



## ASSESSMENT OF INADEQUATE DOMESTIC WATER SUPPLY ON HUMAN HEALTH IN SELECTED NEIGHBOURHOODS OF LOKOJA METROPOLIS, KOGI STATE, NIGERIA

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### ABSTRACT

This study is on the assessment of inadequate domestic water supply on human health in selected neighbourhoods of Lokoja Metropolis. Descriptive and inferential statistics was used to analyse the data obtained using the structured questionnaire. Females and male respondents constituted about 56% and 44% respectively; while 62% and 32% married and unmarried; respondents between ages 31 and 40 years constitute majority of the study population, while respondents with tertiary education constituted 35%, and 32% of the total respondents with secondary education. Civil servants constituted 40%, and unemployed 16% of the total respondents. 40% of the respondents was found to earn between ₦31,000 - 40,000 monthly income. On the perception of households on the availability and adequacy of domestic water supply, the study found 64.7% of the respondents have pipe-borne water as their main source of water supply, with only 28.5% of the total have the supply daily. On the connection between potable water supply and health status among households, 76% of the respondents perceived strong relationship. Cumulatively, 67% of the respondents confirmed both the quality and quantity of water supplied play critical role in determining health status of residents. Skin diseases (96%), diarrhoea (96%), malaria (91%), cholera (67%), dysentery (67%), and respiratory diseases (67%) were the most perceived and experienced in the area, and in terms of prevalence order are malaria (81%); diarrhoea (61%); skin diseases (58%); cholera (34%); dysentery (31%); and respiratory diseases (14%) respectively. Households cope with inadequate water supply with 52% of respondents regularly treating their water before uses, 35%, 26%, 25%, 10% and 4% of the 52% respectively adopted boiling, addition of alums, filtering, chlorination and bleaching as the preferred treatment methods. Policy options that will aggressively launch adequate potable water supply infrastructure in the study area was recommended.

**Keywords:** Potable, Human Health, Perception, Chlorination, Bleaching

### INTRODUCTION

One of the most fundamental rights of human beings is the access to regular supply of quality water (Orji et al., 2020). Adequate potable water supply in both rural and urban regions globally have been neglected, and this has severely affected man, the aesthetics of his environment, and has further worsened issue of diseases prevalence. The importance of this right is far-reaching and includes the attainment of proper hygiene and public health. Thus, in view of the proposal by the United Nations (UN) (2015) on Sustainable Development Goals (SDGs), access to regular supply of quality water in both the rural and urban regions of the world ought to be a priority for local, regional, and international governments. However, this is often not the case in most nations particularly, in the developing nations despite the significance of domestic water supply (UNICEF, 2016). In the average household, water plays several important roles. The most basic of these roles include drinking, cooking, and hygiene practices, that is the washing of hands and other body parts after excretion (Okonko et al., 2008). Considering the significance of these activities, it is evident that water supply is an important aspect of the everyday experience of human beings.

There are many sources of water for the typical household in developing nations of the world. These include rainfall, hand-dug or protected wells and springs, neighbourhood or community, boreholes, and piped water supply (Miya et al., 2020; Basse et al., 2021). However, not all of these sources of water could be said to be totally safe for human consumption, including some of the pipe-borne water. Moreover, with community-level sources like boreholes, Orji et al. (2020) reported that when boreholes are used for too long, water quality gradually drops because the underground

pipes may have been corroded and clogged with sediments. The same is true for pipe-borne water (Shittu et al., 2008).

On his part, Miya et al. (2020) reported that water pollution is the main factor responsible for both water shortage and the contamination. Interestingly, anthropogenic activities have been found behind this pollution, from basic activities like farming and inordinate waste disposal to concentrated changes caused by industrialisation (John-Dewole, 2012). As such, with most agricultural practices relying on the use of fertilisers and pesticides, herbicides, fungicides and others practices that enhances soil erosion causing chemical substances to leach into surface water and aquifers, there will always be shortage of safe water (John-Dewole, 2012; Miya et al., 2020). Safe water in this context is simply water that is safe for human consumption and use. According to Iwara *et al.* (2012), the average quality of health among any population of humans can be used to indicate the quality of water available to the people in that population.

Consequent upon the high number of households with little or inadequate access to clean water supply, studies have shown that diseases such as malaria, cholera, diarrhoea, dysentery, hepatitis, skin diseases, pneumonia, intestinal illness, etc. have been very rampant (Atting *et al.*, 2019; Orji *et al.*, 2020). More so, the prevalence of inadequate water supply has severely affected the aesthetics of the natural environment so that many rural and semi-urban areas (not to mention the ghettos in cities) in Nigeria, and other developing states, are filth from one end to another, further worsening the issue of diseases prevalence (Agwu, 2013; Andres *et al.*, 2018; Akoteyon, 2019). Unlike the other variables of UN's Sustainable Development Goals (SDGs), including economic growth, climate change, and gender inclusion, health is a

fundamental factor without which it is impossible to achieve the other goals of the UN (Echendu, 2020).

In 2010, WHO/UNICEF (2010) reported that about 2.6 billion people globally do not have access to steady water supply sufficient for personal hygiene (about 46% of the world's population). Also, UNICEF (2016) in a study estimated that 74% of the people around the world (approximately 3.6 billion people) did not have access to potable water sources good enough for human consumption. Similarly, despite the water available to the people came from different sources such as protected wells and springs, boreholes, and pipe-borne water, its quality was still low. Good health is an important characteristic of human life. Many studies, including Darko *et al.* (2021), Mondelli *et al.* (2020), and Atting *et al.* (2019) have defined human health as being related to the prevalence or absence of diseases. In other words, a healthy person is one that is not generally vulnerable to common diseases, whereas an unhealthy person is susceptibility to even the most ordinary ailments (Mondelli *et al.*, 2020). Water is a common vessel that disease agents can pass through to infect human beings (Akoteyon, 2019). As a result, the quality of health in any place is highly related to the quality of water in that place (Bassey *et al.*, 2021). And human health and wellbeing are very important determinants of anthropogenic development (Robinette *et al.*, 2013).

There have been many recent studies on the subject of inadequate and contaminated water supply in Nigeria and their effects on human health. For example, Orji *et al.* (2020) was carried out a study on water and excreta sanitation in Imo State. The study used survey method to collect information from respondents, and a quantitative method to analyse the data. The study found that the residents of the study area had access to wells, boreholes, and piped water supply. However, the water these residents obtained from these sources had to be treated before it was consumed or there would be negative health implications.

Similarly, Miya *et al.* (2020) in their study of was about the effects of inadequate water supply to the community of Gidan Kwano in Niger State. The study also used a survey method to collect information regarding the quality and quantity of water from the respondents. The data was analysed using quantitative methods. From the results of this analysis, the study reported that these residents had serious complaints about water supply as their access to clean water was very limited, and were thus susceptible to different water-borne diseases.

Also, Akoteyon (2019) considered the inequalities in access to water and sanitation in rural settlements covering Apa, Ikoga, Ibeshe, Itori, Eruwa, and Lanlate in Lagos, Ogun, and Oyo States, Nigeria. Purposive and random sampling techniques were employed in the administration of copies of questionnaire to households, and descriptive and inferential statistics for the data analysis. The study found that only 8% of the respondents have ready access to safe water supply in the study area. Due to this scarcity of water among the remaining households, the respondents in the study area resulted to ration the water they have for different uses. As a result, they tended to minimize the amount of water used for domestic uses such as cooking, hand washing, among others. Furthermore, Atting *et al.* (2019) in their study on the prevalence of common diseases in a perturbed wetland community of Okorombokho in the Niger-Delta region, Nigeria. The study used stratified random sampling technique to select respondents, and descriptive statistics for the data analyses. From the results, all the respondents interviewed reported that they had recently been diagnosed with malaria, typhoid fever, diarrhoea, and dysentery, and that this was

because water treatment before consumption or usage was not popular among the respondents. It was concluded that lack of potable water supply, use of aquatic ecosystems as dumpsites for wastes, open defecation in water, poor sanitary and environmental conditions, and lack of well-equipped modern health care facilities were some of the enabling factors for the prevalence of diseases in this community.

While it should be obvious that the right to quality water is fundamental, there are households and regions where this is not the case. The regions of sub-Saharan Africa (for example, Nigeria, Ghana, and Kenya) are examples of such regions. They are places where malaria, cholera, diarrhoea, dysentery, Shigellosis, polio, hepatitis A&B, skin diseases, respiratory disorders like asthma, pneumonia, bronchitis, and other water-borne and excreta-related disease are prevalent, especially among children (Miya *et al.*, 2020; Orji *et al.*, 2020). Such diseases are found in water that has been contaminated with coliform organisms such *Streptococcus spp.*, *Staphylococcus spp.*, and *Salmonella*, all three of which pose a threat to healthiness (John-Dewole, 2012).

Despite the many attempts to solve the problem of inadequate/contaminated water supply around the world, people living in Nigerian are still getting ill as a result of bad water (Chukwuma, 2017). Many urban residents in the country have a limited access to frequent supply of safe water, and researchers are still burdened with providing sustainable solutions to these problems (Chukwuma, 2017; Emenike *et al.*, 2017; Roche *et al.*, 2017; Abubakar, 2018; Atting *et al.*, 2019; Orji *et al.*, 2020). While these studies cover the basics of the subject of inadequate water supply and its impact on human health, only Miya *et al.* (2020) conducted a focused study on the association between these two themes, that is, water supply and human health in the North-Central region of Nigeria. However, there are no recent studies on Inadequate Domestic Water Supply and Human Health in Kogi State available to the author. Therefore, this is the rationale for this study which is to examine the effects of inadequate domestic water supply on human health in study area.

The aim of this study is to examine the effects of inadequate domestic water supply on human health in selected neighbourhoods of Lokoja, Kogi State. The study is focused on the availability; accessibility; and adequacy of water supply; effects on human health of residents in the study area. The study area will cover some of the residential neighbourhoods of Lokoja which will include Felele, Lokongoma Phase I, Ganaja Village, Kabawa, and Adankolo. The selection of the study area was based on the fact that they are the residential neighbourhoods of Lokoja metropolis, with fair representation of vast majority of low to average income class earners, that will enhance fair data collection for the study. Meanwhile, data was collected between the months of February and June, 2023. These are transitory months whereby the dry and wet seasons overlap.

Gbarabe *et al.* (2021) in their study on residents' perception of public water supply in Port Harcourt Municipality, Rivers State, Nigeria. The study employed cross-sectional survey research design with sample size of 399 respondents randomly selected from five neighbourhoods in the study area. The results showed the respondents had varying accessibility to regular water supply. 70% of the respondents reported the distance to where they fetched water was less than 50 meters. The remaining 30% of the respondents had to travel for more than 50 meters. Also, the study found that 38.1% of the respondents did not have adequate water for their daily needs and had to resort to buying from commercial hawkers called 'Mai Ruwa' which may be loosely translated as water sellers. Similarly, the respondents reported that the causes of their

water problems are the water board's ineptitude (17.1%), lack of technical expertise to handle water pumping (17.3%), frequent breakdown of pipes (15.5%), dilapidated water mains (27.3%), and unplanned township/community (21.3%). Also, study by Orji *et al.* (2020) on the water and sanitation situation in Owerri Zone, Imo state, Nigeria, used survey research design to randomly sample 400 respondents from five communities and 10 households. The results showed varying responses regarding the perception of households regarding water availability and adequacy. In Owerri North, 40% of the respondents reported that the source of water in the study area was far from their house. In Owerri municipal, however, 72% of the respondents reported the same claim. The study also noted a significant difference in whether residents stored water and treated it before use. 72.2% of the respondents from Owerri North stated that they stored water for future use due to the scarcity of water, and 45% reported that they treat the water before using it. Conversely, 90% of the respondents from Owerri municipal stated that they also stored water for future use due to the scarcity of water, but only 37.5% reported that they treat the water before using it. Akinde *et al.* (2019) in a study on water shortages and drinking water quality in rural Southwest, Nigeria using Osun State as a case study. The study employed random sampling technique to select 200 respondents and frequency distributions in the data analyses. The findings showed that 62% of the respondents were sure that it was because of the inadequacy of water in their households that they were vulnerable to diseases such as cholera and dysentery. Conversely, 34% of the respondents opined that the scarcity of water only contributed a little to the prevalence of such diseases. The remaining 4% of the respondents did not think that the prevalence of illnesses such as cholera and dysentery had anything to do with the inadequacy of water in their neighbourhoods. John-Dewole (2012) studied the adverse effects of insufficient water supply as it affects the health of the people of Kajola local government area in Oyo State, Nigeria. During the three weeks of study in the community, the authors obtained records of various forms of water-borne diseases including typhoid fever, diarrhoea, paratyphoid fever and bacillary dysentery. The study observed that health-related problems in the study area were further aggravated by population growth without a significant improvement in infrastructure. Also, other water-borne diseases transmissible within southwest Nigeria were found to include cholera,

schistosomiasis, and hepatitis. The study concluded that a sufficient supply system represents a worthwhile and lasting investment which would benefit all by improving hygiene and reducing waterborne diseases.

The study conducted by Fadare and Olawuni (2008) focused on domestic water supply and health of households in the three residential densities in Osogbo, Osun State, South West, Nigeria. The study used proportional random sampling technique to select 246 respondents from the study area. Findings showed that only about 23.8% of respondents in the high residential density had access to a public tap and private well in their houses. Also, the incidence of diarrhoea (23.3%), stomach ache (20.2%) and typhoid (14.8%) were higher than the other two residential densities. The study revealed that there was a significant relationship between water sources and ill health in the three residential densities in Osogbo, the Osun State capital, despite the supply of water from three primary sources: pipe borne water, boreholes and wells. It was thus recommended that these water sources be bolstered to nullify the negative implications of their inadequacy to health.

### The Study Area

Lokoja metropolis can be found within latitudes 7°45' and 7°51' North of the Equator, and longitudes 6°41' and 6°45' East of the Greenwich Meridian (Figure 1). Relatively, it lies by the confluence of Rivers Niger and Benue at an altitude of 45-125 meters above sea level, with Niger State to the North, Kogi LGA to the East, Okehi, Adavi and Ajaokuta LGAs to the South, and Koton-Karfe and Kabba/Bunu to the West (Olatunde and Omachona, 2019; Ifatimehin, *et al.* 2014). Furthermore, Lokoja metropolis has an area of about 63.82km<sup>2</sup> (Adetunji *et al.*, 2015). The study area is around the Confluence of Rivers Niger and Benue with seasonal streams Meme & Osara being its major tributaries (Jaiyeoba, 2017; Ajiwoju, 2023).

The climate and vegetation of the study area is of unique characteristics. The climate is of the Aw climatic group of the Koppen climatic classification in which the wet season starts from May and last till October, while the dry season is from November and last till April (Ifatimehin *et al.* 2014). It experiences an annual rainfall of about 1016mm – 1524mm, and an annual temperature of about 27°C (Animasahun, *et al.* 2020). The relative humidity of the study area is about 30% in dry season, and 70% in wet season (Ifatimehin *et al.* 2010; Olatunde & Adejoh, 2017).

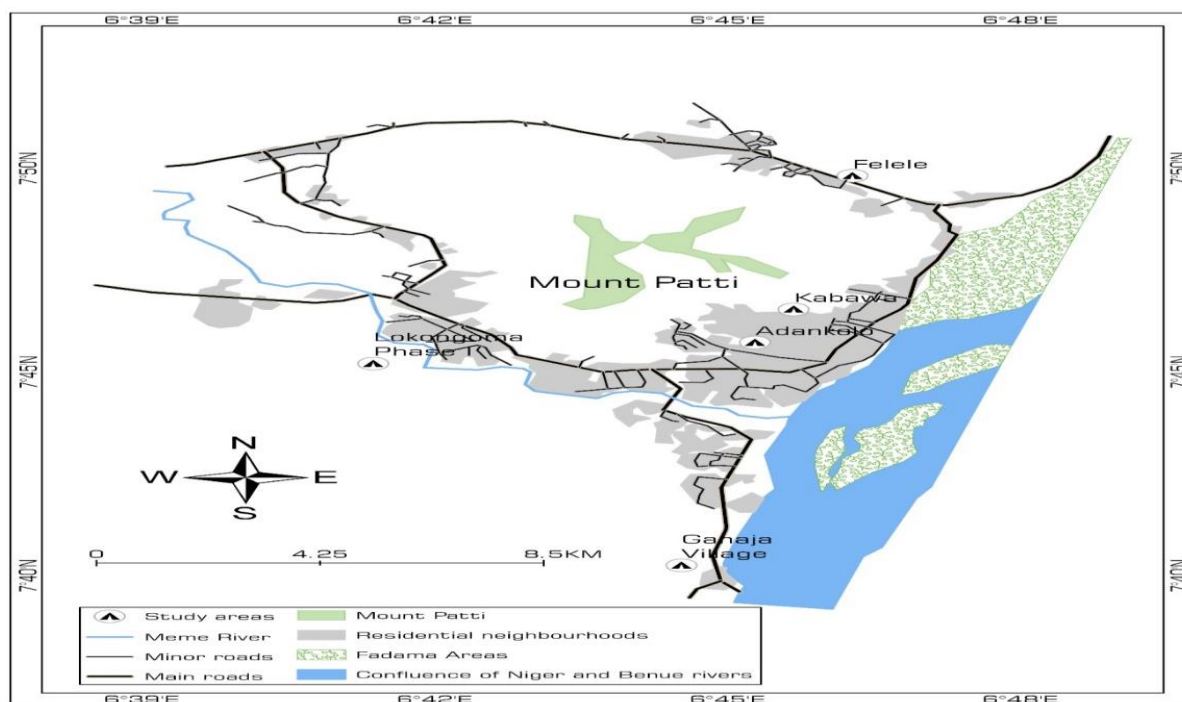


Figure 1: The Study Area

Source: Research work, 2023

The study area is located in the Guinea Savannah zone in the North Central Nigeria where the vegetation is an assortment of trees and grasses (wooded savannah) and forest (Alabi, 2009). Prominent economic trees found in this area include Cashew (*Anacardum occidentale*), Citrus (*Citrus genus*), Mango (*Mangifera indica*), Neem (*Azadiracta indica*), Pine (*Pinus genus*) to mention just a few (Alabi & Christian, 2013). This area is a confluence of the Basement Complex rocks and the Cretaceous Sedimentary rocks, with the area generally made up of dissected undulating plains on the other hand, and lofty masses of ranging Mount Patti and Agbaja, and Mesas on the other hand (Saliu *et al.*, 2015). The soils are greatly influenced by the geologic bedrock of Lokoja area containing upland and lowland soils aside the hydromorphic soils along the river channels (Ifatimehin & Oloninisi, 2017).

## MATERIALS AND METHODS

This study makes use of primary data collected on the availability; accessibility; and adequacy of water supply; and the effects on human health of residents in the study area. Also, both oral interviews and structured questionnaire were used as the instrument for data collection in this study. These instruments were used to obtain information on the demographic and socio-economic characteristics of households in Lokoja metropolis, perception of households regarding the availability and adequacy of domestic water supply in Lokoja, relationship between water supply characteristics and health status among households in Lokoja, and how households manage (cope and adapt to) inadequate domestic water supply and consequent effects on human health. Most of the questionnaire items were close-ended questions/statements. In some cases, 5-scale Likert responses was employed to measure the opinions of the respondents.

The study population comprised of all the residents of Lokoja metropolis as defined in the scope of this study. The sample frame, however, consists of all households with more than one individual who have some level of access to water supply, either from wells, boreholes, or connected piped water supply in selected residential neighbourhoods. These are Felele, Lokongoma Phase I, Ganaja Village, Kabawa, and Adankolo. The populations of the study area in 2016 was 223,094 (National Population Commission Lokoja, 2022). Using a growth rate of 2% as noted by World Development Indicators (WDI) (2021) for neighbourhoods in Nigerian cities, the 2022 populations of these areas were estimated to be 251,249. Specifically, the projected populations for the residential areas (Lokongoma Phase I, Ganaja Village, Kabawa, and Adankolo) are 44,144, 55,355, 49,161, and 26,264, respectively.

To achieve appropriate sample size for the administration of questionnaire, with respondents randomly selected in the study area, Yamane (1976) formula for sample size determination was employed, given as shown in equation 1.

$$n = \frac{N}{(1+N(e)^2)} \quad (1)$$

where:  $n$  is the estimated sample size,  
 $N$  is the size of the population under study (251,249),  
 $e$  is the error margin (7% = 0.07)

The application of the formula yielded a sample size of 204. Proportional random sampling was thereafter employed to select a total of 204 respondents (Table 1). Structured questionnaire was administered to the respondents across the selected residential neighbourhoods using systematic random sampling.

**Table 1: Sample Size Determination in the Study Area**

Areas	Population	Population proportion (%)	Sample size
Felele	76,325	30.4	62
Lokongoma Phase I	44,144	17.6	36
Ganaja Village	55,355	22.0	45
Kabawa	49,161	19.6	40
Adankolo	26,264	10.4	21
<b>Total</b>	<b>251,249</b>	<b>100.0</b>	<b>204</b>

Source: Author's computation, 2023

The application of the formula yielded a sample size of 204. Proportional random sampling was thereafter employed to select a total of 204 respondents (Table 1). Structured questionnaire was administered to the respondents across the selected residential neighbourhoods using systematic random sampling.

In order to achieve the objectives of the study, the following data were required:

- demographic and socio-economic characteristics of households in Lokoja metropolis which include data on sex, age, household size, education and income characteristics, etc. This will be obtained from primary sources through the administration of structured questionnaire to residents of the area.
- the perception of households regarding the availability and adequacy of domestic water supply in Lokoja: this data will also be obtained from primary sources through the administration of structured questionnaire to residents of the area, and include data on sources of water, frequency of water acquisition, level of accessibility, etc.
- the effects of inadequate water supply and human health status among households in the study area: These will be obtained from primary sources through the administration of structured questionnaire to residents of the area, and include information on perceived links between water characteristics (such as purity and cleanness) and disease prevalence.
- how households cope with and adapt to inadequate domestic water supply and its effect on human health: These will also be obtained from primary sources through the administration of structured questionnaire to residents of the area, including information on the various method that residents in the study area use in coping and adapting to the problems of water supply inadequacy and the consequent prevalent diseases.

## RESULTS AND DISCUSSION

### Demographic and Socio-Economic Characteristics of Respondents

From the survey methodology, this study obtained information from 204 selected residents in the study area (Adankolo, Felele, Ganaja Village, Kabawa, and Lokongoma Phase 1). Analysis of the respondents' demographic characteristics showed that averagely, 56% of the respondents are female and the remaining 44% are male. This corroborates the findings of Miya *et al.* (2020) and Umar (2020) that women are generally more open to participating in studies and interviews than men in previous studies related to this research. Similarly, the study shows that the distribution of respondents by marital status shows that 62% of the respondents are married which are in the majority, while 32% are unmarried. This scenario is a confirmation of the study by Lukman *et al.* (2016) that posited that, households with married people tend to use more water for domestic purposes than households with single individuals.

Meanwhile, the distribution of respondents by age range reveals that 32% of the respondents are between the ages of 31 and 40 years which are in the majority. This finding corroborates the studies by Akoteyon (2019) and Gbarabe *et al.* (2021) who concluded that, majority of households that need regular water supply are middle-aged. The rationale behind this fact is that individuals at this age range are often focused and have become responsible. Aside this, it also confirms the fact that, water is an essential requirement for every human irrespective of the age group and for different purposes.

Based on the distribution of respondents in this study by educational qualification, it was observed that 35% of the respondents have tertiary-level education, aside others with secondary, non-formal primary education qualifications. Furthermore, the study has shown the distribution of respondents by occupation revealing that civil servants constituted majority (40%) of the respondents, with about 20% are farmers; about 16% are unemployed; about 14% are students, and about the remaining 10% of the respondents are traders. Similarly, about 33% of the respondents earn between ₦31,000 and ₦40,000 monthly with only about 19% earning between ₦41,000 and ₦50,000, and only about 10% earn above ₦50,000. All these distribution pattern by education, occupation, and income corroborates the observations of Ebiloma (2019) that, Lokoja (the study area) is composed of households with different socio-economic characteristics, but a consideration percentage are in the lower-income class despite the above-secondary educational qualifications.

### Households' Perception on the Availability and Adequacy of Domestic Water Supply

In order to elicit information from respondents on the households' perception on the availability and adequacy of domestic water supply, various uses of water in the study area were examined. From the analysis, it was gathered that all the respondents use water majorly for drinking, bathing, washing, and cooking. However, only 97% and 76% of the respondents use water for washing and cooking respectively, while 100% of the residents use water for both drinking and bathing purposes. Considering the educational level of respondents in the study area, these findings corroborate that of Bassey *et al.* (2021) that, using water for drinking and bathing is a universal behaviour by members of civilised societies. However, these variations could be attributed to differences in the traditional role of men and women, and based on the fact that female gender are more associated with cooking than males.

The above situation is evident in the findings of Gbarabe *et al.* (2021) who explained that gender is one of the reasons for the variation in the constant use of water in households. Nevertheless, this distribution pattern of water uses in Lokoja households substantiates the arguments of Bassey *et al.* (2021) who argued that there are certain purposes of water, e.g., drinking and bathing, that are more important. Due to the nature of the human biology, both of these purposes of water cannot be ignored. The implication of ignoring water for

bathing portend various unhygienic conditions such as bad body odour, skin diseases, etc., whereas the implication for ignoring water for drinking aside thirst, dehydration, among other things may eventually lead to death in humans, and other organisms.

Also, from the analysis of the distribution pattern of respondents, the overall distributions of the respondents from the study area revealed about 65% of the respondents have pipe-borne water as the main source of water supply, whereas 14% rely on well water, 10% rely on public boreholes, while the remaining 7% and 4% respectively rely on rain water and water from streams as the main source of water supply in their neighbourhoods. These findings support the study by Orji *et al.* (2020) on the assessment of water and excreta sanitation in Owerri municipal, Imo State stating that pipe-borne water is the commonest source of water in most Nigerian cities and towns, and that other water sources, such as streams and wells, were gradually being phased out of cities and might only be found in rural or semi-urban areas as a result of civilization bringing development.

On the respondents' perception on the frequency of supply of water from the piped water system, it was altogether revealed that, about 40% of the respondents get pipe-borne water once or twice a week, 21% get pipe-borne water only on weekends, 19% get water 3 to 5 days a week, 16% get water irregularly, and the remaining about 5% get pipe-borne water every day. It is obvious from these results that there is a variation in the respondent population which can be traced to location and socio-economic variables. This confirms the arguments of Akoteyon (2019) about the distribution of pipe-borne water points in South western Nigeria: that this distribution is not universal but dependent on different factors. In other words, unless all the respondents in this study are in the same socio-economic class, for example, there will be an observable variation in the rate at which they get water for their household needs among other reasons.

#### **Effects of Inadequate Water Supply and Health Status of Respondents**

More importantly in this study, the results analysis further showed cumulatively, majority (76%) of the respondents from the study area perceived that, water supply in the area have a very strong relationship with the health status of residents, while the remaining respondents (24%) perceived that there is only a weak relationship between water supply and health status. By these result, majority of the respondents perceived that the health status of an individual is significantly related to the water supply available to that individual. This confirm the arguments presented by studies such as Gbarabe *et al.* (2021), Miya *et al.* (2020), and Chukwuma (2017), which contended against the notion of no association or a weak association between water supply and health status and instead, argued that an average individual's health status is dependent on water characteristics such as quality. In their opinion, when an individual drinks good water, they ought to be fine. It is only when an individual drinks contaminated water that they are prone to illness (Chukwuma, 2017).

However, about 67% of the respondents opined that both water quality and quantity are important indices that determine the health status of an individual, while about 21% opined that only water quality had a significant association with health status, and 12% claimed that only water quantity had a significant association with health status. Going by the majority of 67% who opined that both water quality and quantity is important to determine the health status of an individual, we can draw similarities between the results of this study and those of Gbarabe *et al.* (2021) for the residents of

Port Harcourt, Rivers State, which reported that Port Harcourt residents generally perceived that both water quality and quantity are needed to maintain a healthy lifestyle, so steps should always be taken to ensure that water supply is regular and the water supplied is at least suitable for consumption.

Cumulatively, 95% of the respondents in the study area reported that quality of water played the central role in determining health status, whereas 91% pointed to the source of the water as the chief determinant of health status. Furthermore, 81% of the respondents pointed to the frequency of water supply, and 67% indicated quantity of water as the main variable of water that influences human health. By comparison, the majority of respondents highlight water quality as the main determinant of health status, and this is confirmed by Idowu *et al.* (2015) and Lukman *et al.* (2016). Both of these studies noted that water quality (in terms of purity, especially) can affect human health to the point that an individual can get sick or healthy 1 hour after drinking water. So, if the water is pure, the individual's biological system will be strengthened, but if the water is not pure, the biological system will be weakened (Lukman *et al.*, 2016).

Importantly also, the results from this study shows that among the diseases perceived by the respondents to be caused by water are diarrhoea (96%), skin diseases (96%), malaria (91%), cholera (67%), dysentery (67%), and respiratory diseases (67%). These same diseases have been experienced by the respondents, although they vary in occurrence. The analysis shows that malaria was the most commonly contracted disease (81%), followed by diarrhoea (61%), skin diseases (58%), cholera (31%), dysentery (34%), and respiratory diseases (14%). Although there is a difference between these results and those of Atting *et al.* (2019) and Ifatimehin and Ujoh (2014), both of these latter studies admit that the prevalence of malaria is highly related to the supply of water to households.

#### **Households' Coping Strategies with Inadequate Domestic Water Supply to Residents**

In a further assessment of the respondents' methods of improving the quality of the water used domestically in the study area, given the inadequacy in the supply, about 35% boil water before consumption, 26% add alum, 25% filter water with fabric, 10% use chlorination, and the remaining 4% resort to bleaching. In other words, boiling is the most common method used by households in the study area to treat water. This result supports the reports of the WHO/UNICEF (2010) that rudimentary methods of treating water are prevalent in developing nations like Nigeria. The reason for this 'backwardness' is not only that there is a general unawareness regarding contemporary water treatment methods, but the methods adopted by residents are easy to use. However, on the effectiveness of the treatment methods used, about 48% of the respondents reported that the methods used are not effective in purifying the water in the study area. Thus, about 30% of the respondents reported that the methods they use are moderately effective, while the remaining 22% stated that the methods they use are very effective. Using a cumulative measurement, we can conclude that water treatment methods highlighted earlier are somewhat effective, but not all the time. This is similar to the concession made by Akoteyon (2019) regarding water sanitation in Nigeria affirming that there are a number of varying water treatment methods, but these all have a limited relevance in the average Nigerian household.

Two null hypotheses were stated for this study which stated that there is no significant difference in the perspective of the residents of Lokoja about the adequacy of water supply, and

that there is no significant relationship between inadequate water supply and health status in the households of the study area. Using the Chi-Square statistics however, the results shows that there is a significant difference in residents' perception of water supply ( $\chi^2(4) = 66, p < 0.001$ ). In other words, the null hypothesis is very highly false at the 5% level of significance and must be rejected. Consequently, the alternative hypothesis that there is a significant difference in the perspective of the residents of Lokoja about the adequacy of water supply is correct. This is keeping with the arguments of Akoteyon (2019) that it is impossible for variations not to exist in perception regarding water availability and adequacy. Furthermore, test results on significant relationship between inadequate water supply and health status in the households of the study area, the Spearman's Rank correlation test showed that there is a statistically significant relationship between water supply and health status ( $\rho(2) = 0.918, p < 0.001$ ). In other words, the residents of the study area don't all get the same supply of water, and the higher the frequency of water supply, the higher the health status of an individual/household (UN, 2015; UNICEF, 2016).

## CONCLUSION

There is a clear demographic and socio-economic pattern in the respondents interviewed. According to the analysis of their demographic and socio-economic characteristics, female residents are more common in the study area than male residents. Also, pipe-borne water is the most prevalent source of water in the study area, while others like wells and streams are gradually going out of fashion among respondents. Furthermore, there is a significant relationship between health status and water characteristics such as quality, quantity, and frequency in the study area. The study shows that among the inadequate water related. This study thus recommends collaborative efforts from both government and private individuals in order to provide more functional boreholes in the study area, and government should urgently revive the existing Water Board and distribution network curb the inadequate supply of potable water supply in the study area, thereby improving the health condition of residents in the study area.

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