers that reported washing their hands on different types of occasions increased at endline compared to baseline, except for 'after defecation or using the toilet'. Mother/caregivers with access to handwashing facility with water and soap had 1.20 higher odds of washing hands at 5 critical times. Treatment at public facility, an indirect proxy of health education and having children under 2 years was associated with 1.07 and 1.05 higher odds of washing hands at 5 critical times. Access to handwashing with water and soap, treatment at public facility and children under 2 years were significant and robust to alternative specification of handwashing at least 3 times. Mothers/caregivers who reported contracting infectious diseases in the past 6 months had 1.04- and 1.52-times higher odds of handwashing at 5 critical times and at least 3 times respectively.

The study showed that handwashing at 5 critical times among mothers/caregivers of children under-5 years was positively determined by access to handwashing facility with water and soap. This finding is in line with studies that emphasise the importance of access to handwashing materials and resources as the key drivers for handwashing.[3,4,17,19,20] Distance to water source was negatively related with appropriate handwashing behaviour. These results tally with earlier literature that mothers/caregivers who had water supply far away had reduced odds of handwashing at critical times compared to those with water supply nearer their homesteads.[3,6] These findings imply that having reliable water source that is nearer household should be a top priority for promoting handwashing at critical times.

The seeking of treatment at a public health facility was a key driver of handwashing at critical times. Mother/caregivers usually get health and hygiene education on appropriate hand washing and frequency during visits to health facilities.[3] This study's results demonstrate the importance of promoting health and hygiene information and knowledge to influence appropriate handwashing behaviour.[19]

Mothers/caregivers with children less than 2 years of age adopted appropriate handwashing behaviour. This finding is in line with similar findings from studies conducted in various countries including Bangladesh, Ethiopia, Nepal and Vietnam.[4-6,17,22] The logic being that when mothers/caregivers have younger children, they potentially contact them on a regular basis when feeding them and conducting perineal care which subsequently increases the likelihood of handwashing at and hygiene practices.

The study's results indicate that mothers/caregivers who contracted infectious diseases were more likely to adopt appropriate handwashing behaviours at critical times. These findings resonate with recent literature that individuals susceptible to contracting infectious diseases were more likely to wash their hands at appropriate times.[26-28] For example, some studies found that individuals that contracted influenza and or COVID-19 frequently washed their hands.[27,28]

The manuscript's implication is that it contributes to achievement of Sustainable Development Goal (SDG)-6 of ensuring clean water and sanitation, and in particular outcome target of achieving adequate and equitable sanitation and hygiene for all by 20230. This is achieved by promoting hygiene education for mothers/caregivers with children under-5. Promoting appropriate handwashing behaviour by mothers is one of the cost-effective options for reducing the burden of infectious diseases, and subsequently contribute to SDG-3 (good health and wellbeing) by improving the health and well-being of children under-5 and reducing under-5 mortality rates.

Strengths and limitations

The main strength of the study is in the use of random effects panel poisson regression model that is appropriate for establishing causality. This study is limited to rural areas of 7 provinces and can only be generalised to rural areas of Afghanistan and other areas of similar context. Furthermore, the measurement of hand hygiene and all variables used is based on recall and self-reporting and not immune to recall bias. Despite these shortcomings, this study provides valuable insights on how hygiene practices are understood within rural communities in similar contexts to guide policymakers. Future studies on this topic should consider a wider sample to ensure that the study is representative of both the rural and urban areas of Afghanistan.

Conclusion

The average hand washing practice of mothers/caregivers was 3.3 out of 5 during critical times associated with good hygiene practices. The main determinants that positively influenced appropriate handwashing behaviour were access to handwashing facilities with soap and water, treatment at public facility, infectious diseases, and children under 2 years. These findings suggest that the public sector and development agencies should promote interventions that improve access to handwashing facilities, water, and soap. Households should be encouraged to construct handwashing stations, for example, tippy taps and these should be located at convenient sites to encourage handwashing practice. Hygiene education should be done to nudge mothers/caregivers to adopt appropriate handwashing behaviour at critical times. The policy and programming implications of this study creates a juxtapose for the comparison and dissemination of findings to guide international health providers and aid agencies operating within developing nations with similar contexts. In addition, the public sector and development agencies need to promote remunerative, entrepreneurial activities that increase disposable income to assist households to purchase soap and handwashing facilities, enhance the public health strategy to educate the population on good hand hygiene and finally, to construct clean water sources including handpump, protected spring and well, public tap/standpipe, piped water into dwellings or into compound. These water sources should be constructed within the geographical confines of these rural communities. Furthermore, there is need to promote healthcare seeking behaviour for mothers/caregivers to access medical treatment and health hygiene education at public facilities vital for prevention of infectious diseases.

Acknowledgements

The authors are grateful to survey respondents for their participation in the study. The research assistants who collected the data are acknowledged.

Author Contributions

Conceptualisation, C.M.; methodology, C.M.; software, C.M.; validation, C.M., formal analysis, C.M.; data curation, C.M.; writing – original draft preparation, C.M, R.M, E.K, C.K; writing – review and editing. All authors have read and agreed to the published version of the manuscript.

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Ethical Concern

Ethical clearance was obtained from Save the Children's Ethics Review Committee, number: SCUS-ERC-FY2022-21. Risk assessments were completed and safeguarding and protection of all the respondents was ensured throughout the assessment activities. Permission was obtained from the local authorities. The respondents gave verbal informed consent to participate while mechanisms put in place to ensure safeguarding, anonymity, and confidentiality (safeguard the participant's data and protect it from third-party access).

Data Availability

Data is available upon reasonable request from corresponding author.

REFERENCES

1. Zangana A, Shabila N, Heath T, White S. The determinants of handwashing behaviour among internally displaced women in two camps in the Kurdistan Region of Iraq. *PLoS One*. 2020;15:1-17.

2. Watson J, Dreibelbis R, Aunger R, et al. Child's play: harnessing play and curiosity motives to improve child handwashing in a humanitarian setting. *Int J Hyg Environ Health*. 2019;222:177-182.
3. Wana EW, Mengesha NA. Hand-washing at critical times and associated factors among mothers/caregivers of under-five year children in Nefas Silk Lafto Sub-City, Addis Ababa, Ethiopia. *Health Serv Res Manag Epidemiol*. 2023;10:1-8.
4. Agaro A, Hareru HE, Muche T, et al. Predictors of hand-washing practices at critical times among mothers of under-5 years old children in rural setting of Gedeo Zone, Southern Ethiopia. *Environ Health Insights*. 2022;16:1-11.
5. Xiao C, Le DA, Makarchev N. Handwashing behaviour among adults in rural Vietnam: a cross-sectional mixed methods study. *Int J Water Resour Dev*. 2023;39:530-547.
6. White S, Thorseth AH, Dreibelbis R, Curtis V. The determinants of handwashing behaviour in domestic settings: an integrative systematic review. *Int J Hyg Environ Health*. 2020;227:1-14.
7. People in Need. Hand Washing Practice. Published May 26, 2024. Accessed 3 April 2024. https://irw.indikit.net/indicator/4044-hand-washing-practice
8. Wagner AL, Mubarak MY, Johnson LE, et al. Trends of vaccine-preventable diseases in Afghanistan from the Disease Early Warning System, 2009-2015. *PLoS One*. 2017;12:1-17.
9. Masood W, Aquil S, ullah H, et al. Impact of climate change on health in Afghanistan amidst a humanitarian crisis. *J Clim Chang Heal*. 2022;6:1-4.
10. Prüss-Ustün A, Wolf J, Bartram J, et al. Burden of disease from inadequate water, sanitation and hygiene for selected adverse health outcomes: an updated analysis with a focus on low- and middle-income countries. *Int J Hyg Environ Health*. 2019;222:765-777.
11. GBD Diarrhoeal Diseases Collaborators. Estimates of global, regional, and national morbidity, mortality, and aetiologies of diarrhoeal diseases: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet Infect Dis*. 2017;17:909-948.
12. Thiam S, Diène AN, Fuhrimann S, et al. Prevalence of diarrhoea and risk factors among children under five years old in Mbour, Senegal: a cross-sectional study. *Infect Dis Poverty*. 2017;6:109.
13. Olapeju B, Hendrickson ZM, Rosen JG, et al. Trends in handwashing behaviours for COVID-19 prevention: Longitudinal evidence from online surveys in 10 sub-Saharan African countries. *PLoS Glob Public Health*. 2021;1:1-16.
14. Karinja M, Schlienger R, Pillai GC, et al. Risk reduction of diarrhea and respiratory infections following a community health education program - a facility-based case-control study in rural parts of Kenya. *BMC Public Health*. 2020;20:586.
15. Freeman MC, Stocks ME, Cumming O, et al. Hygiene and health: systematic review of handwashing practices worldwide and update of health effects. *Trop Med Int Health*. 2014;19:906-916.
16. Kalam MA, Davis TP, Islam MA, et al. Exploring behavioral determinants of handwashing with soap after defecation in an urban setting in Bangladesh: findings from a barrier analysis. *J Water Sanit Hyg Dev*. 2021;11:1006-1015.
17. Wolf J, Johnston R, Freeman MC, et al. Handwashing with soap after potential faecal contact: global, regional and country estimates. *Int J Epidemiol*. 2019; 48:1204-1218.
18. UNICEF. *Afghanistan Multiple Indicator Cluster Survey 2022-23, Summary Findings Report*. UNICEF; 2023.
19. Ezezika O, Heng J, Fatima K, Mohamed A, Barrett K. What are the barriers and facilitators to community handwashing with water and soap? A systematic review. *PLoS Glob Public Health*. 2023;3:1-23.
20. Mekonen T, Admasie A, Leka YL, Darota D, Feleke FW. Handwashing practice and its predictors among mothers of children aged 0 to 23 months in South Ethiopia: community based cross-sectional study. *Environ Health Insights*. 2021;15:1-8.
21. Amegah KE, Addo HO, Ashinyo ME, et al. Determinants of hand hygiene practice at critical times among food handlers in educational institutions of the Sagnarigu Municipality of Ghana: across-sectional study. *Environ Health Insights*. 2020;14:1-10.
22. Soboksa NE. Environmental and behavioral factors associated with handwashing with soap after defecation in a rural setting of 2 districts of the Jimma Zone, Ethiopia. *Environ Health Insights*. 2022;16:1-8.
23. World Bank. Afghanistan: Province Dashboard. Published May 31, 2024. https://www.worldbank.org/en/data/interactive/2019/08/01/afghanistan-interactive-province-level-visualization
24. Cameron AC, Trivedi PK, eds. *Microeconomics Using Stata*. 2nd ed. Stata Press; 022.
25. Wooldridge JM ed. *Econometric Analysis of Cross Section and Panel Data*. 2nd ed. MIT; 2010.
26. Jo S, Han S-Y, Howe N. Factors associated with handwashing behaviors during the COVID-19 pandemic: an Analysis of the Community Health Survey in Korea. *Sage Open Nurs*. 2023;9:1-7.
27. Dwipayanti NMU, Lubis DS, Harjana NPA. Public perception and hand hygiene behavior during COVID-19 pandemic in Indonesia. *Front Public Health*. 2021;9:1-12.
28. Lee M-S, Hong SJ, Kim Y-T. Handwashing with soap and national handwashing projects in Korea: focus on the National Handwashing Survey, 2006-2014. *Epidemiol Health*. 2015;37:1-9.