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RESEARCH ARTICLE

Water Demand among Hostel Residents in Tertiary Institutions in Calabar, Cross River State, Nigeria

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Abstract
Water is life and living things depend on it for survival. The role water plays in determining survival has made it a very essential commodity. At the household level, water is needed for several reasons including personal hygiene, food preparation, laundry, drinking and general sanitation. Occupants of hostels in tertiary institutions demand water for the reasons listed above and more hence, the study focused on analysing water demand among hostel occupants in tertiary institutions in Calabar, Nigeria. Data for the study were elicited using copies of questionnaire, interviews and personal observations. A total of 400 copies of questionnaire were distributed in five (5) hostels where students in tertiary institutions reside in the study area. Specifically, data were obtained to ascertain the water demand and supply situation in hostels while the determinants of water consumption in hostels were also addressed. Data were analysed using various statistical approaches such as means/averages, simple percentages, frequencies and Pearson product moment correlation based on statistical package for social sciences (SPSS). The study established a strong positive relationship between water demand and supply in the hostels. Hence, it was observed that water consumption is influenced by supply/availability. The study further observed that the determinants of water consumption in the study area include environmental factors, source of water, gender, among others. Notably, it was deduced from the study that residents of hostels consume water in larger quantity when the temperature is high. Based on the findings, it was suggested that access to improved water be maximized in hostels. The need to ensure regular appraisal on the water demand/supply situation in hostels was also buttressed in the study.

Keywords: Residential hostels; source of water; traveling distance; water consumption; quantity/quality of water

Introduction

Water is a very essential commodity. It influences the survival of all living things. The importance of water has made it to be regarded as one of the basic necessities of life (Eteng and Ajom, 2021). Considering the importance of water, access to remains a very important feature. According to the World Health Organization (2018), water that should be consumed has to be from clean, safe and healthy sources. This implies that people should have access to safe and potable water for consumption from improved sources and within considerable walking distances from water sources to homes of consumers. Against this assertion, access to potable water is measured by the number of people that can obtain water in required quantity and quality on daily basis from healthy sources. Eteng and Ajom (2021) further define access to water incorporating variables such as considerable walking distance to water source, considerable tariff from water vendors, obtaining water that is of good water quality and in sufficient quantity from source of water supply.

From the foregoing, it is clear that water demand is ever increasing among humans. Holistically, there are indicators to water consumption. For instance, population/household size, activities embarked upon, pattern of water consumption and general behavior of people define largely the pattern of water consumption in a particular area (Eteng, 2021). Hence, scholars have found a relationship between household size and water consumption, walking distances, income of consumers and household activities and water consumption among people in various cities of the developing world (Ofem, Atser and Nwagbala, 2019; Okah, Peter and Allain, 2019; Eteng, 2021). Across places, water demand/consumption differs based on activities, water availability and accessibility to water hence, water provision has become a very vital subject of interest in recent studies considering human dependence on it and the ever increasing nature of human population which only deepens the extent to which water is consumed. Furthermore, water is reguired for consumption in homes, offices, schools and administrative institutions. However, the level to which water demand differs across institutions

has not been given attention in available studies especially as it relates to educational institutions specifically in residential halls that are provided for students in tertiary institutions. Arising from existing studies and observations, it is obvious that in several tertiary institutions, accommodation is provided by school authorities to students in residential halls. Water being an indispensable commodity is largely demanded for consumption in residential halls for varied purposes. Available studies (Sattar, Afridi, Afridi and Khan, 2019; Ugwoha and Nwike, 2019; Daud and Abdullah 2020) have shown that water is a serious necessity for students in residential halls in tertiary institutions across the world. The studies reported that students demand/consume water at varying levels depending on body system, activities, seasons and preferences.

Earlier, findings in existing studies posit that among facilities and services needed to be made available and accessible to students in tertiary institutions so as to make residential hostels in tertiary institutions enjoyable, water is a very essential commodity. They opined that when students have access to basic amenities and services, they are likely to be in better state of health to face their academics (Eteng, Mfon and Okoi, 2022; Dare nd; Igudia and Agbonifoh, 2019). The studies above showed that when residents in hostels in tertiary institutions are not provided with sufficient water and at required quantity, their attitude towards sanitation becomes a problem. Generally, sanitation and water availability tend to be intertwined as the earlier tends to depend on the later to a large extent. Eteng *et al.,* (2022) further used water accessibility and water availability as a variable in determining the level of housing satisfaction of students in tertiary institutions. Okoi, Okoi and Eteng (2022) showed that access to facilities and amenities in schools influences the academic performance of students to a large extent. Buckley (nd) pointed out that students in residential halls demand water for laundry, sanitation/personal hygiene, cleaning of surfaces and drinking. Sattar, Afridi, Afridi and Khan (2019) were of the view that water consumption in student hostels is increasing astronomically and it patterns of consumption is tied to activities, water availability and so on.

Apart from water accessibility, another important feature that is concerned with water consumption is water quantity and quality. This is because the quality and quantity of water influences water demand (Eteng, 2021). Notably, when available water for consumption is not sufficient in terms of quantity and of quality, consumers are likely to turn to other sources in order to satisfy water needs. However, water consumption is mostly predicated upon activities, household size, income and seasons (Eteng and Ajom, 2021). Across the globe, water demand/consumption differs. For instance, residents of United States of America consume at least 200 litres of water per person on daily basis and 50 litres per person per day is required for people in India (Eja, Otu, Atu and Edet, 2011). The WHO and UNICEF (2008) suggest the consumption of at least 50 litres of water for domestic use on daily basis. The World Health Organization (WHO) (2010) further suggested at least 50 litres of water for daily use. They explained that, 5 litres is required for drinking, 20 litres is expected to take care of daily hygiene and sanitation, 15 litres is required for bathing and 10 litres should be used for food preparation. Ugwoha and Nwike (2019) showed that hostel residents in Port Harcourt depend on borehole for water needs. Their study revealed that water quality largely influence water consumption. In Calabar, Nigeria, there are several tertiary institutions that provide residential accommodation to their students. These hostel residents demand water for domestic use. For instance, they demand water for laundry, sanitation, personal hygiene and other purposes. Despite the obvious nature that students in residential halls consume water, the level to which they demand water has not been given adequate attention in available studies. This implies that there is a gap on knowledge that needs to be filled. Against this backdrop, this study was conceived.

Literature Review

Water is a very essential commodity. Due to the importance of water, various policy pronouncements have been made in time past by relevant government agencies, development partners and institutions globally. Notably, the United Nations (UN) posited that by the end of 2015, water supply problems will be conquered. The institution captured improved water supply as one of the millennium development goals which were expected to be fully implemented by the end of 2015. Long after 2015, developing countries are still battling with water crisis. Residents especially in rural areas are deprived while contaminated and poorly treated water is continually supplied to urban residents in major towns and cities of developing world (Eteng and Ajom, 2021).

At present, access to water from safe, healthy and improved sources remain a serious problem. Specifically, the World Health Organization (WHO) and United Nations Children Emergency Fund (UNICEF) explained that of 1.1 billion persons representing 17 percent of the world's population do not have access to improved and safe water. The above statistics are applicable where access to water is measured in terms of availability of at least 20 litres of water per person per day from potable and improved water sources within a distance of 1 kilometre. Therefore, access to water is a challenge.

In Nigeria, current realities explain water supply inadequacies in terms of quality and quantity. This is against earlier pronouncements by the Nation that water supply will be largely funded and facilitated by governments at all levels. Atser and Akpabio (2015) pointed out that policies have been generated to facilitate funding for the supply of water. Holistically, the ability of a system to function maximally depends to a large extent on the availability of funds, thus, the National Water Supply policy in Nigeria made provision for the funding process in water supply to be shared across the three tiers of government and the host communities. As reported by Atser and Akpabio (2015), the Federal government is expected to handle 50 percent of the bulk of cost required for the development of water supply systems in both rural and semi-urban areas while 30 percent of the cost is to be shouldered by the federal government in the urban areas. The state government is to take 25 percent of the cost in rural areas while 30 percent of the cost is shouldered in semi urban area. The state government also foot 60 percent of the cost required to supply water in the urban areas. The Local Government bears 20 percent of the cost in rural areas and 15 percent of cost in semi-urban areas. The community further bear 5 percent of the bills required to supply water. Sadly, the policies contradict with current realities as the pronouncements have only remained in principle with little or no attempts to ensure implementation same.

Institutions of learning are not without being affected from the inability of the government and relevant agencies to ensure adequate water supply as noted in existing studies. In studies bordering around water supply in educational institutions, scholars have shown that in spite of the importance and necessity of water to life, there is inadequacies in it supply thus affecting the general consumption/demand of water. Along this line, Igudia and Agbonifoh (2019) observed that sanitation practices among students residing in Ugbowo campus of University of Benin students are poor. The poor sanitation practices are not unconnected with the water supply situation which is worrisome. The quantity of water that is expected to be provided is not met hence, the students are forced to manage the little that is made available thereby constraining their attitude to sanitation. It should be noted that sanitation is a serious derivative of the water supply situation being that it is almost impossible to ensure proper hygiene without application of water in the sanitation process. Igudia and Agbonifoh further observed that sanitation practices among the students is equally influenced by gender and age of the students. For personal hygiene, toilet and environments to be clean, the place of water cannot be over emphasized. Aggregating the quantity of water that should be made available for students in residential hostels, Daud and Abdullah (2020) posited that demand/consumption of water by students in residential halls has long surpassed 250 litres hence, there is need to improve on the water quantity that is supplied. Otaki, Otaki, Sugihara, Mathurasa, Pengchai and Aramaki, (2008) showed that water that is required for personal hygiene per head surpasses 124.8 litres where it can be classified as the highest residential water consumption activity compared with other. Apart from personal hygiene, water is equally demanded for meal preparation, drinking, washing of clothes among others hence, water demand among students need to be given adequate attention in residential hostels.

In related studies, Yagoub, AlSumaitu, Ebrahim, Ahmen and Abdulla, (2019) in United Arab Emirates University (UAEU) appraised water consumption for three years (2016, 2017, and 2018). Their study applied geographic information system (GIS) in determining where water use is high within the university, when and why water is used, who uses it, and how to minimize its usage. They were of the view that water use is directly proportional to the number of students and is lower during winter. They modelled the relationship that exist between water use and number of students in academic buildings using least squares regression. Their results indicated a low correlation between water use and the number of students. They attributed the outcome of their results to centralized usage of academic buildings and movement of students between them. They equally observed that water use within the institution is higher in residential halls of students. Their study showed average water consumption to be 47.5 percent averaging 81.7 litres per person per day. The outcome of their study show lower metrics for residential halls of students in the United States which depict 121 liters per person per day and Europe that indicate 143 liters per person per day (Yagoub *et al*., 2019). Furthermore, Dare, (nd) made similar observations in Kogi State University, Nigeria. Dare's study revealed that only 62 percent of students were satisfied with the water supply situation in the residential halls of the school. He noted that students are facing difficulties in accessing water hence, their consumption of the commodity is proportionally affected.

Materials and Methods

Study Area

Calabar metropolis is the study area. It is the Capital city of Cross River State, Nigeria. It is situated between Longitudes 8 º18` East and 8º26` East of the Greenwich meridian and Latitudes 4º50' North and 5º67' North of the Equator. It is bordered in the North with Odukpani Local Government Area and in the West with the Calabar River. In the East, it share boundaries with the Great Kwa River

and in the South, it share boundaries with the Atlantic Ocean. Calabar is an ancient city with very interesting and fascinating history. The residents of the Calabar had early contact with the colonial masters and as such, there is massive literacy in the area (Bassey, Amba and Eteng, 2022). Between 1882 and 1906, Calabar served as the first administrative capital of Nigeria. The city has been growing astronomically over the years. Going by the population trend, the city had a total of 82,100 in 1975 while in 1978, the population had increased to 159,599. The total number of persons increase to 140,200 in 1985 and by 1991, the population was 217,800 320,862. The 2006 population census results put the total number of humans at 375,196 (Agbor *et al.*, 2022). The bulk of the population is made up of migrants from rural areas. Migration into the city has become inevitable due to disparity in the provision of facilities and services of the area when compared to the adjoining rural areas. The people are largely engaged in commercial, industrial, educational and small scale farming activities. Being the first administrative headquarters of Nigeria, the residents of Calabar had early contact with the colonial masters therefore, literacy level is very high. Presently, there are several tertiary institutions in Calabar Most of the schools provide hostel accommodation for it students.

Due to the nature of the study, data were obtained from 5 (five) tertiary institutions in the study area. Data on the quantity of water demand per head was obtained using copies of questionnaire. Data on water supply situation in the study area were elicited from water regulation units in the institutions. Therefore, the main instrument for data collection in the study was questionnaire. However, observations, linear measurements and interviews with authorities that are concerned with water supply in the institutions aided data availability. In order to determine the quantity of water that is consumed by students in residential halls, data related to water demand/consumption among students were obtained for seven days then, averages/mean were taken on the total water consumption and used in the analysis (Eteng, 2021). To this end, respondents in the study consist of both students and representatives of the school authorities that are concerned with water supply to the students. In all, 400 copies of questionnaire were purposively distributed. Specifically, 80 copies of questionnaire were purposively distributed in each of the 5 schools to help in collecting data on the water consumption, demand and supply situation. Questionnaire adopted various approaches in obtaining responses closed and open ended questionnaires. Information were entered into the SPSS environment and analysed appropriately. Furthermore, data for the study were presented using tables while analysis were operationalized using descriptive statistics, simple percentages and Pearson product moment correlation based on statistical package for social sciences. Data on water demand/consumption among students were compared with the quantity that is supplied using averages in order to establish the strength of the relationship between the variables.

Findings and Discussions

Quantity of water demand and supply

The Pearson Product Moment Correlation was used in examining the association between the quantity of water demand and supply in residential hostels within tertiary institutions in Calabar. The results are shown in Table 1. The results indicate a positive relationship between the variables. Furthermore, the magnitude of the Pearson correlation coefficient determines the strength of the correlation such that a Pearson correlation coefficient (r = 0.978) suggests a strong relationship. The level of statistical significance (i.e., the -p-value) is shown in the second row of the matrix. Its value can range from -1 for a perfect negative linear relationship to +1 for a perfect positive linear relationship while a value of 0 (zero) indicates no relationship between two variables.

In order to analyse the linear relationship between the variables in the sample population, the level of statistical significance was tested. However, it was shown that the level of statistical significance (p-value) of the correlation coefficient was 0.004. This imply that there is a relationship between the two variables. The sample size, n (i.e., the number of observations) shown in the third row of the matrix/ box, indicates that there are 5 samples. In other words, the sample size of 5 was used in this study. The results of the test align with earlier findings. For instance, Eteng (2021) observed a relationship between water demand and supply. His study noted that the relationship is not without disparities in the quality of water that is supplied to respondents. Ofem *et al*., (2019); Eteng and Ajom (2021) in separate studies also reported similar findings. They attributed the relationship to be due to the fact that in spite of the failure of government institutions in supplying water, consumers demand alternative means so as to satisfy their water needs. Eteng and Ajom specifically established that water consumers will explore every available options to obtain water so as to satisfy their needs since water is a necessity of utmost importance. This finding therefore imply that while students may not have access to improved and safe water sources, they may turn to unhealthy sources only to ensure that their water demands are satisfied.

Determinants of Water Demand

The determinants of water demand/consumption in residential halls within tertiary institutions were assessed and presented in Table 2. As noted in the table most water consumers in hostels were identified to be females. However, males consume less water when compared to the females as noted in the table. Differences in water consumption among students on the basis of gender were

earlier carried by Daud and Abdullah (2020). Their findings revealed a difference in the water consumption of both males and females and there agreed that females consume larger water quantity. Dare (nd) opined that water influence sanitation among students and females demand more water quantity to be able to maintain personal hygiene. Furthermore, Mohammed (2014) argued that female water consumption outweigh that of the males being that females engage in more activities that result in cleaning, personal hygiene among others that require large water quantities.

Table 1: Relationship Between Water Demand and Supply in Tertiary institutions in Calabar

		Water demand	Water supply
Water demand	Pearson Correlation	1	.978**
	Sig. (2-tailed)		.004
	Sum of Squares and Cross-products	702.800	2050.000
	Covariance	175.700	512.500
	N	5	5
Water supply	Pearson Correlation	.978**	1
	Sig. (2-tailed)	.004	
	Sum of Squares and Cross-products	2050.000	6250.000
	Covariance	512.500	1562.500
	N	5	5

Statistical Computations, 2022

The study also indicated that the dominant age bracket of water consumers was observed to be those between 18 years and 25years. In earlier studies (Sattar *et al*., 2019; Okoi *et al*., 2022 and Eteng *et al.*, 2022) were of the observation that university hostels are predominantly occupied by students within the age bracket of 18 and 25years. By extension, people within this age bracket tend to be the most consumers of water. Furthermore, the predominant ages of those that demand water in hostels are within the very active ages and as such, can be involved in varying activities that are capable of demanding water in large quantity. The table further revealed that students depend mainly on borehole in order to satisfy water needs. This is due to the fact that other water sources are largely unstable. That is, water sources such as rain-harvest, water board among others are unstable hence, attention has long been turned by school authorities to ensure the drilling of boreholes for it students. Mohammed (2014) made similar observations when he pointed out that poor regulatory frameworks for supply of water and the bundle of costs required in treating water has long made government agencies to prefer the idea of supplying water that is drilled. In most cases, the water from boreholes is not treated before use hence, there are indications that it quality is likely to be poor and it may be unhealthy and unsafe for drinking and general consumption (Ugwoha and Nwike, 2019).

Equally, it was observed that residents in the halls mainly consume larger water quantities during early hours. This variation in water consumption is occasioned by the need for preparation of meals, personal hygiene/sanitation and many other activities by students in residential halls that demand water. It was also observed that environmental factors such as weather, climate and seasons determine water consumption to a large extent. For instance, the quantity of water demand during periods of high temperature exceeds water demand during normal temperature.

Table 2: Determinants of Water Demand

Variables	Categories	Percent
Gender	Female	51
	Male	49
Age	Below 18	32
	18-25	41
	25 – above	27
Water source	Borehole	100
	Rain harvest	-
	Water board	-
Period of intense water use	Morning	49
	Afternoon	16
	Evening	35
Environmental factors	Yes	100
	No	-

Source: Field Survey, 2022

Conclusion and Recommendations

The study analysed water demand among students in residential halls in tertiary institutions in Calabar, Nigeria. Holistically, water is of immense importance and there is need to ensure that students in tertiary institutions are given maximum access to water especially those that are residents of hostels. This is because it is difficult to meet up with needs such as sanitation, personal hygiene and even house chores including food preparation, laundry and so on without sufficient water. Furthermore, residents of hostels in tertiary institutions in the study area demand water at varying quantities depending on their gender, environmental factors and needs. For instance, students drink and consume larger water quantity when the temperature is high than in days of moderate temperature. Water availability plays a very significant role in water consumption. For instance earlier studies (Eteng 2021; Eteng and Ajom, 2021) which the study align with have shown that water demand is significantly tied to water availability/sufficient supply. The issues bordering inadequate water supply are disastrous. For instance, when students are not given access to adequate water and in required quantity, there are indications that health problems will be unavoidable. Equally, when the quality of water that is available is not fit enough for consumption, the health of the public and indeed the residents of tertiary hostels will be threatened. From the study observation, it is obvious that there is need to ensure that water supply has to be maximized and that good quality water should be made accessible to students as the quality of water consumed play a very significant role in determining the state of health of students. It is therefore inferred that water that is made available to students be treated appropriately using best global standards. Furthermore, water should be made available in sufficient quantity so as to help students maximize water use while carrying out personal hygiene, sanitation and satisfying other water needs. Finally, the institutions should carry out regular appraisals and review of the water supply situation in the hostels within tertiary institutions. This will help check water leakages, pipe damage and other problems that may arise in the water provision process in the hostels.

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