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Assessment of Water, Sanitation, and Hygiene (WASH) practices in Onitsha Urban Area of Anambra state, Nigeria

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Abstract

Water, Sanitation, and Hygiene (WASH) are essential components of public health, particularly in urban areas facing rapid population growth and infrastructural challenges. Inadequate WASH services contribute significantly to the burden of disease, environmental degradation, and overall poor quality of life. The study adopted a mixed-method research design to assess integrated Water, Sanitation, and Hygiene (WASH) practices in Onitsha Urban Area, Anambra State, Nigeria. Onitsha, a major commercial hub, experiences rapid urbanization and infrastructural strain. The study area's geography, population growth, climate, geology, and economic activities were considered in evaluating WASH services. A sample of 400 residents from Federal Housing Estate was selected using Taro Yamane's formula. Data were collected via structured questionnaires and field inspections, with instrument reliability confirmed through a pilot study. Analysis involved two-way ANOVA and Principal Component Analysis to identify key factors contributing to poor WASH conditions. Based on the findings, the demographic analysis of (400) respondents showed age distribution as follows: (17%) were 18–28, (28%) aged 29–39, (36%) aged 40–50, and (19%) above 50. Educationally, (8%) had no formal education, (20%) completed primary, (48%) had secondary, and (24%) attained tertiary education. Ethnic composition was largely Igbo at (90.15%), followed by Hausa (3%), Yoruba (1.85%), and others (5%). Household sizes showed (38%) had 1–3 children, (42%) had 4–6, (16%) had 7–9, and (4%) had more than 9. WASH practices revealed strong agreement on clean water prioritization, handwashing, and sanitation, while disagreements emerged on issues like pipe expansion and sustainable water systems. The study highlights the need for integrated policy action, community sensitization, and investment in WASH infrastructure to improve public health outcomes in Onitsha.

Keywords: water supply; sanitation; hygiene practices; public health; urban households; Onitsha

Introduction

Water, Sanitation, and Hygiene (WASH) remain foundational to health and well-being, particularly in urban areas where high population density often overwhelms existing infrastructure. In many developing countries, rapid urbanization has created a mismatch between population growth and the provision of basic WASH services, leading to increased vulnerability to waterborne diseases, poor sanitation, and unhygienic practices (Adjorlolo et al., 2023). The primary issue with WASH in urban areas stems from inadequate infrastructure and poor service delivery, compounded by high urbanization rates and poverty. Despite the recognition of WASH as a human right and its inclusion in the Sustainable Development Goals (SDG 6), access to clean water and improved sanitation remains unevenly distributed in many urban regions (Armah et al., 2018; Deshpande et al., 2020). The situation is particularly severe in informal settlements or slums where municipal services are often absent or unreliable. Households in these areas typically rely on unsafe water sources, share sanitation facilities, or resort to open defecation, which increases the risk of disease transmission and environmental contamination (Emejuru & Oleribe, 2022). In addition to sanitation and hygiene concerns, water access and reliability present another major challenge in urban settings.

Urban areas in developing countries frequently struggle with limited access to potable water due to aging infrastructure, over-extraction of water sources, and poor governance. According to Ezenwaji and Onwuadiochi (2019), many urban households in Nigeria experience irregular water supply, forcing residents to depend on alternative sources such as boreholes, sachet water, or rivers, which are often contaminated. The reliability and safety of water supply remain central to urban health, especially in cities like Onitsha, where industrial activity and waste disposal into water bodies exacerbate the risk of contamination (Aruf et al., 2024). In contrast, studies in more developed urban areas report higher access to piped water and better water quality monitoring (Ezenwaji et al., 2014; Odey et al., 2018). However, even in cities with advanced infrastructure, disparities persist along socioeconomic lines, with low-income neighborhoods frequently receiving substandard services or being excluded altogether from municipal water systems.

Sanitation in urban areas is another critical challenge. The lack of improved toilet facilities, poor waste management, and inadequate sewage systems contribute to environmental pollution and public health risks. According to Chukwu (2017) and Ezenwaji and Onwuadiochi (2019), many urban dwellers in Nigeria rely on pit latrines or public toilets, which are often overcrowded, poorly maintained, or non-functional. The sharing of toilets among multiple households can increase the risk of fecal contamination and the spread of diseases such as cholera, typhoid, and hepatitis A. In a related study, Anthonj et al. (2020) observed that inadequate sanitation in urban Accra, Ghana, was linked to frequent outbreaks of diarrheal diseases, particularly among children under five. This finding agrees with global reports that indicate poor sanitation as a major contributor to child mortality in urban slums (Armah et al., 2018; Deshpande et al., 2020). In contrast, a study conducted in urban Kenya found that public-private partnerships in sanitation service delivery improved access to clean toilets and waste disposal systems, demonstrating that strategic collaboration can enhance WASH outcomes (Ihua et al., 2024). Closely related to sanitation is hygiene, which remains an equally important yet often overlooked component of WASH.

Hygiene behaviors such as handwashing with soap, safe food handling, and personal cleanliness are crucial for disease prevention, yet these practices are often overlooked in urban WASH discussions. Studies have shown that hygiene practices are closely linked to education and awareness. For instance, Anthonj et al. (2020) reported that residents with higher educational attainment were more likely to observe good hygiene behaviors, including regular handwashing after toilet use and before meals. In contrast, households with lower income and limited education were less consistent in adopting hygienic practices due to a lack of awareness and inadequate access to soap or handwashing facilities. The need for the present study arises from the growing concern over deteriorating public health conditions, environmental degradation, and infrastructural inadequacies driven by rapid urbanization. Onitsha, a major commercial city in Anambra State, faces persistent WASH challenges such as limited access to safe drinking water, poor sanitation infrastructure, and unhygienic practices among residents. According to Eneh (2021), urban slums in Nigeria often lack access to improved WASH services, increasing the risk of disease outbreaks such as cholera and typhoid. Although national reports provide data on WASH at the macro level, there is limited empirical evidence specific to Onitsha that captures community-level practices, attitudes, and infrastructure gaps.

Furthermore, WHO and UNICEF highlight that many Nigerian cities fall short of meeting SDG 6 targets, particularly in informal settlements where service delivery is poor. Despite these challenges, few studies have comprehensively assessed WASH practices in Onitsha to inform targeted policy and intervention. This study addresses that gap by evaluating water access, sanitation conditions, and hygiene behaviors to generate data that can guide urban planning, improve public health, and promote sustainable WASH practices within the city.

Method

This study employed a mixed-method research design, combining statistical analysis with qualitative descriptions to assess the extent of Water, Sanitation, and Hygiene (WASH) practices within the study area. The research was conducted in Onitsha Urban Area of Anambra State, Nigeria. As shown in Figure 1, Onitsha Urban is located on the eastern bank of the Niger River and spans parts of Onitsha North and South Local Government Areas (LGAs) as well as neighboring communities. The city is a densely populated commercial and transport hub that connects southeastern and western Nigeria through the Niger Bridge. Covering about 200 square kilometers at an altitude of 300 meters, it includes prominent residential areas such as GRA and Inland Town, with major roads linking to transport hubs like Upper Iweka.

Onitsha Urban Area comprises several key districts, each contributing uniquely to the city's character, as further illustrated in Figure 2. GRA is a well-planned, affluent residential area with modern infrastructure. Inland Town serves as a commercial and cultural hub. Otu is historically significant for trade due to its strategic location by the Niger River. Districts like 3-3, Trans Nkisi Layout, Omagba I and II, Woliwo Layout, and Odoakpu add diverse cultural, residential, and urban dynamics. Onitsha is bounded by Nsugbe (north), Nkpor (east), Ogbaru (south), and the Niger River (west).

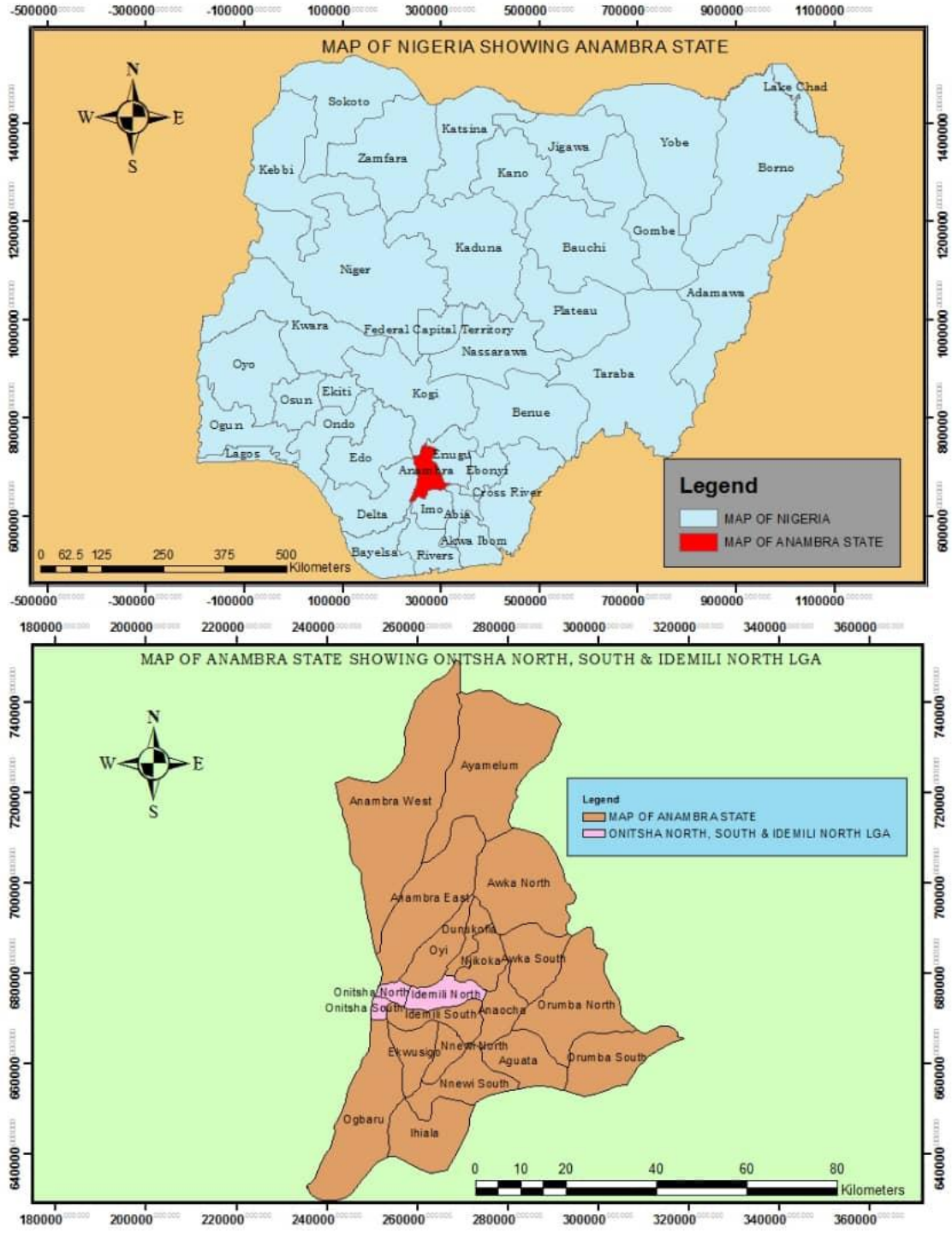

Figure 1. Map of Anambra State Showing Location of Onitsha Urban Within Its Axis

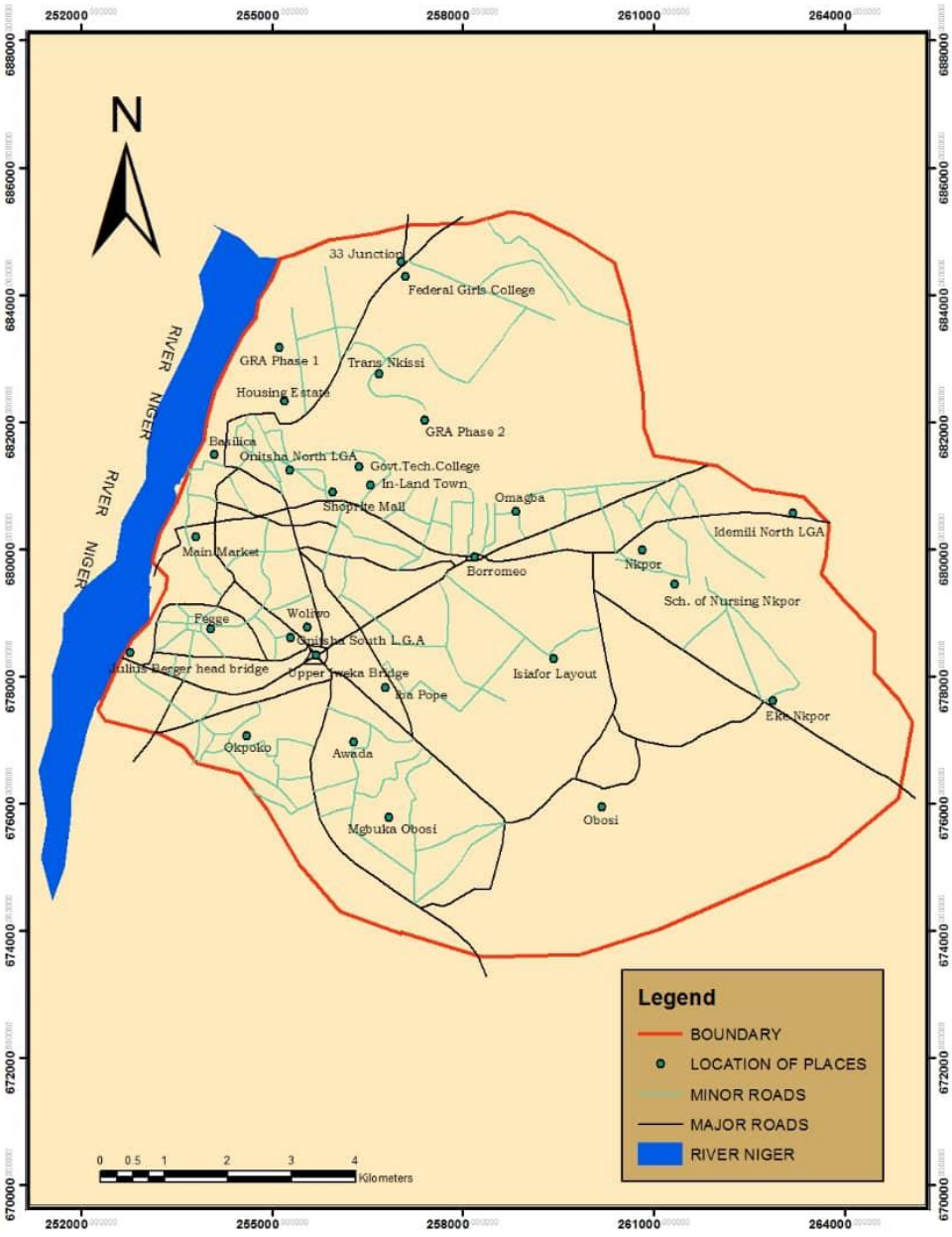

Figure 2. Map of Onitsha Urban Showing Residential Layouts and Towns

Onitsha Urban Area has a tropical wet and dry climate (Köppen–Geiger AW) with annual temperatures ranging from 20°C to 32°C. The wet season lasts from March to November, while the dry season runs from November to March. Average rainfall is about 1,800–2,000 mm per year, and Harmattan winds create dry, dusty conditions in December and January. Humidity levels often reach 90%, making the climate hot and sticky. The city lies within the Niger Basin on gently undulating terrain at 30 to 60 meters above sea level. It is drained by the Niger River and tributaries such as the Anambra, Nkisi, and Idemili. Geologically, Onitsha belongs to the Niger–Benin sedimentary trough, composed mainly of sedimentary rocks and Quaternary alluvium that support fertile soils for agriculture.

The city has experienced rapid population growth, from 135,290 in 1991 to 263,109 in 2006, and is estimated to have reached 796,592 in 2023. This expansion reflects growing urbanization and rising demand on resources and infrastructure. Water resources come mainly from the middle

aquifer of the Ameki group, although over-extraction has led to localized sinkholes. The Niger River, together with tributaries such as the Nkisi, Idemili, and Anambra, supports agriculture, transport, and ecosystems. Soils vary from coastal sands to nutrient-rich alluvium and poorly drained hydromorphic soils. Originally dominated by tropical savanna grassland, urbanization has replaced much of the natural vegetation, leaving only riparian vegetation along rivers and scattered forest patches.

Onitsha's location on the Niger River has established it as a critical commercial hub linking southeastern and western Nigeria through the Niger Bridge. It is home to one of West Africa's largest markets, where billions of naira are exchanged daily. Industrial investments and improvements in inland waterways have supported growth, yet rapid expansion has strained infrastructure, resulting in congestion, pollution, and social challenges. Despite its economic vibrancy, the city continues to struggle with WASH services. Access to safe water is limited, sanitation facilities are inadequate, and waste management systems are inconsistent, creating high risks of disease outbreaks.

To assess WASH practices, this study sampled 400 residents from Onitsha's Federal Housing Estate using the Taro Yamane formula to ensure representativeness from a population of 796,592 at a 0.05 significance level. Data were collected through structured questionnaires administered by seven trained assistants, supported by household inspections to validate responses. The questionnaire was pilot-tested in Ngozika Housing Estate, Awka, to ensure reliability. Data collection used direct delivery and retrieval, with assistants trained beforehand to guarantee consistency. For analysis, Two-Way ANOVA was applied to examine relationships, while Principal Component Analysis (PCA) reduced data complexity and identified the key factors influencing poor WASH services in Onitsha.

Results and Discussion

Demographic Characteristics of the Respondents

The demographic characteristics of the 400 respondents reveal diverse profiles in age, education, ethnicity, and household size. In terms of age, (17%) of respondents were between 18–28 years, (28%) were aged 29–39, (36%) fell within 40–50 years, and (19%) were above 50 years. This indicates that over (60%) were above 30 years, suggesting a mature population with sufficient understanding of the questionnaire. Regarding educational qualifications, (8%) of respondents had no formal education, (20%) completed primary education, (48%) had secondary education, while (24%) attained tertiary education. This suggests that a large proportion of the respondents possessed adequate educational background to comprehend the questionnaire.

Ethnically, the respondents were predominantly Igbo, making up (90.15%) of the sample. Hausa respondents accounted for (3%), Yoruba respondents for (1.85%), and other ethnic groups constituted (5%). This distribution reflects the cultural homogeneity of the study area, with a dominant Igbo presence. In terms of household size, specifically the number of children per household, (38%) of respondents had between 1–3 children, (42%) had 4–6, (16%) reported 7–9 children, and (4%) had more than 9 children. These figures demonstrate that most households had moderate to large family sizes.

WASH Practices in Onitsha Urban Area

Analysing the condition of WASH services makes understanding the nature of WASH practices a priority. It is pertinent to see how WASH is being practiced. Residents in Onitsha were asked questions through questionnaire distributed to obtain insight on their perceptions on WASH practices. The responses obtained were shown in Table 1. From the table, it is evident that there is high level of agreement amongst the respondents that clean water sources are prioritized as safest sources of drinking water for families based on the overall agreement in item one. High agreement was achieved among the respondents given their responses on regular handwashing before meals and after using toilet, community clean-up initiatives, the harvesting of rainwater as a water supply source, residents being educated on the importance of proper waste disposal, adoption of modern sanitation facilities by households, and the need for awareness programs to promote safe water storage and handwashing. Also, the respondents disagreed on a number of items explaining WASH practices in Onitsha given their general disagreement indicating that local authorities do noy promote the use of latrines to reduce open defecation, waste is not being separated at source, communities in Onitsha not working towards sustainable water supply system, pipe borne water not expanding to increase access, efforts are not made to repair leaky pipes and faucets to reduce water wastage and residents are not conscious of the impact of improper waste disposal on water bodies and ecosystems.

Table 1. Responses Obtained on WASH Practices in Onitsha Urban Area

No	Items	SA	A	D	SD
1	Residents in Onitsha Urban Area prioritize clean water sources to ensure safe drinking water for their families.	139	195	55	11
2	Sanitation practices involve proper disposal of waste into designated bins.	88	116	111	85
3	Regular handwashing is encouraged, especially before meals and after using the toilet.	141	123	87	49
4	Onitsha residents actively engage in community clean-up initiatives to maintain a clean environment.	191	120	70	19
5	Rainwater harvesting is a common practice to supplement water supply during dry seasons.	211	140	49	0
6	Local authorities in Onitsha promote the use of latrines to improve sanitation and reduce open defecation.	90	103	100	107
7	Waste separation at source is encouraged to facilitate recycling and reduce environmental pollution.	32	22	190	156
8	Residents are educated on the importance of proper waste disposal to prevent water contamination.	93	200	51	56
9	Many households have adopted the use of modern sanitation facilities such as flush toilets.	201	134	47	18
10	Awareness campaigns emphasize the importance of using soap during handwashing.	199	159	35	7
11	Communities in Onitsha are working towards sustainable water supply systems.	0	13	210	177
12	Local schools incorporate WASH education into their curriculum to instill good practices in students.	109	162	78	51
13	Public awareness programs promote safe water storage to prevent contamination.	108	164	49	79
14	Community leaders play a pivotal role in advocating for improved sanitation and hygiene.	199	101	63	37
15	In urban areas, piped water supply systems are gradually expanding, ensuring access to clean water.	10	100	151	139

No	Items	SA	A	D	SD
16	Residents actively participate in tree planting initiatives to protect water sources and enhance the environment.	43	46	191	120
17	Efforts are made to reduce water wastage through the repair of leaky pipes and faucets.	0	65	200	135
18	Public toilets are available in strategic locations to discourage open defecation.	181	130	35	54
19	Onitsha residents are conscious of the impact of improper waste disposal on water bodies and ecosystems.	56	61	173	110
20	The government collaborates with NGOs to implement WASH programs that benefit the community.	77	97	136	90

However, the raw responses obtained and described above were subjected to further investigations to isolate key WASH practices in Onitsha and explore further how these practices vary across the layouts that make up Onitsha urban area. This was achieved using principal component analysis (PCA).

Principal Component Analysis of WASH Practices in Onitsha

The primary data consists of 20 predefined WASH practices from which the respondents made their choices. The data generated were defined and parameterized for easy handling of the data and presented in Table 2.

Table 2. Variable Coding of the Parameters Analysed

Variable Codes	WASH Practices in Onitsha	Variable Label
1	Residents in Onitsha Urban Area prioritize clean water sources to ensure safe drinking water for their families.	CLEAN
2	Sanitation practices involve proper disposal of waste into designated bins.	DISPOSAL
3	Regular handwashing is encouraged, especially before meals and after using the toilet.	HANDWASH
4	Onitsha residents actively engage in community clean-up initiatives to maintain a clean environment.	COMMCLEAN
5	Rainwater harvesting is a common practice to supplement water supply during dry seasons.	RAINWATER
6	Local authorities in Onitsha promote the use of latrines to improve sanitation and reduce open defecation.	USELAT
7	Waste separation at source is encouraged to facilitate recycling and reduce environmental pollution.	RECYCL
8	Residents are educated on the importance of proper waste disposal to prevent water contamination.	PROWAD
9	Many households have adopted the use of modern sanitation facilities such as flush toilets.	MODSAF
10	Awareness campaigns emphasize the importance of using soap during handwashing.	USODHAW
11	Communities in Onitsha are working towards sustainable water supply systems.	SUSWATSS
12	Local schools incorporate WASH education into their curriculum to instill good practices in students.	WASHEDU
13	Public awareness programs promote safe water storage to prevent contamination.	PUBAWARE
14	Community leaders play a pivotal role in advocating for improved sanitation and hygiene.	LEADER

Variable Codes	WASH Practices in Onitsha	Variable Label
15	In urban areas, piped water supply systems are gradually expanding, ensuring access to clean water.	PIPEDWAT
16	Residents actively participate in tree planting initiatives to protect water sources and enhance the environment.	TPLANT
17	Efforts are made to reduce water wastage through the repair of leaky pipes and faucets.	REPAIR
18	Public toilets are available in strategic locations to discourage open defecation.	DISOPED
19	Onitsha residents are conscious of the impact of improper waste disposal on water bodies and ecosystems.	IMPROWAT
20	The government collaborates with NGOs to implement WASH programs that benefit the community.	COLLAB

The PCA analysis collapsed the 20 identified WASH practices into seven significant and orthogonal components that highlights the major WASH practices being practiced in Onitsha based on the observed data from the respondents (Table 3). From Table 4, the seven components explained approximately 88.4% of the variance in the data while each of the seven components had eigen values greater than 1. The screen plot of these components is shown in Figure 3.

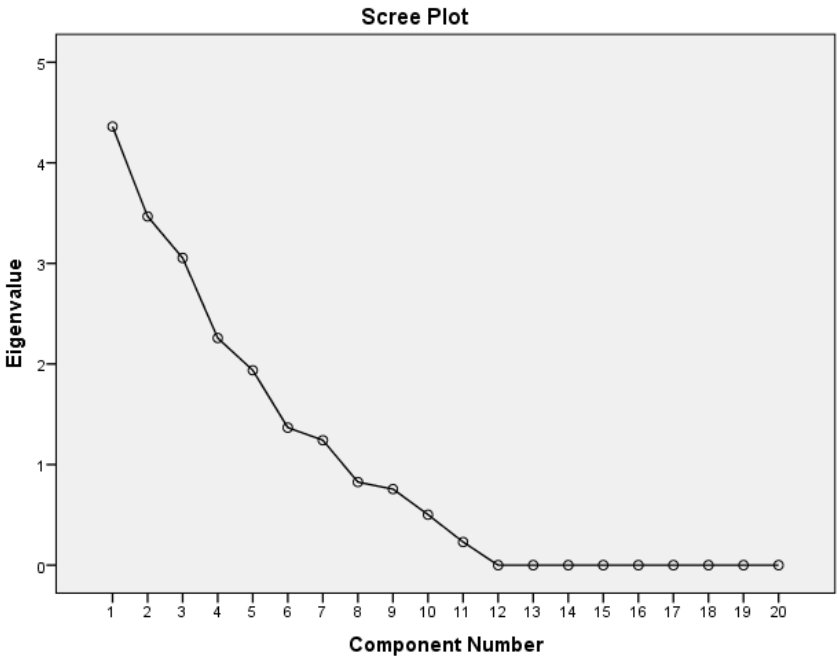

Fig 3. Screen Plot for the WASH Practices in Onitsha

Table 3. Varimax Rotated Component Matrix of the WASH Practices in Onitsha

	Components							
	I	II	III	IV	V	VI	VII	h2
1	.642	-.001	.169	.234	-.139	.011	.512	.778
2	-.007	-.060	-.049	-.026	.886	.107	.084	.811
3	.007	.770	-.048	-.270	.316	-.078	-.152	.797
4	.936	.041	.055	-.007	-.129	-.045	-.297	.987
5	-.046	.195	-.714	-.375	-.057	-.416	.184	.901
6	.152	-.012	.007	.932	-.115	.115	.074	.923
7	.009	.885	.003	-.034	-.298	.055	.160	.902
8	-.092	-.191	.023	.329	.057	.806	-.372	.946
9	-.034	.065	-.073	-.076	-.199	.167	-.744	.638
10	.160	-.311	-.811	.023	.292	-.050	-.056	.872
11	-.513	-.185	-.074	-.027	.708	-.169	.197	.872
12	-.159	-.044	.675	.332	.024	-.010	.568	.917
13	-.399	.827	-.149	.120	-.164	-.161	-.135	.951
14	.681	-.345	-.350	.083	-.352	.104	.315	.947
15	.794	-.316	-.232	.104	.282	-.116	.169	.916
16	.357	-.039	.418	-.128	.169	.729	.244	.939
17	.108	-.520	.808	-.115	.092	-.056	.129	.978
18	.331	-.088	.077	-.105	.522	-.673	.139	.878
19	.044	.504	.239	.394	-.316	-.330	-.415	.850
20	.011	-.055	.088	.926	.049	.061	.098	.884

Table 4. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.361	21.803	21.803	4.361	21.803	21.803	3.140	15.702	15.702
2	3.467	17.333	39.136	3.467	17.333	39.136	3.035	15.175	30.878
3	3.054	15.271	54.407	3.054	15.271	54.407	2.769	13.843	44.720
4	2.258	11.292	65.699	2.258	11.292	65.699	2.450	12.249	56.969
5	1.937	9.686	75.385	1.937	9.686	75.385	2.299	11.497	68.466
6	1.367	6.836	82.221	1.367	6.836	82.221	2.067	10.336	78.802
7	1.242	6.210	88.431	1.242	6.210	88.431	1.926	9.630	88.431
8	.826	4.132	92.563						
9	.756	3.779	96.342						
10	.501	2.507	98.849						
11	.230	1.151	100.000						
12	6.340E-16	3.170E-15	100.000						
13	5.175E-16	2.588E-15	100.000						
14	2.930E-16	1.465E-15	100.000						
15	1.034E-16	5.169E-16	100.000						
16	6.672E-17	3.336E-16	100.000						
17	-1.792E-17	-8.958E-17	100.000						
18	-3.598E-16	-1.799E-15	100.000						
19	-4.858E-16	-2.429E-15	100.000						
20	-1.857E-15	-9.283E-15	100.000						

The variables with the highest loadings on each of the components were displayed in tables 5-11.

Table 5. Variables with High Loadings on Component I

Variables	Variable Name	Loadings	Implication
Y4	Onitsha residents actively engage in community clean-up initiatives to maintain a clean environment.	0.936	Community clean-up initiative

Table 6. Variables with High Loadings on Component II

Variables	Variable Name	Loadings	Implication
Y7	Waste separation at source is encouraged to facilitate recycling and reduce environmental pollution	0.885	Public awareness for waste separation
Y13	Public awareness programs promote safe water storage to prevent contamination.	0.827	

Table 7. Variables with High Loadings on Component III

Variables	Variable Name	Loadings	Implication
Y17	Efforts are made to reduce water wastage through the repair of leaky pipes and faucets.	0.808	Public Hygiene practices using water
Y10	Awareness campaigns emphasize the importance of using soap during handwashing.	-0.811	

Table 8. Variables with High Loadings on Component IV

Variables	Variable Name	Loadings	Implication
Y6	Local authorities in Onitsha promote the use of latrines to improve sanitation and reduce open defecation.	0.932	WASH policy implementation
Y20	The government collaborates with NGOs to implement WASH programs that benefit the community.	0.926	

Table 9. Variables with High Loadings on Component V

Variables	Variable Name	Loadings	Implication
Y2	Sanitation practices involve proper disposal of waste into designated bins	0.886	Proper waste disposal

Table 10. Variables with High Loadings on Component VI

Variables	Variable Name	Loadings	Implication
Y8	Residents are educated on the importance of proper waste disposal to prevent water contamination.	0.806	Education of residents

Table 11. Variables with High Loadings on Component VII

Variables	Variable Name	Loadings	Implication
Y9	Many households have adopted the use of modern sanitation facilities such as flush toilets.	-0.744	Adoption of modern sanitation facilities

The loadings on each of the components were extracted and placed in tables. Based on the pattern of loadings observed across each component, the underlying meanings were interpreted and presented in tables highlighting the key Water, Sanitation, and Hygiene (WASH) practices in Onitsha. These findings revealed seven major WASH practices commonly undertaken by both residents and local authorities in the area. These practices include active participation in

community clean-up initiatives, the regular separation of waste materials, engagement in recycling activities, the enforcement of WASH-related policies by local authorities, consistent disposal of waste in designated bins, public education campaigns aimed at preventing water contamination through proper waste disposal, and the adoption of modern sanitation facilities.

The analysis of WASH practices in Onitsha Urban Area revealed seven key practices: active community clean-up initiatives, waste separation, waste recycling, implementation of WASH policies by local authorities, proper waste disposal in designated bins, public enlightenment on waste disposal to prevent water contamination, and the adoption of modern sanitation facilities. These practices, derived from principal component analysis (PCA), highlighted significant efforts toward improving hygiene and sanitation in the area. Notably, the PCA explained 88.4% of the variance, indicating robust data representation. In contrast to findings in Onitsha, a study in Lagos reported minimal engagement in community clean-up initiatives, attributing this to inadequate governmental support and weak community involvement. This difference underscores the role of local leadership in promoting environmental sanitation (Sinaga et al., 2022). These findings in Onitsha further align with evidence from other Nigerian cities, particularly regarding waste separation and the implementation of WASH policies.

The emphasis on waste separation in Onitsha agrees with findings from a study in Port Harcourt, where residents practiced source segregation to enhance recycling. Both studies highlight the importance of public education in promoting such practices (Knickmeyer, 2020). However, in a related study in Enugu, waste separation was hindered by a lack of facilities and public awareness (Ezenwaji et al., 2014). The implementation of WASH policies in Onitsha aligns with findings from Abuja, where collaborative efforts between local governments and NGOs improved sanitation services. Similarly, such partnerships were essential in advancing WASH programs, as noted in Edo State (Garuba, 2016). In contrast, a study in Kaduna revealed gaps in policy implementation due to limited government funding (Sridhar et al., 2020). Beyond policy implementation, another important dimension of WASH practices in Onitsha is the adoption of modern sanitation facilities.

Onitsha's adoption of modern sanitation facilities agreed with findings in Ibadan, where households increasingly used flush toilets due to awareness campaigns (Çelik & Yüce, 2019). Conversely, rural areas of Kogi State still relied on traditional sanitation methods, highlighting disparities in infrastructure development (Dreibelbis et al., 2013). These comparisons demonstrate regional variations in WASH practices influenced by awareness, policy, and infrastructure.

Conclusions

The assessment of Water, Sanitation, and Hygiene (WASH) practices in the Onitsha urban area of Anambra State, Nigeria, revealed significant insights into the state of public health infrastructure and behavior in the region. While some residents have access to improved water sources, challenges such as irregular supply, contamination, and lack of treatment methods persist, posing risks to water safety and public health. Sanitation practices in many areas remain suboptimal, with inadequate toilet facilities and poor waste disposal systems contributing to environmental degradation and increased vulnerability to disease outbreaks. Hygiene practices, particularly handwashing with soap at critical times, were found to be inconsistent, often hindered by limited access to hygiene materials and insufficient awareness. Socioeconomic and spatial disparities in

WASH access further highlight the need for targeted interventions. These findings underscore the urgent need for coordinated efforts among government agencies, non-governmental organizations, and community stakeholders to strengthen WASH infrastructure and promote sustainable behavioral change. Investments in clean water supply systems, improved sanitation facilities, public health education, and community-based hygiene promotion initiatives are critical to achieving better health outcomes and advancing the Sustainable Development Goals (SDGs), particularly SDG 6, ensuring availability and sustainable management of water and sanitation for all.

Data Availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

All authors in this publication declare no conflict of interest regarding the title, data, location, and results of the research.

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Supplementary Materials

This study does not include any supplementary materials.

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