INTERNATIONAL JOURNAL OF HEALTH & MEDICAL RESEARCH
ISSN(print): 2833-213X, ISSN(online): 2833-2148
Volume 05 Issue 11 November 2026
DOI : 10.58806/ijhmr.2026.v5i11n06
Page No. 1168-1181

Household Water Collection Burden, Hygiene Practices and Satisfaction with Wash Services in South-South Nigeria: A Cross-Sectional Study

Dr. Hendrith Esene[1], Dr. Bodeno Ehis[2*]
[1,2]Department of Community Medicine, Igbinedion University, Edo State, Nigeria

ABSTRACT
Background: Water, sanitation and hygiene services (WASH) are important determinants of population health, but nominal access may not reflect reliability, accessibility or adequacy at household level. **Objective:** This study assessed water-collection burden, hygiene practices and household satisfaction with WASH in Okada, Edo State, Nigeria, and examined factors associated with these outcomes.
Methods: A descriptive cross-sectional household survey was conducted from April to July 2025 among 289 households in Okada. Data were collected using a structured interviewer-administered questionnaire adapted from WHO/UNICEF Joint Monitoring Programme core household questions. Outcomes were handwashing at all key times, consistent soap use and overall satisfaction with WASH services. Satisfaction was assessed across eight service attributes using a five-point scale. Associations were examined using Pearson's chi-square test and multivariable binary logistic regression with Firth-penalized likelihood. Statistical significance was set at $p < 0.05$.
Results: Handwashing at all key times was reported by 220 (76.1%) households, while 185 (64.0%) always used soap. Stored water ran out before the next collection in 184 (63.7%) households. The mean overall satisfaction score was 3.38 ± 0.90, with 144 (49.8%) households classified as satisfied, 101 (34.9%). Households without regular soap availability had lower odds of handwashing at all key times. Consistent soap use was less likely among households without a basic handwashing facility. Satisfaction was lower among households without a basic handwashing facility, and with longer water-collection times. Adult male water collection was associated with higher odds of satisfaction (AOR 2.11, 95% CI 1.13–3.99; $p = 0.019$).
Conclusion: Household WASH experience was characterized by substantial water-collection burden and gaps in consistent soap use. Basic handwashing facilities, regular soap availability and shorter water-collection times were independently associated with hygiene practices and satisfaction. Improving these household-level service conditions may strengthen WASH adequacy and user satisfaction in Okada.

KEYWORDS: Water Supply; Sanitation; Hygiene; Household Satisfaction; Nigeria.

BACKGROUND

Water, sanitation and hygiene (WASH) are major determinants of population health and remain important sources of preventable morbidity and mortality. In 2024, approximately 2.2 billion people globally lacked safely managed drinking-water services, 3.4 billion lacked safely managed sanitation and 1.7 billion lacked basic hygiene services at home.[1,2] Although global coverage of basic hygiene services increased from 52% in 2015 to 71% in 2024, major inequalities persist, particularly in low-income and rural settings.[3,4]

The consequences of inadequate WASH are significant, as diarrheal disease remains the third leading cause of death among children aged 1–59 months, with approximately 443,832 under-five deaths annually worldwide; nearly 1.7 billion episodes of childhood diarrhoea occur each year.[5] Unsafe WASH also contributes to acute respiratory infections, intestinal parasitic infections and undernutrition.[6,7] Globally, inadequate WASH has been estimated to contribute to approximately 1.4 million deaths annually, including nearly 400,000 deaths among children under five.[6]

Nigeria continues to experience substantial gaps in household WASH services. According to the 2024 WHO/UNICEF Joint Monitoring Programme estimates, 67% of the Nigerian population had access to at least basic drinking-water services, while 95% had at least basic sanitation services and 82% had basic hygiene services.[8] However, 20% still relied on unimproved drinking-water sources and 8% on surface water, indicating persistent inequalities in effective access.[8] These national figures also mask important differences in service quality and reliability, as access to a basic service does not necessarily mean that water is available on premises, continuously accessible or sufficient for household needs. Consequently, measures of water-collection time, availability of soap, hygiene practices and users' satisfaction are important for understanding how WASH services function at household level.

Household Water Collection Burden, Hygiene Practices and Satisfaction with Wash Services in South-South Nigeria: A Cross-Sectional Study

Beyond nominal access, the distance, time and effort required to obtain water may determine how much water households can collect and use for drinking, cleaning and hygiene. Limited availability of soap may further constrain handwashing despite knowledge of appropriate practices. Consequently, infrastructure-based WASH indicators may not fully capture household experience or service adequacy. Household satisfaction can provide an additional user-centred measure of reliability, accessibility and adequacy.

In Okada, Edo State, evidence integrating WASH access, water-collection burden, hygiene practices and household satisfaction remains limited. This study therefore assessed these dimensions and examined factors associated with household hygiene practices and satisfaction with WASH services.

MATERIALS AND METHODS

Study area

The study was conducted in Okada, the headquarters of Ovia North-East Local Government Area, Edo State, South-South Nigeria. Okada had a population of 153,849 at the 2006 national census and hosts Igbinedion University and its teaching hospital. The community has a predominantly indigenous population engaged in farming, trading and other occupations.

Study design and period

A descriptive cross-sectional household survey was conducted from April to July 2025.

Study population and eligibility

The study population comprised households resident in Okada. Households were eligible if an adult household representative was available and provided informed consent. Households that declined participation or were inaccessible during the study period were excluded. One adult respondent was interviewed per household.

Sample size determination

The minimum sample size was calculated using the single-proportion formula, $n = z^2pq/d^2$, where $z = 1.96$, $p = 21.7\%$ based on a previous report of rural household water access[9] , $q = 1 - p$, and $d = 0.05$. The calculated minimum sample was 260 households. Allowing for 10% non-response yielded a final required sample of 289 households.

Sampling procedure

Cluster sampling was used. The major residential areas of Okada were divided into six clusters, from which clusters were selected by balloting. Eligible households within the selected clusters were subsequently enrolled consecutively until the required sample of 289 households was reached. One adult respondent was interviewed per household.

Data collection instrument

Data were collected using a structured interviewer-administered questionnaire adapted from the WHO/UNICEF Joint Monitoring Programme (JMP) core household questions.[10] The questionnaire assessed the person who usually collected water, number of water-collection trips per day, exhaustion of stored water before the next collection, actions taken when stored water was exhausted, handwashing at key times and soap use during handwashing. Information on household WASH service access and satisfaction was also collected.

Study outcomes

Three binary outcomes were assessed. Handwashing at all key times was defined as reporting "always" for handwashing at the specified critical times, including before eating and after toilet use; all other responses were classified as not meeting this criterion. Consistent soap use was defined as reporting "always" using soap when washing hands, with all other responses classified otherwise. Household satisfaction was assessed using eight five-point items addressing water-source reliability, distance or time required to collect water, water quality, toilet condition, toilet privacy, toilet cleanliness, and availability of water and soap at the handwashing station. Each item was scored from 1 (very dissatisfied) to 5 (very satisfied). The mean of the eight items was calculated for each household. A mean score ≥3.5 was classified as satisfied, 2.5–3.4 as neutral and <2.5 as dissatisfied.

Exposure variables

Exposure variables comprised sociodemographic characteristics, JMP WASH service indicators and structural service characteristics. The JMP indicators included improved drinking-water source, improved unshared sanitation and a basic handwashing facility with water and soap present. Structural service characteristics included water source on premises, round-trip water-collection time, interruption of water supply for >2 days during the preceding 2 weeks, number of collection trips per day and exhaustion of stored water. Household soap availability was also assessed.

Variable categorization

For multivariable analysis, sparse response categories were combined into substantively related groups. Age was grouped as <25, 25–34, 35–44 and ≥45 years; education as primary or no formal education, secondary and tertiary; occupation as student, formal salaried employment (civil/public servants, teachers and health workers), trading or self-employment, farming, and other/unemployed/transport occupations; and dwelling type as permanent solid versus semi-permanent or temporary. Round-trip water-collection time was grouped as <10, 10–30 and >30 minutes, with 16 households in the >30-minute category.

Categories were combined on substantive grounds rather than by collapsing them into the largest category. Each category therefore retained a distinct estimate and homogeneous reference group. Descriptive analyses retained the original response categories.

Data analysis

Data were analyzed using IBM SPSS Statistics version 27 and Python version 3.11. Categorical variables were summarized using frequencies and percentages, while satisfaction-item scores were summarized using means and standard deviations. Pearson's chi-square test was used to assess bivariate associations between categorical variables.

Variables with $p < 0.20$ in bivariate analysis were entered simultaneously into multivariable binary logistic regression models. All multivariable models were fitted using Firth penalized likelihood to reduce bias associated with sparse data and separation. Statistical significance was set at $p < 0.05$, and all tests were two-sided.

Ethical considerations

Ethical approval was obtained from the Research Ethics Committee of Igbinedion University Teaching Hospital, Okada [approval number IUTH/R.24/VOL.I/203]. Written informed consent was obtained from all respondents before participation. Participation was voluntary, respondents could withdraw at any stage, and no personal identifiers were collected. The study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

Respondents

All 289 sampled households were successfully interviewed. Respondents were predominantly female (188, 65.1%), with most aged 25–54 years; 184 (63.7%) had tertiary education. Trading, business or self-employment was the most frequently reported occupational group (72, 24.9%).

Water collection and hygiene practices (Table 1)

Water was most commonly collected by an adult female (114, 39.4%), followed by an adult male (86, 29.8%), while children were the usual collectors in 37 (12.8%) households. One collection trip per day was reported by 112 (38.8%) households, two by 62 (21.5%), and three or more by 115 (39.8%). Stored water ran out before the next collection in 184 (63.7%) households. Among the reported responses to water exhaustion, 144 (49.8%) fetched additional water from the usual source, 116 (40.1%) bought water, 11 (3.8%) used another potentially unsafe source and 18 (6.2%) reported other actions.

Handwashing at all key times was reported by 220 (76.1%) households. Soap was always used by 185 (64.0%), sometimes by 101 (34.9%) and never by 3 (1.0%) households.

Household satisfaction with WASH services (Table 2; Figure 1)

The mean overall satisfaction score across the eight service attributes was 3.38 ± 0.90 on the five-point scale. Overall, 144 (49.8%) households were satisfied, 101 (34.9%) were neutral and 44 (15.2%) were dissatisfied. Mean item scores ranged from 3.18 ± 1.28 for water availability at the handwashing station to 3.52 ± 1.17 for distance or time required to fetch water. Water source reliability had a mean score of 3.49 ± 1.22, while soap availability at the handwashing station had a mean score of 3.23 ± 1.34.

Practice and satisfaction by WASH service access (Figure 2)

Handwashing at all key times was reported by 93 (88.6%) of 105 households with Basic WASH compared with 127 (69.0%) of 184 without Basic WASH. Consistent soap use was reported by 81 (77.1%) and 104 (56.5%) households, respectively, while satisfaction was reported by 68 (64.8%) and 76 (41.3%), respectively. Among households with a basic handwashing facility, 117 (76.0%) always used soap compared with 68 (50.4%) among those without a basic facility.

Determinants of handwashing at all key times (Table 3; Figure 3)

On bivariate analysis, regular household soap availability ($\chi^2 = 16.80$, $p < 0.001$), sanitation service ($\chi^2 = 12.30$, $p < 0.001$), stored-water exhaustion ($\chi^2 = 7.54$, $p = 0.006$), supply interruption ($\chi^2 = 6.02$, $p = 0.014$), handwashing facility ($\chi^2 = 5.23$, $p = 0.022$), drinking-water source ($\chi^2 = 4.57$, $p = 0.033$), water source on premises ($\chi^2 = 4.20$, $p = 0.040$), age group ($\chi^2 = 9.20$, $p = 0.027$), occupational group ($\chi^2 = 14.10$, $p = 0.007$) and number of children under five years ($\chi^2 = 9.35$, $p = 0.025$) were associated with handwashing at all key times.

In the multivariable model, households without regular soap availability had lower odds of handwashing at all key times than those with regular availability (AOR 0.37, 95% CI 0.18–0.76; p = 0.007). Households with three or more children under five years also had lower odds than households without children under five years (AOR 0.32, 95% CI 0.11–0.90; p = 0.031). The remaining predictors were not independently associated with the outcome.

Determinants of consistent soap use (Table 4)

On bivariate analysis, consistent soap use was associated with the availability of a basic handwashing facility ($\chi^2 = 19.38$, $p < 0.001$), regular household soap availability ($\chi^2 = 15.25$, $p < 0.001$), stored-water exhaustion ($\chi^2 = 8.27$, $p = 0.004$), sanitation service ($\chi^2 = 6.31$, $p = 0.012$) and supply interruption ($\chi^2 = 4.61$, $p = 0.032$).

After adjustment, households without a basic handwashing facility had lower odds of consistent soap use than those with a basic facility (AOR 0.50, 95% CI 0.29–0.85; p = 0.011). Lower odds were also observed among households without regular soap availability (AOR 0.42, 95% CI 0.21–0.84; p = 0.013) and among those whose stored water ran out before the next collection (AOR 0.56, 95% CI 0.32–0.97; p = 0.040). Education, occupation, household size, dwelling characteristics, water source and water-collection characteristics were not independently associated with consistent soap use.

Determinants of overall satisfaction (Table 5; Figure 4)

On bivariate analysis, overall satisfaction was associated with handwashing facility ($\chi^2 = 19.58$, $p < 0.001$), regular soap availability ($\chi^2 = 15.88$, $p < 0.001$), round-trip water collection time ($\chi^2 = 13.96$, $p < 0.001$), sanitation service ($\chi^2 = 10.76$, $p = 0.001$), stored-water exhaustion ($\chi^2 = 7.48$, $p = 0.006$), supply interruption ($\chi^2 = 6.13$, $p = 0.013$), number of collection trips per day ($\chi^2 = 7.31$, $p = 0.026$) and occupational group ($\chi^2 = 12.80$, $p = 0.012$).

After adjustment, households without a basic handwashing facility had lower odds of overall satisfaction than those with a basic facility (AOR 0.50, 95% CI 0.29–0.87; p = 0.014). Lack of regular household soap availability was similarly associated with lower odds of satisfaction (AOR 0.41, 95% CI 0.19–0.86; p = 0.018). Compared with households requiring less than 10 minutes for a round trip to collect water, those requiring 10–30 minutes had lower odds of satisfaction (AOR 0.48, 95% CI 0.25–0.89; p = 0.020), while those requiring more than 30 minutes had still lower odds (AOR 0.32, 95% CI 0.09–1.00; p = 0.049). Households in which an adult male usually collected water had higher odds of satisfaction than those in which an adult female was the usual collector (AOR 2.11, 95% CI 1.13–3.99; p = 0.019). Education, household size, dwelling type, tenure, drinking-water source, supply interruption, stored-water exhaustion and number of collection trips were not independently associated with overall satisfaction.

TABLE 1: Water collection practices and hygiene behaviour of households

Variable	Frequency (n = 289)	Percentage (%)
Water collection		
Usually collected by an adult female	114	39.4
Usually collected by an adult male	86	29.8
Usually collected by children	37	12.8
Collected by another person	52	18.0
One collection trip per day	112	38.8
Two collection trips per day	62	21.5
Three or more collection trips per day	115	39.8
Stored water runs out before next collection	184	63.7
Action taken when stored water runs out		
Fetches more from the usual source	144	49.8
Buys water	116	40.1
Uses another, possibly unsafe, source	11	3.8
Other action	18	6.2
Hygiene behaviour		
Washes hands always at key times	220	76.1
Washes hands most of the time	16	5.5
Washes hands sometimes	52	18.0
Washes hands rarely or never	1	0.3
Always uses soap when washing hands	185	64.0
Sometimes uses soap	101	34.9
Never uses soap	3	1.0

TABLE 2: Household satisfaction with each water, sanitation and hygiene service attribute

Satisfaction item	Very dissatisfied n (%)	Dissatisfied n (%)	Neutral n (%)	Satisfied n (%)	Very satisfied n (%)	Mean ± SD
Water source reliability	21 (7.3)	48 (16.6)	56 (19.4)	97 (33.6)	67 (23.2)	3.49 ± 1.22
Distance or time to fetch water	17 (5.9)	45 (15.6)	63 (21.8)	98 (33.9)	66 (22.8)	3.52 ± 1.17
Water quality, taste and safety	21 (7.3)	44 (15.2)	73 (25.3)	103 (35.6)	48 (16.6)	3.39 ± 1.15
Toilet condition	23 (8.0)	51 (17.6)	66 (22.8)	86 (29.8)	63 (21.8)	3.40 ± 1.23
Toilet privacy	29 (10.0)	56 (19.4)	33 (11.4)	107 (37.0)	64 (22.1)	3.42 ± 1.30
Toilet cleanliness	24 (8.3)	56 (19.4)	57 (19.7)	91 (31.5)	61 (21.1)	3.38 ± 1.24
Water at the handwashing station	41 (14.2)	48 (16.6)	64 (22.1)	91 (31.5)	45 (15.6)	3.18 ± 1.28
Soap at the handwashing station	43 (14.9)	48 (16.6)	54 (18.7)	88 (30.4)	56 (19.4)	3.23 ± 1.34
Overall satisfaction score						***3.38 ± 0.90***

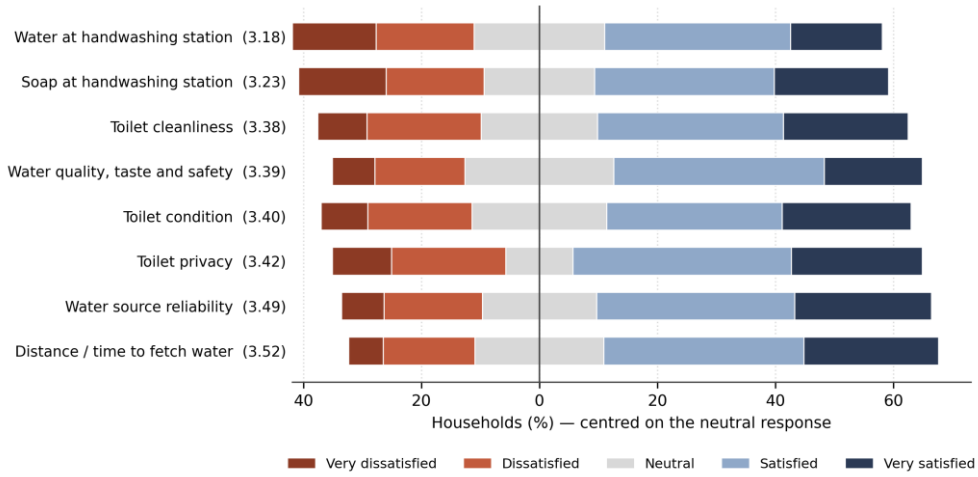


FIGURE 1: Distribution of household satisfaction across the eight service attributes

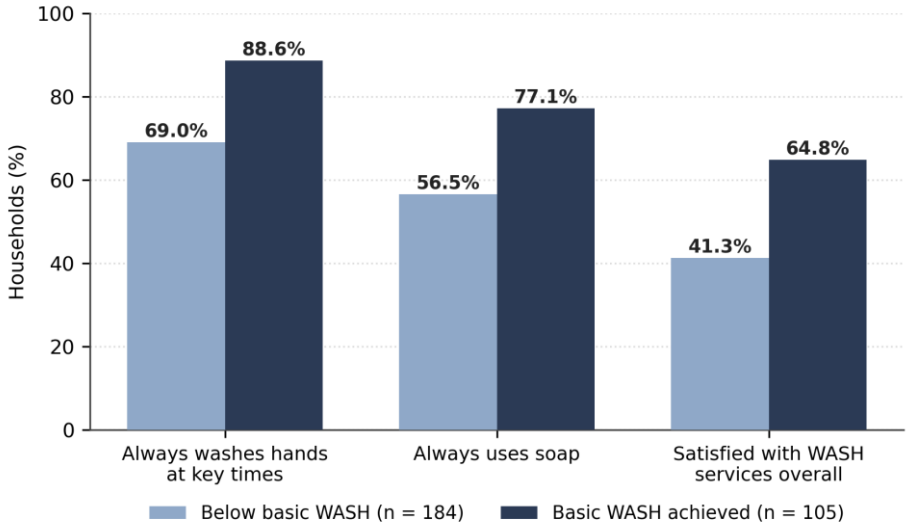


FIGURE 2: Hygiene practice and satisfaction by attainment of Basic WASH

TABLE 3: Determinants of handwashing at all key times

Variable (N = 289)	Always n (%)	Not always n (%)	χ^2	p	AOR (95% CI)	p
Sex of respondent						
Male	79 (78.2)	22 (21.8)	0.22	0.640		
Female	141 (75.0)	47 (25.0)				
Age group of respondent						
Under 25 years	36 (63.2)	21 (36.8)	9.20	0.027	0.63 (0.25–1.55)	0.311
25–34 years	73 (83.9)	14 (16.1)			1.00 (reference)	
35–44 years	51 (72.9)	19 (27.1)			0.59 (0.24–1.40)	0.231
45 years and above	60 (80.0)	15 (20.0)			0.74 (0.30–1.82)	0.510
Highest level of education						
Primary or none	12 (66.7)	6 (33.3)	3.07	0.216		
Secondary	62 (71.3)	25 (28.7)				
Tertiary	146 (79.3)	38 (20.7)				
Occupational group						
Student	31 (62.0)	19 (38.0)	14.10	0.007	0.67 (0.26–1.73)	0.407
Formal salaried employment	61 (87.1)	9 (12.9)			1.43 (0.54–3.89)	0.471
Trading, business or self-employed	58 (80.6)	14 (19.4)			1.00 (reference)	
Farming or agriculture	30 (65.2)	16 (34.8)			0.65 (0.26–1.65)	0.363
Other, unemployed or transport	40 (78.4)	11 (21.6)			1.06 (0.41–2.83)	0.907
Number of persons in household						
1–2 persons	39 (83.0)	8 (17.0)	3.79	0.285		
3–4 persons	108 (78.3)	30 (21.7)				
5–6 persons	57 (71.2)	23 (28.7)				
7 or more	16 (66.7)	8 (33.3)				
Number of children under five years						
None	136 (78.2)	38 (21.8)	9.35	0.025	1.00 (reference)	
1 child	49 (81.7)	11 (18.3)			1.40 (0.64–3.28)	0.407
2 children	25 (71.4)	10 (28.6)			0.96 (0.41–2.41)	0.932
3 or more	10 (50.0)	10 (50.0)			0.32 (0.11–0.90)	0.031
Type of dwelling						
Permanent solid	198 (77.3)	58 (22.7)	1.29	0.255		
Semi-permanent or temporary	22 (66.7)	11 (33.3)				
Ownership of dwelling						
Owned	88 (75.2)	29 (24.8)	0.12	0.940		
Rented	114 (76.5)	35 (23.5)				
Other	18 (78.3)	5 (21.7)				
Drinking-water source (JMP)						
Unimproved	19 (59.4)	13 (40.6)	4.57	0.033	0.61 (0.26–1.50)	0.277
Improved	201 (78.2)	56 (21.8)			1.00 (reference)	
Sanitation service (JMP)						
Unimproved or shared	65 (63.7)	37 (36.3)	12.30	< 0.001	0.59 (0.32–1.10)	0.097
Improved (unshared)	155 (82.9)	32 (17.1)			1.00 (reference)	
Handwashing facility (JMP)						
Limited or none	94 (69.6)	41 (30.4)	5.23	0.022	1.03 (0.54–1.95)	0.939
Basic (water and soap)	126 (81.8)	28 (18.2)			1.00 (reference)	
Water source on premises						
Yes	198 (78.3)	55 (21.7)	4.20	0.040	1.00 (reference)	
No	22 (61.1)	14 (38.9)			0.65 (0.28–1.50)	0.305
Supply interrupted > 2 days in past fortnight						
Yes	43 (64.2)	24 (35.8)	6.02	0.014	0.61 (0.31–1.19)	0.146

Variable (N = 289)	Always n (%)	Not always n (%)	χ^2	p	AOR (95% CI)	p
No	177 (79.7)	45 (20.3)			1.00 (reference)	
Stored water runs out before next collection						
Yes	130 (70.7)	54 (29.3)	7.54	0.006	0.52 (0.26–1.00)	0.051
No	90 (85.7)	15 (14.3)			1.00 (reference)	
Person who usually collects water						
Adult female	88 (77.2)	26 (22.8)	1.39	0.708		
Adult male	68 (79.1)	18 (20.9)				
Children	27 (73.0)	10 (27.0)				
Other	37 (71.2)	15 (28.8)				
Soap regularly available in the household						
Yes	193 (81.1)	45 (18.9)	16.80	< 0.001	1.00 (reference)	
No	27 (52.9)	24 (47.1)			0.37 (0.18–0.76)	0.007

AOR, adjusted odds ratio; CI, confidence interval.

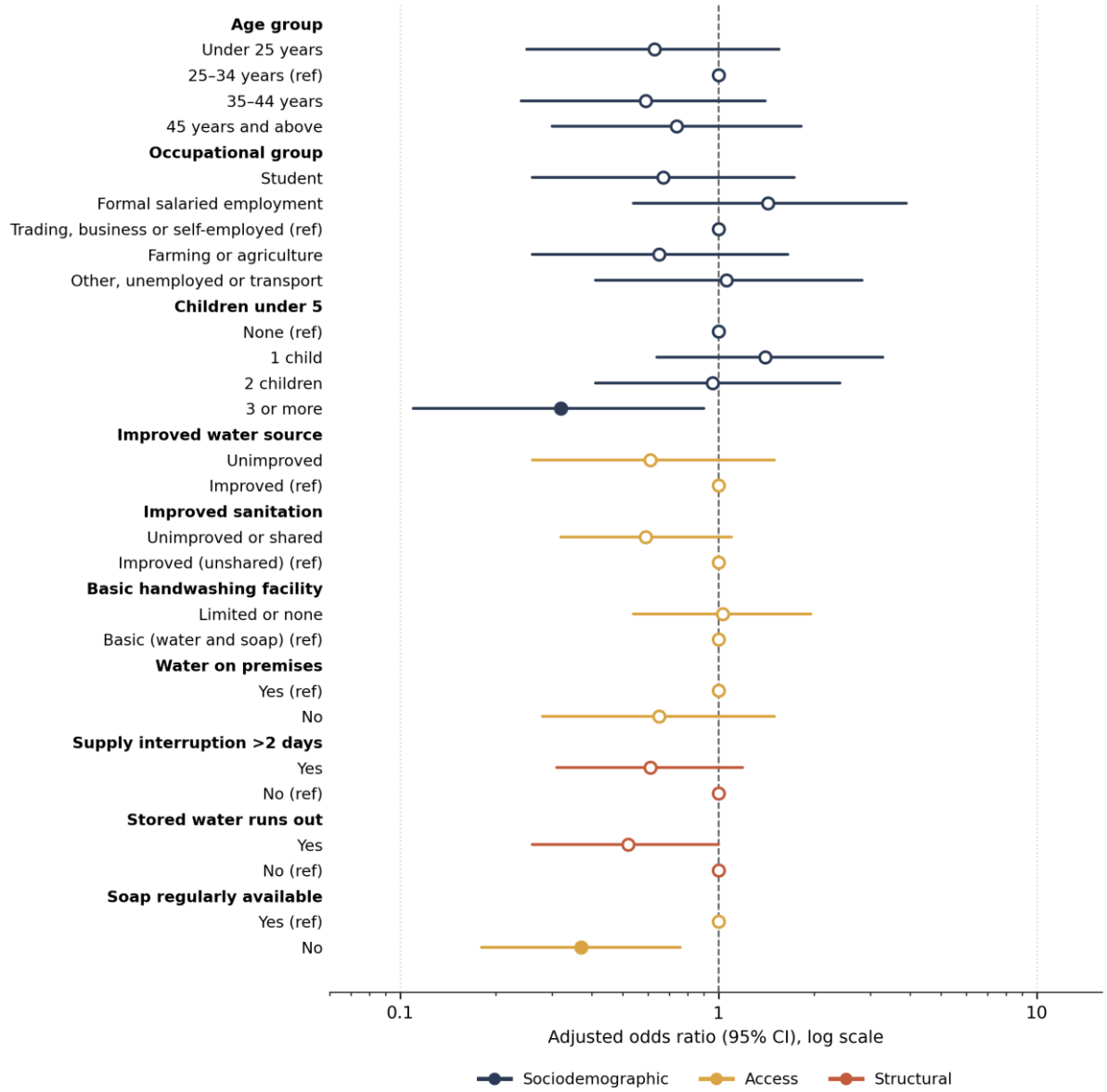


FIGURE 3: Adjusted odds of handwashing at all key times

TABLE 4: Determinants of consistent soap use when washing hands

Variable (N = 289)	Always n (%)	Not always n (%)	χ^2	p	AOR (95% CI)	p
Sex of respondent						
Male	61 (60.4)	40 (39.6)	0.66	0.418		
Female	124 (66.0)	64 (34.0)				
Age group of respondents						
Under 25 years	34 (59.6)	23 (40.4)	4.22	0.238		
25–34 years	55 (63.2)	32 (36.8)				
35–44 years	41 (58.6)	29 (41.4)				
45 years and above	55 (73.3)	20 (26.7)				
Highest level of education						
Primary or none	7 (38.9)	11 (61.1)	5.26	0.072	0.56 (0.19–1.63)	0.285
Secondary	57 (65.5)	30 (34.5)			1.32 (0.72–2.48)	0.370
Tertiary	121 (65.8)	63 (34.2)			1.00 (reference)	
Occupational group						
Student	31 (62.0)	19 (38.0)	8.45	0.076	1.18 (0.52–2.69)	0.694
Formal salaried employment	53 (75.7)	17 (24.3)			1.29 (0.58–2.89)	0.529
Trading, business or self-employed	47 (65.3)	25 (34.7)			1.00 (reference)	
Farming or agriculture	23 (50.0)	23 (50.0)			0.61 (0.27–1.36)	0.228
Other, unemployed or transport	31 (60.8)	20 (39.2)			0.83 (0.37–1.87)	0.652
Number of persons in household						
1–2 persons	34 (72.3)	13 (27.7)	3.00	0.392		
3–4 persons	90 (65.2)	48 (34.8)				
5–6 persons	46 (57.5)	34 (42.5)				
7 or more	15 (62.5)	9 (37.5)				
Number of children under five years						
None	118 (67.8)	56 (32.2)	2.79	0.425		
1 child	35 (58.3)	25 (41.7)				
2 children	20 (57.1)	15 (42.9)				
3 or more	12 (60.0)	8 (40.0)				
Type of dwelling						
Permanent solid	168 (65.6)	88 (34.4)	1.95	0.162	1.00 (reference)	
Semi-permanent or temporary	17 (51.5)	16 (48.5)			0.63 (0.29–1.39)	0.253
Ownership of dwelling						
Owned	70 (59.8)	47 (40.2)	2.99	0.224		
Rented	97 (65.1)	52 (34.9)				
Other	18 (78.3)	5 (21.7)				
Drinking-water source (JMP)						
Unimproved	17 (53.1)	15 (46.9)	1.36	0.244		
Improved	168 (65.4)	89 (34.6)				
Sanitation service (JMP)						
Unimproved or shared	55 (53.9)	47 (46.1)	6.31	0.012	0.72 (0.42–1.24)	0.234
Improved (unshared)	130 (69.5)	57 (30.5)			1.00 (reference)	
Handwashing facility (JMP)						
Limited or none	68 (50.4)	67 (49.6)	19.38	< 0.001	0.50 (0.29–0.85)	0.011
Basic (water and soap)	117 (76.0)	37 (24.0)			1.00 (reference)	
Water source on premises						
Yes	165 (65.2)	88 (34.8)	0.89	0.345		
No	20 (55.6)	16 (44.4)				
Supply interrupted > 2 days in past fortnight						
Yes	35 (52.2)	32 (47.8)	4.61	0.032	0.69 (0.38–1.28)	0.241

Variable (N = 289)	Always n (%)	Not always n (%)	χ^2	p	AOR (95% CI)	p
No	150 (67.6)	72 (32.4)			1.00 (reference)	
Stored water runs out before next collection						
Yes	106 (57.6)	78 (42.4)	8.27	0.004	0.56 (0.32–0.97)	0.040
No	79 (75.2)	26 (24.8)			1.00 (reference)	
Person who usually collects water						
Adult female	71 (62.3)	43 (37.7)	3.82	0.281		
Adult male	62 (72.1)	24 (27.9)				
Children	22 (59.5)	15 (40.5)				
Other	30 (57.7)	22 (42.3)				
Soap regularly available in the household						
Yes	165 (69.3)	73 (30.7)	15.25	< 0.001	1.00 (reference)	
No	20 (39.2)	31 (60.8)			0.42 (0.21–0.84)	0.013

AOR, adjusted odds ratio; CI, confidence interval.

TABLE 5: Determinants of overall satisfaction with WASH services

Variable (N = 289)	Satisfied n (%)	Not satisfied n (%)	χ^2	p	AOR (95% CI)	p
Sex of respondent						
Male	54 (53.5)	47 (46.5)	0.61	0.433		
Female	90 (47.9)	98 (52.1)				
Age group of respondent						
Under 25 years	26 (45.6)	31 (54.4)	2.29	0.514		
25–34 years	46 (52.9)	41 (47.1)				
35–44 years	31 (44.3)	39 (55.7)				
45 years and above	41 (54.7)	34 (45.3)				
Highest level of education						
Primary or none	8 (44.4)	10 (55.6)	2.39	0.302		
Secondary	38 (43.7)	49 (56.3)				
Tertiary	98 (53.3)	86 (46.7)				
Occupational group						
Student	24 (48.0)	26 (52.0)	12.80	0.012	1.37 (0.61–3.08)	0.446
Formal salaried employment	46 (65.7)	24 (34.3)			1.69 (0.82–3.52)	0.159
Trading, business or self-employed	34 (47.2)	38 (52.8)			1.00 (reference)	
Farming or agriculture	15 (32.6)	31 (67.4)			0.68 (0.28–1.59)	0.373
Other, unemployed or transport	25 (49.0)	26 (51.0)			1.15 (0.52–2.60)	0.729
Number of persons in household						
1–2 persons	26 (55.3)	21 (44.7)	3.29	0.349		
3–4 persons	65 (47.1)	73 (52.9)				
5–6 persons	44 (55.0)	36 (45.0)				
7 or more	9 (37.5)	15 (62.5)				
Number of children under five years						
None	89 (51.1)	85 (48.9)	1.87	0.600		
1 child	32 (53.3)	28 (46.7)				
2 children	15 (42.9)	20 (57.1)				
3 or more	8 (40.0)	12 (60.0)				
Type of dwelling						
Permanent solid	132 (51.6)	124 (48.4)	2.13	0.145	1.00 (reference)	
Semi-permanent or temporary	12 (36.4)	21 (63.6)			0.68 (0.29–1.52)	0.345
Ownership of dwelling						
Owned	60 (51.3)	57 (48.7)	0.47	0.790		
Rented	74 (49.7)	75 (50.3)				

Variable (N = 289)	Satisfied n (%)	Not satisfied n (%)	χ^2	p	AOR (95% CI)	p
Other	10 (43.5)	13 (56.5)				
Drinking-water source (JMP)						
Unimproved	14 (43.8)	18 (56.2)	0.29	0.588		
Improved	130 (50.6)	127 (49.4)				
Sanitation service (JMP)						
Unimproved or shared	37 (36.3)	65 (63.7)	10.76	0.001	0.68 (0.39–1.19)	0.174
Improved (unshared)	107 (57.2)	80 (42.8)			1.00 (reference)	
Handwashing facility (JMP)						
Limited or none	48 (35.6)	87 (64.4)	19.58	< 0.001	0.50 (0.29–0.87)	0.014
Basic (water and soap)	96 (62.3)	58 (37.7)			1.00 (reference)	
Water source on premises						
Yes	129 (51.0)	124 (49.0)	0.75	0.385		
No	15 (41.7)	21 (58.3)				
Supply interrupted > 2 days in past fortnight						
Yes	24 (35.8)	43 (64.2)	6.13	0.013	0.55 (0.28–1.04)	0.067
No	120 (54.1)	102 (45.9)			1.00 (reference)	
Stored water runs out before next collection						
Yes	80 (43.5)	104 (56.5)	7.48	0.006	0.67 (0.38–1.16)	0.152
No	64 (61.0)	41 (39.0)			1.00 (reference)	
Person who usually collects water						
Adult female	49 (43.0)	65 (57.0)	6.11	0.106	1.00 (reference)	
Adult male	52 (60.5)	34 (39.5)			2.11 (1.13–3.99)	0.019
Children	18 (48.6)	19 (51.4)			1.37 (0.60–3.15)	0.452
Other	25 (48.1)	27 (51.9)			0.99 (0.47–2.10)	0.984
Soap regularly available in the household						
Yes	132 (55.5)	106 (44.5)	15.88	< 0.001	1.00 (reference)	
No	12 (23.5)	39 (76.5)			0.41 (0.19–0.86)	0.018
Round-trip water collection time						
< 10 minutes	114 (57.0)	86 (43.0)	13.96	< 0.001	1.00 (reference)	
10–30 minutes	26 (35.6)	47 (64.4)			0.48 (0.25–0.89)	0.020
Over 30 minutes	4 (25.0)	12 (75.0)			0.32 (0.09–1.00)	0.049
Water collection trips per day						
One trip	67 (59.8)	45 (40.2)	7.31	0.026	1.00 (reference)	
Two trips	27 (43.5)	35 (56.5)			0.71 (0.35–1.41)	0.324
Three or more trips	50 (43.5)	65 (56.5)			0.89 (0.48–1.64)	0.703

AOR, adjusted odds ratio; CI, confidence interval.

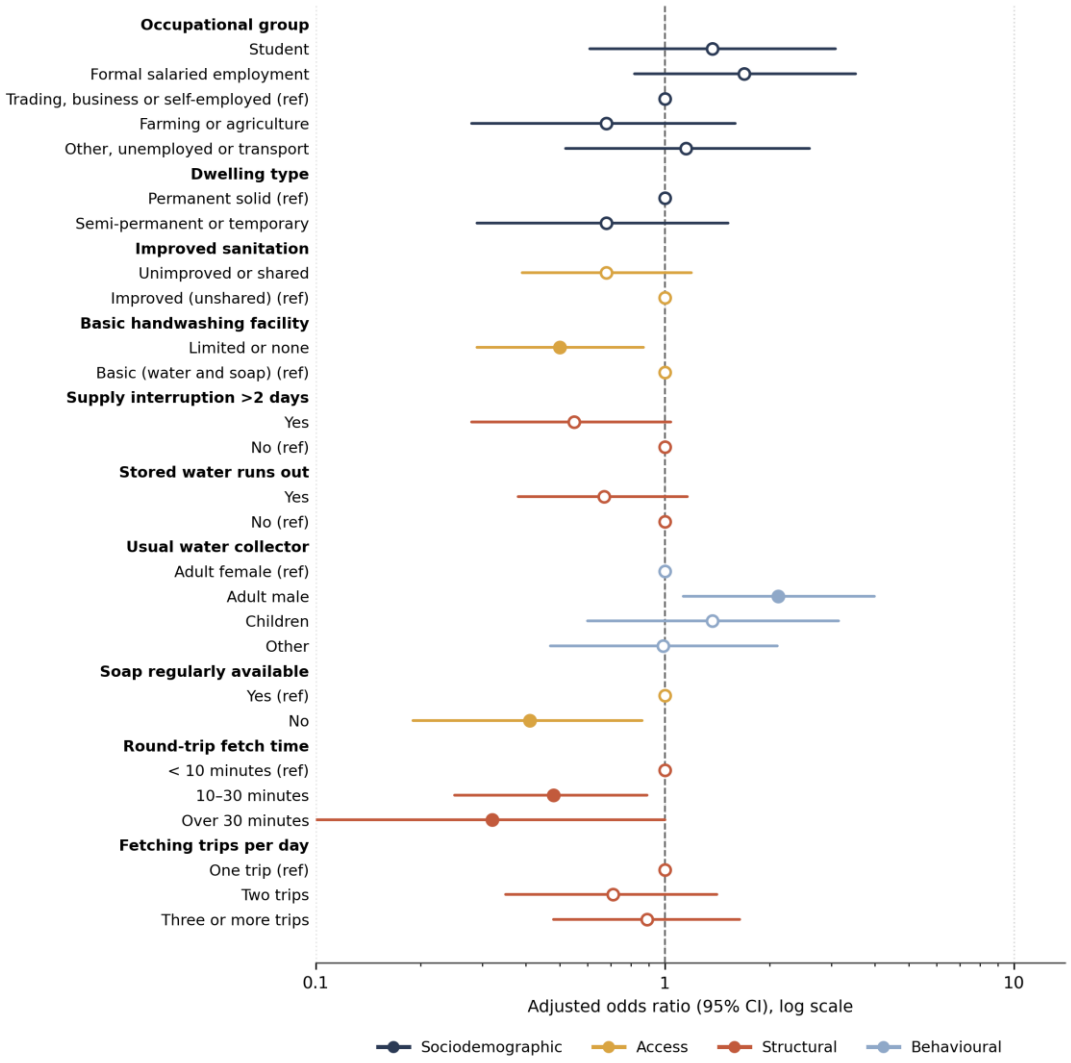


FIGURE 4: Adjusted odds of overall satisfaction with WASH services, by predictor class

DISCUSSION

The principal finding of this study was that availability of basic handwashing inputs was more consistently associated with hygiene practice and household satisfaction than respondent sociodemographic characteristics. Regular soap availability was independently associated with handwashing at all key times, consistent soap use and overall satisfaction, while absence of a basic handwashing facility was associated with lower odds of consistent soap use and satisfaction. This finding is consistent with a multi-country analysis of more than 36,000 households from 14 low- and middle-income countries, which found substantial discrepancies between reported handwashing behaviour and actual access to water and soap, highlighting the importance of assessing both hygiene practice and enabling infrastructure.[11]

More than three-quarters of households reported handwashing at all key times, although only about two-thirds reported always using soap. This proportion is higher than that reported in several sub-Saharan African studies. A pooled analysis of 18 countries found water available at only about half of observed handwashing stations, while more than two-thirds of households obtained water away from the home.[12] Similarly, an analysis of 29 sub-Saharan African countries found that almost three-quarters of households had limited handwashing facilities, with longer water-collection times associated with limited facilities.[13] The comparatively higher reported practice in this study may partly reflect differences in population and measurement, particularly reliance on self-reported rather than observed behaviour.

The gap between handwashing and consistent soap use is important. Regular soap availability was associated with approximately three-fold greater odds of handwashing at all key times and more than twice the odds of consistent soap use. Nigerian national studies has similarly demonstrated deficiencies in household access to water and soap.[14–16] The finding is therefore logical because

soap is a recurrent household consumable; households may understand the importance of handwashing but be unable to sustain soap use when supplies are unavailable or unaffordable.

Water availability was also associated with hygiene practice. More than three-fifths of households reported that stored water ran out before the next collection, and these households had lower odds of consistent soap use. Similar findings have been reported from southern Niger, where greater water availability was associated with the presence of water and soap at handwashing stations[17] , and from Ethiopia, where household water insecurity was negatively associated with maternal handwashing.[18] When water becomes scarce, households may prioritise drinking, cooking and other essential uses over handwashing, particularly where water must be manually collected.

Households with Basic WASH had better hygiene practices and satisfaction than those without Basic WASH. This agrees with sub-Saharan African evidence showing that inadequate combined WASH infrastructure is associated with limited handwashing facilities.[13,19,20] The present findings further suggest that the handwashing component itself may be particularly important, as the presence of a functional facility provides an immediate opportunity to wash hands at the point of need.

The frequency of water collection further demonstrates the practical burden of maintaining household water supplies. Almost two-fifths of households made three or more collection trips daily, while almost two-thirds exhausted stored water before the next collection. Similar studies from Enugu and several South-western Nigerian states indicate that off-premises water collection remains common and that many households spend substantial time obtaining water.[21,22] Repeated collection may reflect limited storage capacity, inadequate source yield or unreliable supply and increases the time and effort required to maintain adequate household water availability.

Satisfaction was independently associated with water-collection time. Households requiring more than 30 minutes had approximately one-third the odds of satisfaction compared with those requiring less than 10 minutes, while those requiring 10–30 minutes had about half the odds. This agrees with evidence identifying collection time as an important dimension of household water access.[23,24] Longer collection times impose physical and opportunity costs, particularly when collection is repeated several times daily.

An adult male being the usual water collector was associated with approximately twice the odds of satisfaction compared with an adult female collector, despite females being the more common collectors. This may reflect differences in the quantity collected, distance travelled, physical carrying capacity or household division of labour, although these factors were not directly measured.

Finally, households with three or more children under five years had approximately one-third the odds of handwashing at all key times. This may reflect increased caregiving and cleaning demands associated with multiple young children. The absence of an independent association with overall household size suggests that the finding may relate more specifically to caregiving demands than household size itself.

CONCLUSION

Household WASH experience in Okada was characterized by substantial water-collection burden, intermittent exhaustion of stored water and incomplete consistency in soap use despite relatively high reported handwashing at key times. Basic and washingfacilities, regular household soap availability and shorter water-collection times were independently associated with hygiene practices and household satisfaction. These findings indicate that household WASH adequacy

extends beyond nominal access to include the availability of essential inputs, reliability of water supply and the effort required to obtain water.

LIMITATIONS

1. The cross-sectional design precludes determination of temporal or causal relationships between WASH conditions, hygiene practices and household satisfaction.
2. Hygiene practices, water-collection behaviour and satisfaction were self-reported and may have been affected by recall or social-desirability bias.
3. The study was conducted in selected clusters within Okada and may not be generalisable to households in other communities or rural settings with different WASH conditions.

RECOMMENDATIONS

1. **Improve household access to reliable water and soap:** WASH interventions should prioritize reliable household water availability and consistent access to soap, particularly at handwashing stations.
2. **Reduce water-collection burden:** Local WASH planning should prioritise measures that shorten the distance and time required to obtain water, including improved proximity and reliability of household or community water points.
3. **Strengthen basic handwashing facilities:** Households should be supported to maintain functional handwashing facilities with both water and soap consistently available.

4. **Monitor user-centred WASH outcomes:** Routine WASH assessments should complement infrastructure-based indicators with measures of water-collection time, service reliability, hygiene practices and household satisfaction.

REFERENCES

1) World Health Organization. Water, sanitation and hygiene (WASH) [Internet]. Geneva: WHO; [cited 2026 Sep 24]. Available from: https://www.who.int/data/gho/data/themes/water-sanitation-and-hygiene
2) United Nations Statistics Division. SDG indicators: Goal 6 [Internet]. New York: United Nations; [cited 2026 Sep 24]. Available from: https://unstats.un.org/sdgs/report/2025/goal-06/
3) UNICEF. Fast facts: 1 in 4 people globally still lack access to safe drinking water – WHO, UNICEF [Internet]. New York: UNICEF; [cited 2026 Sep 24]. Available from: https://www.unicef.org/press-releases/fast-facts-1-4-people-globally-still-lack-access-safe-drinking-water
4) World Health Organization, United Nations Children's Fund. World Health Organization & United Nations Children's Fund (UNICEF); 2025.
5) World Health Organization. Diarrhoeal disease [Internet]. Geneva: WHO; [cited 2026 Sep 24]. Available from: https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease
6) Black RE, Perin J, Yeung D, Rajeev T, Miller J, Elwood SE, et al. Estimated global and regional causes of deaths from diarrhoea in children younger than 5 years during 2000–21: a systematic review and Bayesian multinomial analysis. Lancet Glob Health. 2024;12(6):e919–28. doi:10.1016/S2214-109X(24)00078-0. PMID: 38648812.
7) UNICEF. Diarrhoea [Internet]. New York: UNICEF; [cited 2026 Sep 24]. Available from: https://data.unicef.org/topic/child-health/diarrhoeal-disease/
8) WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene. Nigeria [Internet]. [cited 2026 Sep 24]. Available from: https://washdata.org/countries/nigeria
9) Alemayehu MA, Agimas MC, Shewaye DA, Derseh NM, Aragaw FM. Spatial distribution and determinants of limited access to improved drinking water service among households in Ethiopia based on the 2019 Ethiopian Mini Demographic and Health Survey: spatial and multilevel analyses. Front Water. 2023;5:1166733. doi:10.3389/frwa.2023.1166733.
10) WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene. Core questions [Internet]. [cited 2026 Sep 24]. Available from: https://washdata.org/topics/methods/core-questions
11) Moffa M, Cronk R, Fleming L, Tidwell JB. Measuring household hygiene access and handwashing behaviors: findings from 14 low- and middle-income countries. Int J Hyg Environ Health. 2021;237:113810. doi:10.1016/j.ijheh.2021.113810. PMID: 34311417.
12) Tamene A, Habte A, Tagesse M, Endale F, Melis T, Sewalem ZW, et al. Exploring associations between household environmental factors and handwashing with essential agents in sub-Saharan Africa. PLoS One. 2023;18(6):e0286735. doi:10.1371/journal.pone.0286735. PMID: 37384738.
13) Endalew M, Belay DG, Tsega NT, Aragaw FM, Gashaw M, Asratie MH. Limited handwashing facility and associated factors in sub-Saharan Africa: pooled prevalence and multilevel analysis of 29 sub-Saharan Africa countries from demographic health survey data. BMC Public Health. 2022;22(1). doi:10.1186/s12889-022-14390-4. PMID: 36303201.
14) Victor C, Kupoluyi JA, Oyinlola FF, Sule VO. Prevalence and factors associated with water, sanitation and hygiene (WASH) facilities deprivation among children in Nigeria. BMC Pediatr. 2025;25(1):102. doi:10.1186/s12887-025-05463-5. PMID: 39920645.
15) Abubakar A, Abdullahi M, Bello FM. Statistical analysis of household access to water, sanitation and hygiene (WASH) in North-Eastern Nigeria. J Systematic Modern Sci Res. 2026;10(9). doi:10.70382/BEJSMSR.V10I9.016.
16) Mobolaji JW, Akinwumiju AS. Geospatial assessment of household water, sanitation and hygiene conditions and associated factors in Nigeria: a causal relationship model. PLoS One. 2025;20(8):e0330167. doi:10.1371/journal.pone.0330167. PMID: 40811663.
17) Pinchoff J, Dougherty L, Dadi C. Water and handwashing in a drought-prone region of Southern Niger: how environment, household infrastructure, and exposure to social and behavior change messages interact. Am J Trop Med Hyg. 2023;108(3):536.
18) Aydamo AA, Gari SR, Mereta ST. The nexus between household water insecurity, mother's handwashing practices, and diarrheal diseases among under-five children. J Water Health. 2024;22(8):1357–71. doi:10.2166/wh.2024.026. PMID: 39212275.
19) Hlongwa N, Nkomo SL, Desai SA. Barriers to water, sanitation, and hygiene in sub-Saharan Africa: a mini review. J Water Sanit Hyg Dev. 2024;14(7):497–510. doi:10.2166/washdev.2024.266.

20) Tseole NP, Mindu T, Kalinda C, Chimbari MJ. Barriers and facilitators to water, sanitation and hygiene (WaSH) practices in Southern Africa: a scoping review. PLoS One. 2022;17(8):e0271726. doi:10.1371/journal.pone.0271726. PMID: 35917339.
21) Ezenwaka U, Onwujekwe O, Nwokolo C, de Siqueira Filha NT. Examining households' expenditure patterns on water, sanitation, and hygiene services in urban slums in Southeast Nigeria. Front Water. 2025;7:1632720. doi:10.3389/frwa.2025.1632720.
22) Oyerinde AO, Jacobs HE. Determinants of household water demand: a cross-sectional study in South West Nigeria. J Water Sanit Hyg Dev. 2022;12(2):200–7. doi:10.2166/washdev.2021.175.
23) Cassivi A, Dorea CC, Johnston R, Waygood EOD. Access to drinking water: time matters. J Water Health. 2018;16(4):661–6. doi:10.2166/wh.2018.009. PMID: 30067247.
24) Abubakar IR. Factors influencing household access to drinking water in Nigeria. Util Policy. 2019;58:40–51. doi:10.1016/j.jup.2019.03.005.