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Evaluating Nigeria's progress working towards achieving SDG 6: A systematic literature review

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1. Abstract

Building a better and sustainable future remains a target of the global community, SDGs a universal urgent call to action to achieving this by 2030. Of particular interest in implementation is SDG 6, recent reports revealing that two-third of the population in Nigeria lack access to safe water, sanitation and hygiene services; responsible for the rising burden of WBDs in the country. In an attempt to evaluate Nigeria's progress so far in meeting SDG 6, this SLR seeks to ascertain the availability and level of access to safe water supply, sanitation and hygiene practices, and patterns of WBDs. The PEO model was utilized to generate a research question, and a comprehensive search through databases done, utilizing key words such as "safe and clean water", "sanitation facilities", "hygiene practices" and "water-borne diseases". Following the PRISMA guideline, a total of 11 studies were finally included in this review having met the inclusion criteria, and were critically appraised for the quality of evidence. Synthesis of findings gathered from included studies were developed through thematic analysis and presented in a tabular form. It was revealed that unimproved water sources were the main source of water supply, lack of water treatment evident. Pit latrine was found to be the predominant toilet system. Backwardness in hygienic practices was seen as open dumping of refuse and open defecation still a common practice, diarrhea and typhoid the major WBDs. Although gaps in knowledge were identified, this SLR is expected to provide high quality evidence to address issues of WASH promotion interventions and policy implementation; evidence-based recommendations given to ensure SDG 6 is met by 2030, which appears unlikely.

2. Introduction

The Sustainable Development Goals (SDGs) was adopted by all UN member states following a historical UN summit held in New York on 25th September 2015, boosting 160 Heads of State and Government in attendance; with a target of creating a more sustainable world over the next 15 years (2015-2030) [1]. These set of goals (17 in number) are universal, broader in scope and builds on the success and momentum of the Millennium Development Goals (MDG) that ran from 2000-2015; recognizing the fact that today's health and development challenges are increasingly complex, integrated and interlinked [2].

Nigeria has since 2015 continued to demonstrate its commitment to achieving these global goals through leadership and ownership

of the implementation process [3]. Of particular interest in this review is the SDG 6: Clean Water and Sanitation. Water is an important environmental component, essential for survival and sustainability of every life form on earth. In fact, the demand for water in Nigeria has increased due to the exponential rise in population growth, urbanization and other anthropogenic factors. Despite giant strides, it is disheartening that over 66 million Nigerians lack access to potable drinking water supply [4], with more than two-third of the general population relying on unimproved water sources such as rivers, streams, lakes and ponds for survival. According to the studies of Obinna, et al. [5], streams and rivers have now become important sources of water for cooking and drinking in remote villages that are continually faced with environmental contamination from discharges or effluents from abattoirs, sewage (especially downstream) and industrial waste. Igwe, et al. [6] noted that recent anthropogenic activities such as agricultural practices (poultry droppings, fertilizers), human domestic activities (excreta, sewage and refuse disposal) and dredging (mining and industrial waste) are fast degrading and polluting most water bodies.

Drinking contaminated water has serious devastating impact on the health and productivity of the populace, resulting in common water borne diseases (WBDs) such as diarrhoea, cholera, dysentery and typhoid fever [5]. According to statistics from United Nations International Children Emergency Fund (UNICEF), 117,000 children in Nigeria die of water-borne diseases annually, the highest number of any nation, with 70% of water at point of consumption contaminated [7]. Poor sanitation and hygiene practices such as open defecation, no hand washing and bathing facilities, and inadequate waste management have further increased the risk of spread of WBDs. It was disclosed following a new survey that 46 million Nigerians are still practicing open defecation, about 167 million homes lack access to hand washing facilities, and approximately 80 million people living without improved sanitation [8,9]. Moreover, water contamination through leachates from solid waste deposits and industrial waste in urban areas of the country has been reported [10,11]. Also, the presence of heavy metals (e.g. aluminum, cadmium, lead, manganese and nickel) above permissible levels for drinking in surface water [12], sachet-packet water [13] and ground water [14], known risk factors for cancer, respiratory disease, neurological disorder and renal failure calls for concern [15]. Thus, the scope of this systematic literature review (SLR) is to assess Nigeria's progress so far working towards achieving clean water and sanitation (SDG 6) in 2030 by reviewing relevant literature on water, sanitation and hygiene (WASH) practices.

In addressing this, it is necessary to formulate a research question that better examines this progression, acting as a guide throughout this process of writing the SLR. The Population Exposure Outcome (PEO) model is deemed appropriate and will be utilized; clearly defining the following:

i) Population/Problem-
   a. Defined population: Residents in Nigeria
   b. Patients or Groups being affected: Urban and especially rural areas of Nigeria
   c. What are their problems: Lack of access to clean and safe water, poor sanitation and hand washing facilities, below par waste/disposal system
   d. Age, gender and source of livelihood: All ages, both gender, all occupations
ii) Exposure- Poor water, sanitation and hygiene practices
iii) Outcomes-water-borne diseases

Putting all elements of the PEO model together, the research question for this SLR will be "Assessment of water, sanitation and hygiene (WASH) facilities and practices in combating water borne diseases in rural and urban areas of Nigeria in a bid to attaining SDG 6". This review seeks to determine the availability and access to safe and affordable water supply, evaluate the availability and condition of sanitation facilities, ascertain the level of hygiene practices and understand patterns of WBDs. Information gotten will prove vital in redesigning interventions, foster government and international partnership working and address issues of policy implementation.

3. Methodology

3.1. Search strategy

A comprehensive searching strategy was developed in sourcing for relevant literature, critically appraise and synthesize the evidence it brings to answer the already defined research question.

- **Databases:** Several databases such as Medline, Global Health, Embase, Web of Knowledge, Cochrane Library, Proquest Social Sciences, CAB Abstracts, Web of Science, Open Access and Africa Wide Information were consulted to identify studies.
- **Key words, phrases and Boolean commands:** Key words and concepts were identified in the research question following the PEO format. There include "safe and clean water", "sanitation facilities", "hygiene practices", "waterborne diseases". Each element was searched individually and the screen cleared before beginning a new search.

Developing related search terms was further done for each of the major elements of the question as seen below and a search was done.

i. "Safe and clean water in low income countries"- sources of water supply, household water storage, water treatment, water quality
ii. "Sanitation facilities in low income countries"- toilets, pit latrines, container/bucket latrines, bathroom, refuge disposal system, hand-washing facilities
iii. "Hygiene practices in low-income countries"- open defecation, hand-washing, vessel disinfection
iv. "Water borne diseases in low-income countries"- Typhoid, diarrhoea, dysentery, cholera

On identifying some relevant literatures, additional studies were obtained form the reference list and their titles used as search terms on Google and Google Scholar search engines, leading to databases from which related studies were found by choosing the "show similar studies" search option.

- **Inclusion and exclusion criteria:** Advanced search option was utilized based on developed inclusion and exclusion criteria, resulting in fewer results.

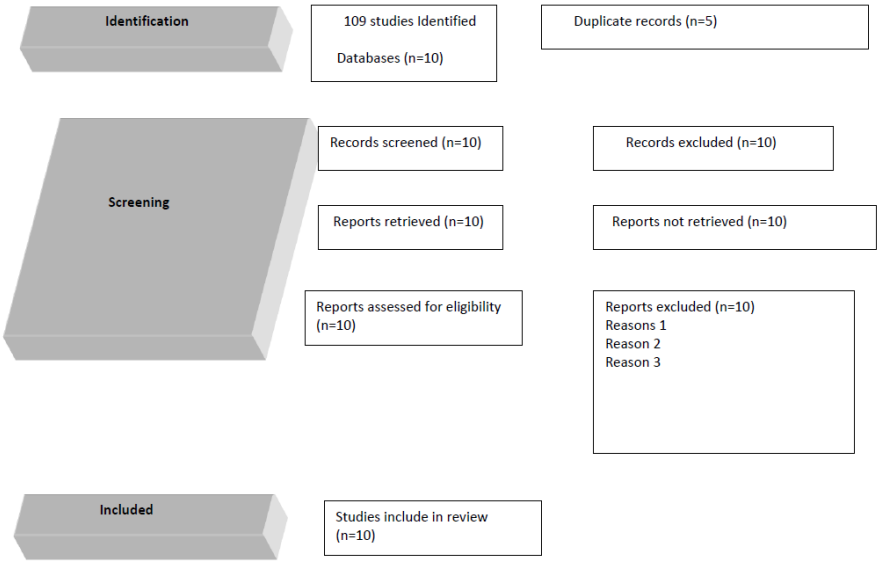
Criteria for including studies in this review followed the PEO format.

Criteria	Definition
Population	- Only studies conducted in Nigeria were included. - Populations of any age, sex, gender, disability or socio-economic status were included. - Studies outside Nigeria were excluded.
Exposure	Eligible studies were those that evaluated at least one of: a. Access to safe and clean water (Water supply, water storage and water treatment) b. Knowledge and practice on sanitation and hygiene (Toilet/bathroom facilities, hand washing, refuse disposal system and hand washing facilities in homes and communities.
Outcome	Studies that reported on water-borne diseases or water-borne disease causing organisms as a result of poor WASH practices were included.

Other inclusion criteria

Language	Only studies in English were included. Studies in other languages were included where an English translation was available.
Timeframe	Studies published after 2015 were excluded.

The guideline for the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)



3.2. Method of Critical Appraisal for Studies Selected for Inclusion

A methodological quality assessment of the included studies was conducted based on the Critical Appraisal tool for assessing the quality of cross-sectional studies (AXIS). This is because all selected literatures for the review were cross-sectional studies due to the nature of the research question.

3.3. Type of Analysis

3 major themes that helps answer the research question were developed. These are:

i. Water- Sources, storage, treatment and quality
ii. Sanitation and hygiene practices
iii. Water-borne diseases

Included studies were organized into these themes and thematic analysis utilized in aggregating and comparing findings from separate studies in a transparent way, facilitating the explicit production of new concepts and hypothesis.

4. Findings/Results

4.1. Synthesis and Presentation of Main Findings from Selected Studies

Water- Sources, storage, treatment and quality

No	Studies	Sources	Storage	Treatment

1	Ahmad, et al. (2019)	Unprotected spring (23.3%), Well (21.78%), Surface water (20%)	Jerry cans (63%), Clay pot (20%), Iron bucket (10%) 68.3% have a cover; 31.7% have no cover	91.7% not using any method of water treatment; 8.3% treats water (31.7% boiling, 2.3% chlorination, 66% stand and settle)
2	Aminu, et al. (2018)	River/stream (70.5%), Piped water (5.3%), Tap (4.6%)	Wide mouth container (75.1%), Narrow container (22.9%) 88.5% have cover; 11.5% have no cover. 45% had no dedicated container for fetching; 39.4% had permanent container for fetching.	5.9% not using any method of water treatment; 94.1% treats water (78.4% alum, stand and settle 8.4%, filter through a cloth 6.4%)
3	Esther, et al. (2020)	Procurement from water vendors (34.9%), Boreholes (24%), Wells (19.1%)		59.7% not using any method of water treatment; 40.3% treats water (17.8% boiling method and 15.5% filter with cloth).
4	Miner, et al. (2015)	Wells (54.6%), Boreholes (6.3%)	Buckets (58.7%), Jerry cans (32.0%), Clay pots (6.2%) 95.1% have a cover; 4.9% have no cover.	45.9% not using any method of water treatment; 54.1 % treats water (43.3% alum, 24.9% boiling, 21.4% filtration, 10.5% sedimentation).

			58% had no dedicated container for fetching	
5	Odafivwotu (2019)	Wells and Borehole (64%), Surface water (16%)		
6	Ojima, et al. (2021)	Borehole (100%)	Plastic container (66%), Clay pot (34%)	99% treats water (chlorination)
7	Onyekachi, et al. (2020)	Borehole (53.6%), Well (38.5%)	Plastic bucket with lid (33.3%), Plastic bucket without lid (19.4%), Tanks (29.8%)	53.6% not using any method of water treatment; 46.4% treats water (27.8% boiling, 7.9% filtration, 7.7% sedimentation)
8	Orimoloye, et al. (2015)	Well (49.1%), Boreholes (26.4%)		43.6% not using any method of water treatment; 56.4% treats water (33.5% bleach, 28.0% boiling, 20.1% alum and filter through cloth)
9	Raimi, et al. (2018)	Borehole (53%), Rain (19%)	Closed container (81%), Open container (19%)	45% not using any method of water treatment;
10	Simon, et al. (2020)	Borehole (35.5%), Streams/rivers/wells (27.5%), Rain (25.0%)	Plastic container (69.3%)	35.0% not using any method of water treatment; 30.3% treats water (filtration)
11	Sridhar, Okareh and Mustapha (2020)	Surface water (52.5%), Unprotected wells (44.8%)	Covered clay pots (54.1%), Plastic containers (48.4%)	53.8% not using any method of water treatment; 46.2% treats water (filtration through cloth accounting for 45.2%).

Sanitation and hygiene practices

No	Studies	Toilet/Bathroom Facility	Refuse Disposal System	Hand Washing System	Hygiene Practices
1	Ahmad, et al. (2019)	33.7% had no latrines; 66.3% had latrines Pit with slab (3.7%), Pit without slab (69.3%), Open defecation (27%)	Open dumping (35%), Private pit (28.3%), Burning (6.7%)	63% had no hand washing facility	Hand washing practice: Poor (70%), Good (30%) Hand washing with water only (46%), water and soap (41.7%) Clean water storage daily (49.3%)
2	Aminu, et al. (2018)	42.2% had no toilet; 57.8% had toilet Pit latrine (67%), Bucket latrine (29.0%), Open defecation (94.6%)			Hand washing before eating/cooking (70.7%), after going to toilet (75.6%) Hand washing with water only (75.1%), water and soap (22.4%)
3	Esther, et al. (2020)	36% had no latrines; 64% had latrines Pit latrine (42.4%) Pour flush (39.0%) Septic tank (18.6%)	Open dumping (73%), Burning (18%), Refuse pit (9%)	77.4% had no hand washing facility	Hygiene condition of latrine: 17.2% good 40.3% moderate 33.1% bad
4	Odafivwotu (2019)	Improved (53%), Unimproved (11%), Open defecation (11%)		Hand washing facility (73%), No hand washing facility (18%), unimproved (9%)	
5	Ojima, et al. (2021)	Pit latrine (90%),			Hand washing practice before eating (99%), after going to toilet (100%)

		Bucket latrine (9%), Open defecation (100%)			Hand washing with water and soap (97%)
6	Orimoloye, et al. (2015)	1.8% had no toilet; 98.2% had toilet Pour flush (67.3%) Pit latrine (16%) Open defecation (1.8%)			Hand washing before eating (43.5%), after going to the toilet (37.3%) Hand washing with water only (25.8%), water and soap (74.2%)
7	Raimi, et al. (2018)	45% flush toilets, 32% Jetty/pier, 4% Pit latrine, Open defecation (19%)	Throw into the river (56%), Burning (20%), Bush (19%), Refuse pit (5%)		Hand washing after going to toilet (73%) Clean water storage container weekly (52%), bi-weekly (36%), monthly (12%)
8	Simon, et al. (2020)	Pit latrine (47.5%) Swat latrine (21.2%) Water system closet (20.3%) Open defecation (79.0%)	Open dumpsite (41.5%), Burning (25%), Throw into the bush (20.3%)		Hand washing practice before cooking (57.8%), before eating (79.5%), after going to toilet (48.3%) Hand washing with water only (58%), water and soap (42%) Clean water storage container every 2 weeks (100%)
9	Sridhar, Okareh and Mustapha (2020)	Pit latrine (76.5%), Water closet toilets (2.4%), Open defecation (41.4%)		Hand washing facility location: Next to toilet (3.9%), Within walking distance (4.4%), Inside the house (37.6%)	Hand washing before cooking (23.4%), before eating (34.3%), after going to toilet (31.3%) Hand washing with water only (21.6%), water and soap (65.4%)

Water-borne diseases

No	Studies	WBDs
1	Aminu, et al. (2018)	Diarrhea (32.3%), Diarrhea and vomiting (23.2%) For under-five children

2	Miner, et al. (2015)	Typhoid (42.2%), Diarrhea (35.2%), Cholera (7.8%), Dysentery (4.2%)
3	Onyekachi, et al. (2020)	Diarrhea (44.5%), Typhoid (23.7%), Cholera (13.5%), Dysentery (12.4%)
4	Orimoloye, et al. (2015)	Diarrhea (30.8%), Diarrhea and vomiting (11.9%), stomach pains (28.7%), fever (28.7%)
5	Sridhar, Okareh and Mustapha (2020)	Typhoid (56.5%), Diarrhea/Dysentery (33.1%), Cholera (22.6%)

4.3. Critical Appraisal of the Studies for Inclusion

List of studies and critical appraisal utilizing critical appraisal tool AXIS

No	Study	Title	Clear Aim and Objectives	Appropriate Study Design	Justified Sample Size	Clearly-Defined Target Population	Sample Frame from Appropriate Population Base
1	Ahmad, et al. (2019)	An Epidemiological Study to Access Water, Sanitation and Hygiene Practices among Rural Communities of Gulu, Kano, Nigeria.	Yes; to assess water, sanitation and hygiene Practices	Yes, Cross-sectional descriptive design	Yes, determined using Morgan and Krejcie formula	Yes	Not clearly defined
2	Aminu, et al. (2018)	Drinking water quality, Sanitation and Hygiene practices in a rural community of Sokoto state, Nigeria.	Yes; to assess quality of drinking water, sanitation and hygiene levels	Yes, Cross-sectional descriptive design	Yes, determined using formula for cross-sectional studies	Yes	Yes, using multi-stage sampling method
3	Esther, et al. (2020)	A preview of Water, Sanitation and Hygiene Practices in Kofai community of Taraba State, Nigeria.	Yes; to ascertain WASH related condition and practices.	Yes, Cross-sectional descriptive design	Yes, determined using Sloven's formula	Yes	Yes, using multi-stage sampling method

4	Miner, et al. (2015)	Household drinking water; Knowledge and Practice of purification in a community of Lamingo, Plateau state, Nigeria.	Yes; to determine the knowledge, practice and quality of household drinking water and relationship with occurrence of diarrhea	Yes, Cross-sectional descriptive design	Yes, determined using formula for cross-sectional studies	Yes	Yes, using multi-stage sampling method
5	Odafivwotu (2019)	Analysis of household's vulnerability to waterborne diseases in Yenagoa, Nigeria.	Yes; to determine degree of household Vulnerability to WBDs	Yes, Survey research design	Yes, determined using the krejcie and morgan equation	Yes	Chance of over-or-under representation and data manipulation using systematic sampling technique
6	Ojima, et al. (2021)	Evaluation of Household Water, Sanitation and Hygiene Management in a Nigerian Rural Community.	Yes; to assess the state of WASH services	Yes, Cross-sectional design	Not defined	Yes	High chance of bias adopting purposive sampling technique
7	Onyekachi, et al. (2020)	Risk assessment of Water-borne infections in Enugu state, Nigeria: Implications of household water choices, knowledge and practices.	Yes; to investigate the prevalence and associated risk of WBDs	Yes, Cross-sectional design	Not defined	Yes	Yes, using multi-stage sampling method

8	Orimoloye, et al. (2015)	Assessment of Water sanitation and Hygiene practices in Ibadan, Nigeria.	Yes; to ascertain the water sanitation and hygiene practices among household	Yes, Cross-sectional descriptive design	Not defined	Yes	Chance of bias adopting simple random sampling technique
9	Raimi, et al. (2018)	The Sources of Water supply, Sanitation facilities and Hygiene practices in oil producing communities in central senatorial district of Bayelsa state, Nigeria.	Yes; to identify sources of water supply, types of sanitation facilities and effectiveness of personal Hygiene	Yes, quantitative descriptive design	Yes, determined using Taro Yamane formula	Yes	Chance of bias adopting simple random sampling technique
10	Simon, et al. (2020)	Assessment of Water supply, Sanitation and Hygiene Practices among households in Southern Nigeria.	Yes; to assess water supply, sanitation and hygiene practices	Yes, Cross-sectional descriptive design	Not defined	Yes	Yes, using multi-stage sampling method
11	Sridhar, Okareh and Mustapha (2020)	Assessment of Knowledge, Attitudes and Practices on Water, Sanitation and Hygiene in some selected LGAs in Kaduna state, Northwestern Nigeria.	Yes; to assess the knowledge, attitudes and practices related to WASH	Yes, Cross-sectional descriptive design	Yes, using a scientific formula	Yes	Yes, using a three-stage sampling procedure

Critical Appraisal of studies selected for inclusion in the Systematic Literature Review utilizing critical appraisal tool-AXIS (continuation.)

No	Study	Non-Respondents Addressed	Risk Factor and Outcome Variable Measurement	Clear Statistical Methods & Significance	Basic Data Described	Internally Consistent Result	Discussion/ Conclusion Justified by Result	Study Limitations Discussed	Quality
1	Ahmad, et al. (2019)	Nil non-respondents	Only risk factor measured	Yes	Yes	Yes	Yes	No	11/12
2	Aminu, et al. (2018)	Nil non-respondents	Both risk factor and outcome measured	Yes	Yes	Yes	Yes	No	10/12
3	Esther, et al. (2020)	Nil non-respondents	Only risk factor measured	Yes	Yes	Yes	Yes	No	
4	Miner, et al. (2015)	Nil non-respondents	Both risk factor and outcome measured	Yes	Yes	Yes	Yes	No	
5	Odafivwotu (2019)	Nil non-respondents	Only risk factor measured	Yes	Yes	Yes	Yes	No	
6	Ojima, et al. (2021)	Nil non-respondents	Only risk factor measured	Yes	Yes	Yes	Yes	No	8.5/12
7	Onyekachi, et al. (2020)	Not defined	Both risk factor and outcome measured	Yes	Yes	Yes	Yes	Yes	10/12
8	Orimoloye, et al. (2015)	Nil non-respondents	Both risk factor and outcome measured	Yes	Yes	Yes	Yes	No	9/12
9	Raimi, et al. (2018)	Incomplete filling and difficulty retrieving questionnaire both	Only risk factor measured	Yes	Yes	Yes	Yes	No	9.5/12

		addressed despite 100% response rate							
10	Simon, et al. (2020)	Nil non-respondents	Only risk factor measured	Yes	Yes	Yes	Yes	No	10/12
11	Sridhar, Okareh and Mustapha (2020)	Nil non-respondents	Both risk factor and outcome measured	Yes	Yes	Yes	Yes	Yes	12/12

5. Discussion

5.1. Summary of Findings

This will be done in the identified 3 thematic areas of analysis

5.1.1. Water-sources, storage, treatment and quality: The findings of these studies reveal poor quality of drinking water sources in Nigeria, seven studies projecting unimproved water sources such as rain, well, rivers and streams as the main source of water supply. Nearly all respondents indicated that reason for choice of water is based on availability, with low consideration given to water safety. While agriculture was found to be the occupation for majority of the populace in the studies under review, there is no denying the fact that chemical contaminants such as nitrogen compounds and phosphorus, released from livestock waste, fertilizers and pesticides will pose a major source of pollution to river bodies (Kato et al., 2009, pp.). The use of unprotected wells as source of drinking water, evident in almost all studies under review poses a public health threat to the populace, considering the proven presence of contaminants (arsenic and fluoride) in ground water beyond WHO recommended concentration limits Christiana and Amobichukwu (2014, pp.). Procurement from water vendors as a major source of drinking water in one of the studies calls for concern. This is because most studies conducted to ascertain the safety of water packaged into polythene sachet, a form of water vending, was shown to be contaminated with pathogenic bacteria and coliform, heavy metals and estrogens (Edema et al., 2011, pp.; Ignatius et al., 2010, pp.; Omoruyi et al., 2014, pp.).

The situation is even worse considering the fact that significant proportion of the population do not use any form of water treatment method, as reflected in about half of the studies under review. A majority of those that treated water utilized manual (traditional) filtration and boiling techniques, which cannot completely get rid of bacteria, viruses, organic matter and harmful chemicals or metals that may be in water [16].

It is important to note that storage vessels and user practices affect water quality [17]. While plastic buckets /containers were widely used to store water and no explanation (whether cost, convenience availability or climatic condition) was given to justify this, the use of storage containers with wide open mouth or without covers reported in some studies increases the chances of water contamination. It is surprising that only three studies in this review reported on cleaning of vessels that promotes microbiological and physiochemical quality of water; 50% of the populace in two out of the three studies reportedly cleaning storage containers weekly or every two weeks, which is fair. According to the studies of Musa, et al. [17], increased cleaning frequency has been found to reduce the risk of harboring pathogens and limits the spread of WBDs.

5.1.2. Sanitation and hygiene practices: It was discovered in this review that unimproved sanitation facilities especially pit latrine, known for contaminating ground water [18] is the predominant toilet system owing to its low cost and availability. A whooping

eight out of the nine studies on sanitation reported open defecation of varying degrees, four of these studies having a percentage of over 40%. Open defecation, a major health and social burden for the populace at large is responsible for the high prevalence of diarrhea and typhoid. Common reasons cited by respondents for this act were financial in capability, no toilets in homes, schools and places of work. It is important to note that WASH services goes beyond homes as a reasonable amount of time is spent outside.

Open dumping as a means of refuse disposal was the common practice of the populace, observed in three out of the four reported studies. According to Syeda, et al. [19], open dumps has been showed to cause surface water pollution (contamination of rivers, streams, lakes), soil pollution, decrease in vegetation abundance and overall degradation of the environment.

Furthermore, two of the four studies reportedly had no hand washing facilities, while hand washing practice was generally not good especially after using the toilet; less than 50% hand washing practice seen in this regard in about half of the studies. This is worrying especially in the context of the COVID-19 pandemic, putting the population at risk of transmitting infectious diseases, hand washing being a critical infection prevention practice. A fairly equal proportion of respondents belonged to both water only and water and soap categories. Recent studies have attributed this to inaccessibility to steadily available water supply, associated cost outlay for water needs and level of education [20].

5.1.3. Water-borne diseases: Diarrhea and typhoid accounted for the major WBDs especially among children 0-5 years of age, all studies under review agreeing that household water choices were highly susceptible to contamination at various points in their journey from source to mouth.

Following this systematic review, several areas of gap in knowledge have been identified. First is ascertaining populace knowledge and practice on modern water treatment, involving centralized and decentralized systems. Secondly is finding out the level of understanding and practice on modern waste disposal system such as incineration, landfill disposal and recycling. Quantifying the degree of awareness on the dangers of open defecation and the need to collectively promote good hygienic practices including anal cleansing is yet another area. Lastly is determining the level of effectiveness of present-day WASH interventions.

One of the major strength of the undertaken systematic review is that selected studies cuts across the northern, southern, eastern and western regions of Nigeria; an effective representation of the entire country. This review provides a conceptual framework that will help link future WASH intervention mechanisms with behavioural, health and socioeconomic outcomes, as well as help policy decision making. Gaps in existing evidence where potential new studies could be undertaken were identified. Nevertheless, this review is limited by unavailability of randomized controlled trial (RCT) studies conducted in Nigeria, with lack of studies assessing current WASH programs/interventions and outcomes.

5.2. Implications arising from the Systematic Literature Review

Lack of access to improved water supply increases vulnerability to WBDs and remains a major contributory factor to lost productivity and the high recorded mortality and morbidity rates of diarrhea and typhoid (especially among children under five) [21]. Poor sanitary and hygienic practices have disastrous consequences on the survival of humans, animals and the quality of soil and water. Open defecation and unsafe management of fecal waste continues to pose a major risk to public health and the environment, resulting in infectious intestinal diseases, including diarrheal diseases which are exacerbated by poor water supplies [22]. Open dumping of refuse contaminates ground water via a process known as leaching, exposing humans to toxic chemicals and metals; and this has been associated with cancers, skin diseases, respiratory disorders and kidney disease. In addition, dump sites encourages deforestation, soil erosion and destruction of the ecosystem and habitat [23].

In an era of globalization where human activities have gradually destroyed and degraded land, the state of waste management system in Nigeria can be described as pitiable. Therefore, achieving SDG 6 in Nigeria by the target date 2030 does not look feasible

at the moment as it requires extraordinary efforts.

With only 26.5% of the populace having access to improved drinking water sources and sanitation facilities, it can be deduced that universal access to safe water and adequate sanitation (especially in rural areas) is far from being reached due to several reasons. First is low government budget amidst increasing population. Secondly, international funding in this sub-sector is weak. Low level of family incomes is yet another challenge. Poor regulatory practices on open defecation/waste disposal also an issue hampering progress [21].

The centrality of clean water and sanitation (SDG 6) to sustainable development cannot be over emphasized, playing a vital role in progress in other key SDGs areas. Access to improved and safe water supply fosters good health and well being (SDG 3), education (SDG 4), poverty reduction (SDG 1) and improved life below water (SDG 14). On the other hand, effective sanitation and hygiene practice ensures environmental protection; key to a sustainable city/community (SDG 11), decent work and economic growth (SDG 8) and better life on land (SDG 15) [24].

5.3. Recommendations

In a bid to address clean water supply and provide adequate sanitation facilities, it is recommended that the country triple its budget or at least allocate 1.7 % of the current Gross Domestic Product (GDP) to WASH, with emphasis on the rural areas where perceived gap for improved services is very high (UNICEF, 2021).

Furthermore, increase international funding is commended. UN is encouraged to work closely with the government of Nigeria and other partners as well as line ministries in an effort to ensure that planning and budgeting for development activities in the country are within the framework of the SDGs [25].

Accelerating WASH coverage is encouraged, requiring prioritization at the highest level of decision making by international agencies, government, civil society and private sector. New policies should be articulated following wide consultation and collaboration with all relevant stakeholders, and realistic implementation plans and timelines for all existing water policies developed. Local government authorities should also be empowered to provide mini-water schemes in their areas of jurisdiction while two or more local government could collaborate to provide larger water scheme [26].

Scaling up community-led total sanitation efforts that focuses on empowering local communities to end open defecation is advised and should be an essential part of WASH interventions [22].

Lastly, a legal framework that effectively regulates indiscriminate dumping of refuse as well as open defecation is highly recommended [27].

6. Conclusion

In conclusion, the need to ensure availability and sustainable management of water and sanitation for all cannot be overemphasized. Hence a call to assess Nigeria's progress so far in working to achieve clean water and sanitation (SDG 6) by 2030, following the country's commitment to accomplish the SDGs. It was revealed in the conducted SLR that unimproved water sources such as rain, well, rivers and streams constitute the main source of water supply, worsened by the fact that a significant proportion of the population do not use any form of water treatment; putting the populace at risk of WBDs. The use of storage containers without cover was still obtainable in some studies, increasing chances of water contamination. Inadequate sanitation facilities such as pit latrine, capable of contaminating underground water, were the predominant toilet system. While open defecation gained popularity among Nigerians, the major means of refuse disposal was open dumping, both acts proven to pollute surface water. Significant absence of hand washing facilities with associated poor hygienic practices was seen, putting the population at risk of transmitting

infectious diseases. Typhoid and diarrhea were the commonly reported WBDs. Gaps in knowledge as well as strengths and weaknesses of the undertaken SLR were identified. Key issues hampering progress were highlighted and several evidence-based recommendations made in a bid to meet SDG 6 by 2030, which appears unlikely.

7. References

1. https://www.unaids.org/en/resources/presscentre/featurestories/2015/september/20150925_UN_Summit_opening
2. https://www.who.int/health-topics/sustainable-development-goals
3. https://nigeria.un.org/en/sdgs/6
4. Raimi MO. Odubo Tonye Vivien, Omidiji Adedoyin O, et al. (2018) Thesourcesof water supply, sanitation facilitiesand hygienepracticesin oil producing communities in central senatorial district of Bayel sastate, Nigeria. MOJ Public Health. 7(6): 337-345.
5. Obinna, CN, Osariyekemwen Uyi, Emmanuel J. Awosanya, et al. (2022) Review of Drinking Water Quality in Nigeria: Towards Attaining the Sustainable Development Goal Six. Annals of Science and Technology. 5(2): 58-77.
6. Igwe PU, Chukwudi CC, Ifenatuorah FC, et al. (2017) A Review of Environmental Effects of Surface Water Pollution. International Journal of Advances Engineering Research and Science. 4(12): 128-137.
7. https://www.google.com/amp/s/www.voanews.com/amp/unicef-nigeria-warns-million-at-risk-of-water-contamination-ailments/6494928.html
8. https://www.unicef.org/nigeria/stories/new-survey-reveals-progress-and-gaps-nigerians-access-water-sanitation-and-hygiene-services
9. https://www.worldbank.org/en/news/feature/2021/05/26/nigeria-ensuring-water-sanitation-and-hygiene-for-all
10. Aboyeji OS, Eigbokhan SF. (2016) Evaluations of groundwater contamination by leachates around Olusosun open dumpsite in Lagos metropolis, southwest Nigeria. Journal of Environmental Management. 183(1): 333-341.
11. Bello-Osagie OI, Omoruyi IM. (2012) Effect of brewery effluent on the bacteriological and physicochemical properties of Ikpoba River, Edo State, Nigeria. Journal of Applied Technology in Environmental Sanitation. 2(4): 197-204.
12. Titilawo Y, Adeniji A, Adeniyi M, et al. (2018) Determination of levels of some metal contaminants in the freshwater environments of Osun State, Southwest Nigeria: A risk assessment approach to predict health threat. Chemosphere. 211(1): 834-843.
13. Emenike CP, Tenebe IT, Jarvis P. (2018) Fluoride contamination in groundwater sources in Southwestern Nigeria: Assessment using multivariate statistical approach and human health risk. 156(1): 391-402.
14. Ayedun H, A M Gbadebo, O A Idowu, et al. (2015) Toxic elements in groundwater of Lagos and Ogun States, Southwest, Nigeria and their human health risk assessment. Environ Monit Assess. 187(6): 351- 367.
15. Ugwu CE, Maduka Ignatius Chukwudi, Suru Stephen Monday, et al. (2022) Human health risk assessment of heavy metals in drinking water sources in three senatorial districts of Anambra State, Nigeria. Toxicology Reports. 9(1): 869-875.
16. Odugbemi TI, Ogunsola FT. (2002) An assessment of existing common traditional methods of water purification. African Journal of Clinical and Experimental Microbiology. 3(1): 41-44.
17. Musa Manga, Timothy G. Ngobi, Lawrence Okeny, et al. (2021) The effect of household storage tanks/vessels and user practices on the quality of water: A systematic review of literature. Environmental Systems Research. 10(18): 2-26.
18. Jay PG, Matthew LP. (2013) Pit Latrines and Their Impacts on Groundwater Quality: A Systematic Review. Environmental Health Perspectives. 121(5): 521-530.
19. Syeda M, Aroma Pervaiz, Beenish Afzal (2013) Open dumping of municipal solid waste and its hazardous impacts on soil and vegetation diversity at waste dumping sites of Islamabad city. Journal of King Saud University-Science. 26(1): 60-64.
20. Daniel BO, Alemayehu GM. (2021) Availability and factors influencing community level handwashing facility in Ethiopia: Implication for prevention of infectious diseases. PLoS ONE. 16(1): 2-13.
21. https://www.unicef.org/nigeria/water-sanitation-and-hygiene
22. Dandabathula G, Pankaj Bharadwaj, Rutvik Sitiraju, et al. (2019) Combating Open Defecation through Community-led

Sanitation. Dr Sulaiman AI Habib Medical Journal. 1(3-4): 45-51.

23. https://eartheclipse.com/pollution/serious-effects-of-land-pollution.html
24. https://unstats.un.org/sdgs/report/2016/goal-06/
25. https://nigeria.un.org/en/sdgs
26. Ajibade, FO. (2015) Issues, Challenges and Management of Water Supply and Sanitation in Nigeria. Nigeria: Nigerian Institute of Civil Engineers.
27. Opeyemi A, Simisola O. (2020) A Legal Approach to Winning the 'Wash' War in Nigeria. European Journal of Environmental and Public Health. 4(2): 2-9.