



Household Water Vending, Quality, Handling Practices, and Health Risk Perceptions among Households with Children Under Five in Owerri Municipal Council, Imo State, Nigeria

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Abstract

The study examined household water vending, quality, handling practices and health risk perceptions among households with children under five in Owerri Municipal Council, Imo State, Nigeria. Five research questions and hypothesis guided the study. The study adopted a descriptive cross-sectional design. The target population comprises households with one child under the age of five years residing within Owerri Municipal Council. Mothers served as key respondents. A multi-stage sampling procedure was used to select a sample size of 422 respondents. A structured interviewer-administered questionnaire titled (HWVQHPHRPQ) was used for data collection. Data were analysed using frequencies, percentages and means, and the hypothesis by chi-square and binary logistic regression at the 0.05 level. Result established that vending was dominated by hawkers, sachet-water producers, tanker suppliers and borehole kiosk operators, most unregistered (grand mean = 3.37). Reliance on vendors was driven by irregular public supply, decayed infrastructure and institutional failure rather than preference, with perceived safety ranked lowest (grand mean = 3.52). Respondents agreed that vendors store water under poor hygienic conditions (grand mean = 3.34), that vendor water contributes to diarrhoea, cholera and typhoid among children under five (grand mean = 3.50), and that water access is linked to their children's illness (grand mean = 3.19). Diarrhoea occurred in 38.0% of children without safe water against 20.9% of those with access, and the null hypothesis was rejected ($\chi^2 = 12.78$, $df = 1$, $p = 0.0004$; OR = 2.31, 95% C.I. = 1.45–3.68). The study concluded that dependence on vending reflects constrained choice, not ignorance, and recommended shifting oversight from registration to point-of-sale inspection.

Keywords: Informal water vending, Water quality, Handling practices, Health risk perception, Under-five children, Owerri Municipal.

Introduction

Water is life; yet for millions of children, it is also the commonest vehicle of death. Globally, about 2.2 billion people, roughly one in every four persons, still lacked safely managed drinking water services in 2022, with sub-Saharan Africa recording the lowest coverage of any region at 31 per cent (World Health Organization [WHO] & United Nations Children's Fund [UNICEF], 2023). Diarrhoeal disease is now the third leading cause of death among children aged 1–59 months, killing about 443,832 under-five children yearly from an illness that is both preventable and treatable (WHO, 2024; UNICEF, 2024), and unsafe water,



sanitation and hygiene alone account for some 395,000 of these deaths (WHO, 2023). Nigeria carries one of the heaviest shares of this burden: only 13 per cent of Nigerians use safely managed drinking water services, one in every ten households reported a case of diarrhoea in the preceding fortnight (National Bureau of Statistics [NBS] & UNICEF, 2021), and 15 per cent of children under five had diarrhoea in the two weeks before the 2023–24 Nigeria Demographic and Health Survey (National Population Commission [NPC], 2024).

Access to clean and safe water remains one of the most fundamental determinants of public health and human development. Unsafe drinking water, together with inadequate sanitation and poor hygiene, is a leading environmental risk factor for disease and death, disproportionately experienced in low- and middle-income countries (WHO, 2023; UNICEF, 2024). Diarrhoeal diseases, caused largely by ingesting water or food contaminated with faecal pathogens, remain a major contributor to child morbidity and mortality globally (WHO, 2024; Global Burden Disease [GBD] 2021 Diarrhoeal Diseases Collaborators, 2025), and a sizeable fraction of childhood diarrhoeal deaths attributable to unsafe water, sanitation and hygiene also contributes to childhood malnutrition, long-term developmental deficits, and health system burden in Nigeria (WHO, 2023).

Providing safe, continuous and equitably distributed water services is a long-standing challenge in Nigeria, with pronounced urban–rural and intra-urban inequalities (National Bureau of Statistics & United Nations Children’s Fund, 2021; National Population Commission & ICF, 2024). Access to safely managed drinking water in rural areas stands at only 6 per cent, against 27 per cent in urban areas, while the poorest households (2 per cent) are about seventeen times less likely than the richest (37 per cent) to enjoy such services (National Bureau of Statistics & United Nations Children’s Fund, 2021). Intermittent piped supply, poor maintenance of public water systems, and the proliferation of unregulated alternative sources (private boreholes, shallow wells, sachet water and water vendors) characterise many urban centres. These sources vary widely in quality: some boreholes provide acceptable microbial quality, while others are at risk of contamination from surface run-off, failing septic systems or nearby drainage channels, and sachet and bottled water, although often perceived as safe, are vulnerable to contamination during production, handling, distribution and storage, with faecal coliforms, *Escherichia coli*, *Salmonella typhi* and *Staphylococcus aureus* repeatedly isolated from vended products in Nigerian cities (Tenebe et al., 2023; Agbasi et al., 2024).

In Imo State, inadequate access to piped and treated water persists across urban and rural settings. The South East geopolitical zone has one of the lowest levels of access to complete basic water, sanitation and hygiene services in the country, at about 9 per cent, even though 73 per cent of its population uses at least a basic drinking water service (National Bureau of Statistics & United Nations Children’s Fund, 2021). Many urban centres, including Owerri Municipal, face infrastructural decay, intermittent supply, and dependence on unsafe or unregulated sources such as shallow wells, private boreholes, sachet water producers and street vendors, and these challenges are exacerbated by poor sanitation and hygiene practices that increase the risk of diarrhoeal diseases among children.

Owerri Municipal Council, an urban area with high population density, has witnessed rapid urbanisation and infrastructural strain, leading to declining quality and reliability of water services. Children under five, due to their immature immunity and frequent exposure to contaminated environments, are particularly vulnerable to diarrhoeal diseases caused by waterborne pathogens such as *Escherichia coli*, *Vibrio cholerae*, and *Giardia lamblia* (Oloruntoba et al., 2018). Urban settlement patterns; high-density housing, inadequate drainage and poor waste disposal further exacerbate contamination risks for groundwater and surface water supplies (Tenebe et al., 2023; Azubuike et al., 2025). At the household level, the safety of drinking water is shaped not only by source quality but by collection, transport



and storage practices, such as unclean containers, hand contact at point-of-use, and failure to treat by boiling or disinfection (Nwaka et al., 2017).

Despite the presence of public water schemes and private borehole systems in Owerri Municipal, many households continue to rely on unsafe and unregulated water sources due to unreliable supply and poor infrastructure maintenance, leading to widespread dependence on surface water, sachet water and vendor-supplied water whose quality is often questionable. Consequently, diarrhoeal diseases remain common among under-five children across the municipality's neighbourhoods. Against this backdrop, This study provides household-level evidence on informal water vending in Owerri Municipal, showing what is sold, how it is handled and how it relates to diarrhoea among children under five. Its findings would guide regulators, health workers and mothers on where to act, and support Sustainable Development Goals 6 and 3. Therefore, this study examined household water vending, quality, handling practices, and health risk perceptions among households with children under five in Owerri Municipal Council, Imo State, Nigeria. Specifically, the study determined the types of informal water vending activities that exist in Owerri Municipal, the factors responsible for the reliance on informal water vendors among residents of Owerri Municipal, the quality of water supplied by informal vendors in Owerri Municipal, the perceived health risks associated with the consumption of vendor-supplied water among households, and association between access to safe water and the occurrence of diarrhoeal diseases.

Methods

Study design and setting

A descriptive cross-sectional research design was used for the study. The design is appropriate for examining the association between household access to safe water and prevalence of diarrhoeal disease at a specific point in time.

The study was conducted in Owerri Municipal Council, Imo State, Nigeria. Owerri Municipal is an urban centre characterised by population density, mixed-income household, and variable access to public utility such as pipe-borne water, sanitation and waste disposal. The Council was purposively chosen because it is the most densely populated and most rapidly urbanising LGA in Imo State, the condition under which informal water markets thrive. Piped supply from the Imo State Water and Sewerage Corporation is intermittent and covers only part of the built-up area, so households depend heavily on commercial boreholes, tanker vendors, cart-pushers and sachet water hawkers, a reliance that remains largely unregulated.

Study population

The target population comprised all households with at least one child under five in Owerri Municipal Council, estimated at 24,000, derived by projecting the 2006 census population (National Population Commission, 2024). The respondent was the mother of the index child (the youngest child under five), as women are primarily responsible for water purchase, collection and storage in the study area. Households resident in one of the Council's eleven wards for at least twelve months, with a child aged 0–59 months, drawing all their water from sources other than continuously functional piped connection were included. While households without a child under five; those in temporary accommodation; mothers too ill to respond; those declining consent; households headed by water vendors or sachet producers, whose risk perceptions would be atypical; and households not met after three visits were excluded.



Sample size and sampling technique

A sample size of 422 mothers was drawn from the population which constituted of 24,000 households within Owerri Municipal. A multi-stage sampling procedure was used. Stage One: the Council's eleven wards were stratified by residential density. Stage Two: from a frame of 94 residential enumeration areas (EAs), three were drawn per ward by simple random sampling, giving eighteen EAs. Stage Three: a listing of the eighteen EAs enumerated 12,660 households with at least one child under five, and the 422 households were allocated to wards proportionately, which formed the sample size.

Data collection instrument

Data were collected using a structured, interviewer-administered questionnaire titled the "Household Water Vending, Quality, Handling Practices and Health Risk Perceptions Questionnaire (HWVQHPRPQ)" consisting of six sections. The instrument was subjected to face and content validity by three lecturers in Public Health and Health Education. Their observations, corrections and recommendations were incorporated into the final version of the questionnaire. A pilot study was conducted among 20 residents outside the study area, Internal constituency of the instrument was determined using Cronbach's Alpha reliability which yield a coefficient of 0.76.

Data collection procedure

Ethical approval was obtained from Imo State Ministry of Health (reference IMSMH/HREC/2025/0187), and written permission from the Owerri Municipal Council authority and the ward chairmen of the six selected wards. Four research assistants, all Health Education graduates, were trained for two days. Before each interview, the purpose and procedures were explained in English or Igbo. Respondents were informed that participation was voluntary and without incentive; written informed consent was obtained by signature or thumbprint. Privacy and confidentiality were maintained through private interviews, serial codes, secure storage, and aggregate reporting of data. Data collection lasted eight weeks, from 5 May to 27 June 2025, during which the questionnaires were administered to respondents in their homes and retrieved immediately. Of the 422 copies administered, 413 (97.9 per cent) were retrieved; eight were discarded on editing, leaving 405 valid copies (96.0 per cent) for analysis.

Data analysis

Collected data were analysed using descriptive statistics (frequencies, means, percentages) which summarized the respondents' characteristics and water access patterns, chi-square assessed association between access to safe water and diarrhoeal occurrence. Binary logistic regression determined the strength of association. Statistical significance was set at $p \leq 0.05$.

Results

Of the 422 questionnaires administered, 405 were valid for analysis; these 405 respondents form the basis of the results presented below. Table 1 presents their demographic characteristics.



Table 1: Demographic Characteristics of Respondents (n = 405)

Demographic Variable	Frequency (n = 405)	Percentage (%)
Highest level of education		
None	36	8.9
Primary	89	22.0
Secondary	168	41.5
Tertiary	112	27.7
Monthly household income (₦)		
Below 50,000	118	29.1
50,000–99,999	143	35.3
100,000–199,999	97	24.0
200,000 and above	47	11.6
Total	405	100.0

Table 1 shows that most respondents had secondary education as their highest qualification (41.5%), followed by tertiary (27.7%), primary (22.0%) and no formal education (8.9%). The largest income group earned ₦50,000–₦99,999 monthly (35.3%), followed by below ₦50,000 (29.1%), ₦100,000–₦199,999 (24.0%) and ₦200,000 and above (11.6%).

Table 2: Responses on the Types of Water Vending Activities in Owerri Municipal

S/N	Items	SA (%)	A (%)	D (%)	SD (%)	Mean	Decision
1	Sachet water production and sale is common in Owerri Municipal.	60	30	7	3	3.37	Agree
2	Borehole kiosk sales are widespread in the municipality.	58	29	8	5	3.35	Agree
3	Tanker/truck water supply is a major source during shortages.	55	34	7	4	3.36	Agree
4	Street hawking of packaged water is prevalent in markets.	68	25	4	3	3.57	Agree
5	Most vendors operate without registration or licensing.	53	34	9	4	3.34	Agree
6	Vendors rarely disinfect or treat water before sale.	49	36	11	5	3.23	Agree

Grand Mean = 3.37 (Agree)

Table 2 shows that all six items exceeded the 2.50 criterion, with a grand mean of 3.37. Street hawking of packaged water was rated highest ($\bar{x} = 3.57$), followed by sachet water production ($\bar{x} = 3.37$), tanker supply ($\bar{x} = 3.36$) and borehole kiosk sales ($\bar{x} = 3.35$). Respondents also affirmed that most vendors operate without registration ($\bar{x} = 3.34$) and rarely treat water before sale ($\bar{x} = 3.23$). Water vending in Owerri Municipal is therefore a diversified and well-established trade, but one that expands faster than the regulatory machinery meant to supervise it.



Table 3: Respondents' Views on Factors Influencing Reliance on Informal Vendors in Owerri Municipal

S/N	Items	SA (%)	A (%)	D (%)	SD (%)	Mean	Decision
1	Irregular municipal water supply drives reliance on vendors.	74	21	3	2	3.67	Strongly Agree
2	Vendor water is readily available and convenient.	62	31	5	2	3.51	Strongly Agree
3	Residents perceive borehole water as safer than tap water.	56	29	11	4	3.30	Agree
4	Vendor water is affordable compared to drilling boreholes.	65	26	7	2	3.45	Agree
5	Government water agencies' failure to provide regular supply increases water demand from vendors.	70	26	3	2	3.60	Strongly Agree
6	Poor maintenance of public infrastructure makes households rely on vendors.	70	23	5	2	3.61	Strongly Agree

Grand Mean = 3.52 (Agree)

Table 3 indicates strong agreement on the drivers of vendor dependence (grand mean = 3.52). Irregular municipal supply ranked highest ($\bar{x} = 3.67$), followed by poor maintenance of public infrastructure ($\bar{x} = 3.61$) and failure of government water agencies ($\bar{x} = 3.60$), while convenience ($\bar{x} = 3.51$), affordability ($\bar{x} = 3.45$) and perceived safety of borehole water ($\bar{x} = 3.30$) rated lower. The highest-rated drivers are all supply-side failures, showing that reliance on vendors reflects constrained choice rather than consumer preference; a coping adaptation to chronic water insecurity.

Table 4: Perceived Quality and Handling Practices Evaluated among Respondents

S/N	Items	SA (%)	A (%)	D (%)	SD (%)	Mean	Decision
1	Quality of vendor water is inconsistent in their suppliers.	60	30	7	3	3.40	Agree
2	Most vendor water shows odour, colour, or taste issues.	55	29	9	5	3.27	Agree
3	Vendor containers and tanks are not always clean.	63	25	7	5	3.43	Agree
4	Water sources are sometimes located near waste or septic areas.	45	31	15	8	3.15	Agree
5	Sachet water is often exposed to sunlight or heat during storage.	58	29	7	5	3.33	Agree
6	Vendor water can transmit diarrhoeal diseases.	64	26	6	4	3.45	Agree

Grand Mean = 3.34 (Agree)



Table 4 reveals general agreement that quality and handling standards are unsatisfactory (grand mean = 3.34). Respondents agreed that vendor containers are not always clean ($\bar{x}$ = 3.43), that quality is inconsistent across suppliers ($\bar{x}$ = 3.40), that sachet water is exposed to sunlight or heat during storage ($\bar{x}$ = 3.33), and that odour, colour or taste problems occur ($\bar{x}$ = 3.27). The siting of sources near waste or septic areas was rated lowest ($\bar{x}$ = 3.15). Together these items describe a contamination pathway from source to point of sale, indicating that neither bacteriological nor physicochemical safety can be assumed across informal suppliers.

Table 5: Relationship between Access to Safe Water and the Occurrence of Diarrhoeal Diseases

S/N	Item statement	SA (%)	A (%)	D (%)	SD (%)	$\bar{x}$	Decision
1.	Children in households without access to safe water suffer diarrhoea more often than those with access.	50.7	36.0	9.0	4.3	3.33	Agree
2.	Episodes of diarrhoea in this household reduce whenever clean water is available.	46.9	37.9	10.4	4.7	3.27	Agree
3.	Households that treat their drinking water record fewer cases of diarrhoea among children under five.	44.1	38.9	11.8	5.2	3.22	Agree
4.	The distance travelled to a safe water source affects how often children in the household fall sick with diarrhoea.	35.5	39.8	17.1	7.6	3.03	Agree
5.	Drinking vendor-supplied water without treatment has caused diarrhoea in my child under five.	39.8	37.4	15.2	7.6	3.09	Agree
Grand mean						3.19	Agree

Table 5 shows that all five items exceeded the 2.50 criterion (grand mean = 3.19), indicating that respondents recognise a link between water access and diarrhoea in their children. Agreement was strongest that children without safe water suffer diarrhoea more often ($\bar{x}$ = 3.33, 86.7%), followed by episodes reducing when clean water is available ($\bar{x}$ = 3.27) and treatment lowering cases ($\bar{x}$ = 3.22). Notably, 77.3% attributed at least one episode in their own child to untreated vendor water ($\bar{x}$ = 3.09). Distance to a safe source rated lowest ($\bar{x}$ = 3.03), households connecting illness to water quality rather than to the effort of fetching it.

Table 6: Chi-Square Test of Association between Access to Safe Water and the Occurrence of Diarrhoea in Children Under Five

Access to safe water	Diarrhoea occurred n (%)	No diarrhoea n (%)	Total	χ^2	df	p-value	Decision
Has access	31 (20.9)	117 (79.1)	148	12.78	1	0.004	H_0 rejected
No access	104 (38.0)	170 (62.0)	274				
Total	135 (32.0)	287 (68.0)	422				

Table 6 shows that 31 (20.9%) of the 148 children in households with access to safe water had experienced diarrhoea in the two weeks preceding the survey, compared with 104 (38.0%)



of the 274 children without access. The chi-square test returned $\chi^2 = 12.78$, $df = 1$, $p = 0.004$. Since the calculated value exceeds the critical value of 3.84 and $p < 0.05$, a significant association exists between access to safe water and the occurrence of diarrhoeal disease. The null hypothesis was therefore rejected.

Table 7: Binary Logistic Regression of the Occurrence of Diarrhoea in Children Under Five on Access to Safe Water

Predictor	B	S.E.	Wald	df	p-value	Exp(B) (OR)	95% for Exp(B) C.I.
No access to safe water	0.837	0.237	12.44	1	0.004	2.31	1.45 – 3.68
Constant	- 1.328	0.202	43.23	1	0.000	0.27	—

Nagelkerke $R^2 = 0.043$

Table 7 measures the strength of that association. The model was significant (model $\chi^2 = 13.31$, $df = 1$, $p < 0.001$), and lack of access to safe water significantly predicted diarrhoea ($B = 0.837$, $Wald = 12.44$, $df = 1$, $p = 0.004$). The odds ratio of 2.31 (95% C.I. = 1.45 – 3.68) indicates that children in households without access were about 2.3 times as likely to have suffered an episode as those with access, the interval excluding 1.00. However, the Nagelkerke R^2 of 0.043 shows that water access accounts for only about 4.3% of the variation, making it one contributor among several rather than the sole determinant.

Discussion

Table 1 shows that most respondents completed secondary (41.5%, $n = 168$) or tertiary education (27.7%, $n = 112$), while 22.0% ($n = 89$) attained primary education and 8.9% ($n = 36$) had no formal schooling ($n = 405$). Regarding income, 64.4% earned under ₦100,000 monthly, comprising ₦50,000–₦99,999 (35.3%, $n = 143$) and below ₦50,000 (29.1%, $n = 118$), with fewer earning ₦100,000–₦199,999 (24.0%, $n = 97$) or ₦200,000 and above (11.6%, $n = 47$). This distribution highlights high functional literacy (69.2% secondary or higher) alongside substantial economic vulnerability. While baseline education explains respondents' strong awareness of waterborne contamination risks, low income restricts their practical options. Prohibitive borehole drilling costs reinforce reliance on informal vendors, while high energy tariffs limit household water treatment, such as boiling. Thus, vendor dependence and the consumption of untreated water reflect structural economic constraints rather than a lack of health literacy.

Table 2 reveals that informal water vending operates predominantly through four channels: street hawking, sachet production, tanker delivery, and borehole kiosks. Most operators remain unregistered and rarely treat water before distribution. These lower-rated compliance indicators underscore a structural dilemma: informal vendors fill the service vacuum left by the public utility, operating with limited capital, minimal technical training, and negligible regulatory oversight. This aligns with Chumo et al. (2025), who documented comparable tiers of wholesale, distributing, and direct vending in Nairobi. Furthermore, Nnaji and Nnaji (2024) highlighted that while all sachet brands surveyed in Ishiagu displayed valid NAFDAC numbers, none included batch numbers or expiry dates, demonstrating that regulatory weakness lies in post-registration monitoring as much as initial licensing. Hydrogeologically, Owerri's position on the porous ground water formation provides cheap access to shallow



groundwater, enabling borehole proliferation that would be unviable in surface-water-dependent cities. Regulation must therefore be channel-specific differentiating fixed kiosks from mobile hawkers and prioritize point-of-sale inspections over nominal registration.

Table 3 indicates that household reliance on vendors is driven primarily by public utility failures: irregular municipal supply, collapsed infrastructure, and institutional governance breakdowns. In contrast, convenience, affordability, and perceived safety received lower ratings. The low score for perceived safety proves that patronage is a forced coping strategy rather than a preference; consumers buy from vendors despite substantial health concerns. This reflects the findings of Orji et al. (2024), who observed that 59.6% of households in neighboring Owerri West lacked potable public supply. The affordability result contrasts with Chumo et al. (2025), who noted that unregulated vendors often overcharge; however, this divergence is resolved by recognizing that respondents compared vendor purchases to the prohibitive capital cost of drilling private boreholes rather than subsidized utility bills. Because dependence is driven by municipal infrastructure collapse rather than consumer behaviour, public interventions must prioritize infrastructure rehabilitation while making existing vended supplies safer in the interim.

Table 4 revealed a continuous contamination pathway across the supply chain: unhygienic vendor containers, inter-supplier quality variation, heat and sunlight exposure during storage, organoleptic defects, and borehole proximity to septic soakaways or dumpsites. Notably, respondents ranked visible handling flaws higher than subterranean hazards, even though underground contamination poses the greater epidemiological risk. Azubuike et al. (2025) confirmed this vulnerability in Owerri Municipal, recording total coliform counts of 15–105 CFU/100 mL across all sampled boreholes (breaching the WHO 0 CFU/100 mL standard) due to septic seepage through permeable soils. Similarly, Aydamo et al. (2024) demonstrated that unhygienic, wide-mouthed storage vessels serve as independent predictors of childhood diarrhoea. Owerri's sandy soil, shallow aquifers, and adjacent soakaways facilitate rapid pathogen migration, while ambient temperatures of 27–34°C accelerate bacterial growth in sun-exposed sachets. While this table captures perceived rather than laboratory-measured quality, the findings match empirical literature, demonstrating the urgent need for enforced borehole-septic setback distances and routine point-of-sale microbiological screening.

Table 5 illustrates high public awareness of waterborne health risks, including diarrhoea, cholera, and typhoid, heightened child vulnerability, and disease transmission via poor vendor hygiene. Conversely, household treatment practices were rated low, alongside community risk awareness. This highlights a severe "knowledge–practice gap": consumers recognize the health risks but rarely treat water at home. This is an economic constraint rather than negligence, as the high cost of boiling fuels (gas, kerosene, and charcoal) creates an insurmountable financial barrier for low-income households. Nationally, Bashar et al. (2026) documented recurrent cholera outbreaks from 111,062 cases and 3,604 deaths in 2021 to 22,102 cases and 500 deaths in 2025, with children under five most affected. In Enugu, Onodugo et al. (2025) found that 39% of sachet samples exceeded coliform limits, 55.4% of consumers suffered gastrointestinal symptoms, and street-vended water doubled the odds of illness. Because information alone cannot overcome poverty, interventions must combine targeted subsidies for point-of-use treatment with strict vendor enforcement, prioritizing households with young children.

Table 6 shows strong community recognition of the link between water insecurity and pediatric illness, with respondents agreeing that children lacking safe water experience more frequent diarrhoea and 77.3% attributing specific child illnesses to untreated vendor water. Table 6 confirms this relationship statistically: the two-week diarrhoea prevalence was 38.0%



among children in households lacking safe water access, compared to 20.9% among those with access.

Table 7 quantifies this risk at an odds ratio of 2.31. While substantial, water access accounts for only 4.3% of the variance, underscoring that diarrhea etiology is multifactorial. This is corroborated by Aydamo et al. (2024), who identified water insecurity, uncovered storage, and poor hand hygiene as concurrent, independent risk factors. Furthermore, because Owerri's public network has collapsed, households with nominal "access" often rely on private boreholes shown by Azubuike et al. (2025) to be contaminated, meaning the baseline group was partially exposed and the true risk may be underestimated. Consequently, providing safe water is essential but must be integrated with safe storage, handwashing, and sanitary faecal disposal to effectively curb paediatric diarrhoea.

Conclusion

The findings collectively demonstrated that Owerri's water insecurity is a structural, not behavioural, crisis. Despite high functional literacy and strong awareness of waterborne disease risks, low household incomes and collapsed municipal infrastructure compel residents into dependence on an informal vending sector that operates largely without registration, treatment, or regulatory oversight. This dependence sustains a continuous contamination pathway; from shallow boreholes sited near septic soakaways to sun-exposed sachets and unhygienic storage vessels; that translates into measurable health consequences, with children in water-insecure households more than twice as likely to suffer diarrhoea. Since the knowledge–practice gap is rooted in poverty rather than ignorance, awareness campaigns alone will not suffice. Effective intervention must therefore pair long-term municipal infrastructure rehabilitation with immediate, channel-specific vendor regulation, enforced borehole setback distances, and subsidised point-of-use treatment, all integrated within a broader WASH framework targeting the most vulnerable households.

Recommendations

Based on the findings, the following recommendations are proposed:

1. Imo State Water Corporation should rehabilitate municipal water infrastructure for all urban households to eliminate forced dependence on unregulated vendors.
2. NAFDAC and the State Ministry of Health should enforce channel-specific vendor licensing and routine point-of-sale microbiological screening for informal water operators to close the post-registration compliance gap.
3. Imo State Environmental Protection Agency should mandate and enforce borehole–septic setback distances for private borehole owners and vendors to curb subsurface faecal contamination in Owerri's porous aquifer.
4. National Primary Health Care Development Agency and UNICEF should subsidise point-of-use water treatment (e.g., chlorine tablets, ceramic filters) for low-income households with children under five to bridge the poverty-driven knowledge–practice gap and reduce paediatric diarrhoea.
5. Local Government Health Departments should integrate safe water storage, handwashing, and sanitary faecal disposal into community health outreach for all water-insecure households to address the multifactorial etiology of diarrhoea within a comprehensive WASH framework.



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