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Water Sanitation and Hygiene Practices in Slums – A Case Study of Ilaje Slum in Lagos State, Nigeria

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***Abstract*: Environmental health studies have grouped factors influencing water transmitted diseases into; water related, water based, water washed and water borne diseases. These diseases are classified to be either induced by level of access to water and sanitary or hygienic behaviours, and are considered as a concern for optimal environmental health. However, despite the deplorable environmental conditions of slum communities in Lagos metropolis, no study has considered access to water supply conditions as a contributing factor to environmental health challenge in Ilaje slum. Thus, this study examined the influence of access to water supply conditions on environmental health problems in Ilaje community of Lagos State. Using a simple random sampling procedure, 391 questionnaire were administered and analysed with the use of descriptive statistics (frequency tables) and inferential statistics (Pearson Chi-Square). Attempts were made to identify and examine the socio-economic characteristics, access to water supply, sanitary/hygienic behaviours of respondents, and also the relationship between access to water supply and environmental health status of respondents in the study area. The research result established that variations exist in the respondents' access to water supply, with 51.2% indicating that borehole is their predominant source of water. Analysis on sanitary/hygienic behaviours showed that the most dominant (27.4%) toilet type is flush/pour toilet and 60.9% of these toilets are shared. Result of analysis on rate of suffering water related, water based, water washed and water borne diseases revealed that at least 59% households have cases of malaria monthly, 85%, 53%, and 79% reported an annual case of Worm, scabies and dysenteries respectively. Also 56% and 64% reported an annual case of diarrhoea and Typhoid Fever respectively. In conclusion, the study inferred that household access to water supply conditions influence environmental health status of Ilaje slum households. Thus, the study calls for a deliberate policy to provide good water supply conditions that will encourage sanitary and hygienic behaviour adequate enough for slum households to have improved environmental health condition.**

***Keywords*: environmental health, slum, water supply, sanitation, hygiene.**

1. Introduction

Recent population estimation has shown that 54 per cent of the world's population currently resides in urban areas, while 66 per cent is projected to be urban between now and 2050 (UN-HABITAT, 2014). Specifically, population growth and urbanization are projected to add 2.5 billion people to the world's urban population by 2050, with nearly 90 per cent of this increase expected to come from Asia and Africa. Just three countries-India, China and Nigeria-together are expected to account for 37 per cent of the projected growth of the world's urban population. Over 40% of this urban population is projected to live in slums. According to United Nations news Centre report in 2010, a significant per cent of the urban population in developing countries are typically found in slums. This has been corroborated by Ahmed in 2011 when his study revealed that in Bangladesh, a great majority of the urban populations live in slums. In Kenya, Hurskainen (2004) reported that the issue is very pronounced – some 70% of the total urban population lives in slums. In Lagos, over 49 neighbourhoods have been identified as slum communities with poor housing characteristics, lack of basic amenities, particularly good water, food insecurity, unclean environment, crowded compounds all associated with poverty and poor health conditions.

Among the challenges posed by slums, the most prevalent in developing countries are environmental risk factors which emanate as result of lack or inadequate urban infrastructure/utilities. As opined by Bartram, Lewis, Lenton and Wright (2005) almost half the people in the slums of developing world have one or more of the main diseases or infections associated with inadequate water supply and sanitation. Also Shyamsundar (2001), in an attempt to rank environmental diseases in terms of their contribution to burden of diseases suggests that water and sanitation related diseases are the most important for developing countries.

Water and sanitation are often studied together to determine their combined impact on health since they are assumed to be highly correlated with each other. A few studies have recognized this tendency and attempted to separate the effects of improved water from the effects of improved sanitation. Esrey et al. (1985) designed a study that separately analysed the effects of water quality, water availability, and method of excreta disposal and found that water quality does not have as large of an impact on diarrheal diseases as water availability or proper excreta disposal. In another study, by separating water

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and sanitation, Esrey concluded that child nutritional statuses only improved from increased water access when water was increased to the optimal level and when sanitation was also improved (1996). Wibowo and Tisdell (1993) also found that improved sanitation had a stronger effect on morbidity than clean water in a study of communities in Central Java, Indonesia.

Ilaje is listed as one of the slum communities in Lagos metropolis (LASURA, 2014). This classification agrees with the informal settlement indicators used by (UN-HABITAT, 2010). This neighbourhood is characterized by poor housing condition, lack of basic amenities, and poor sanitary conditions especially inadequate access to water, health facilities and when available lack of other livelihood capitals can frustrate timely accessibility or makes it inconvenient and unsafe to the health. Several studies have also confirmed that this community has a record of poor environmental health reports. These underscore the serious need for improvement in access to water and good sanitary condition in the study area. Accordingly, there are several reasons why environmental health is an important concern for residents of slums. Residents of slums live in areas with the worst environmental conditions; they have lower resistance to infection; they pay more for services; and when they fall ill, they lose income and even their jobs.

This study examined the relationship between access to water/sanitary facilities and reported health conditions of Ilaje residents. The environmental health problems considered are classified under Water-related disease, Water-washed disease, Water-based diseases, and Water-borne diseases. Appropriate policy action was made towards improving access to water and sanitary facilities in the study area which can be replicated in other places with similar characteristics.

2. Statement of Research Problem

In response to the consistent message showing that environmental conditions in slum settlement is peculiar, numerous researchers have developed interest in understanding the nature of relationship between environmental conditions in slum settlements and residents health. Another important factor that drives researchers towards environmental conditions and health is the equity concept, which according to Whitehead (1988 and 1990), Braveman et al (1996) and Acheson (1998) is ethical and is governed by distributive justice. Equity in health reflects a concern to unequal opportunities to be healthy associated with membership in less privileged group such as residents of slums. Poverty reduction is the third entry point for researchers who are interested in health conditions of slum settlements. Despite these efforts, increase in slum formation and the challenges they posed still draw the attentions of many researchers such as Akinwale et al (2013) who did a cross-sectional survey of living conditions and public health status in three urban slums of Lagos; Ajegunle, Ijora-Oloye and Makoko, and found that majority of these slums are densely populated with low-income earners who live in unhygienic conditions and work in the informal service sector. They lack appropriate facilities such as water, electricity, garbage disposal and drainage facilities, and even when these facilities are available, they are inadequate and overstressed. Personal hygiene habits are very poor; open defecation in ditches and the lagoon is widely practiced. Often these slum dwellers are threatened by perennial flooding due to blocked drainage systems resulting in a number of diseases, such as malaria, diarrhoea, cold and cough.

Another study by Nwokoro and Ilechukwu in 2011 examined housing and environmental health conditions of low-income communities in three urban slums of Lagos; Makoko, Ajegunle and Mushin, and found that only 10.5% out of the 541 respondents surveyed have access to portable water while 43.5% use pit latrine. Also, most members of the communities (41.9%) patronize chemist as health care facility. The study further revealed that housing types and housing facilities like water supply source, kitchen types, toilet types and sewage disposal types have very high positive relationship with the most prevalent diseases. Prevalent diseases found in the study area were malaria, diarrhoea, Asthma and other respiratory diseases.

Most of these researches confined their studies on general description of the ugly slum environment, socio-economic characteristics of slum dwellers, historical emergence of slums and to geographical and sociological analysis of slum areas. Some of these studies have been able to reveal that slums have adverse effect on the health of slum dwellers; others have even advanced new approaches to slum elimination but nothing about in-depth identification of the nature of relationship between water condition and the health of the residents in the slum of Ilaje. This has therefore become a gap that this research has tried to fill by investigating the nature of relationship between access to water, sanitary and hygiene in slum and slum health.

3. Aim and Objectives of the Study

The aim of this study is to understand the nature of relationship between access to water supply and reported health status of slum dwellers of Ilaje. To achieve this aim, specific objectives were raised, they are to:

a) Examine environmental health conditions in the study area.
b) Determine the level of access to water facilities in the study area.
c) Identify sanitary and hygienic conditions in the study area.
d) Examine the relationship between source of water supply and health status of respondents in the study area.

4. Geographical Location and General Characteristics of the Study Area

Ilaje, a home to an estimated population of 50,000 inhabitants, is one of the suburbs of Bariga LGA Lagos state. It is bound to the north by Gbagada, to the south by Akoka, to the west by Bariga and to the east by Ibrahim Babangida Bridge. It lies between longitude 3º 23’ East and latitude 6º 31’ North of the equator. The area can be accessed through the St. Finbarr’s

Road. By canoe, it is accessible via community road and the Lagos lagoon. The community is very close to the coastline of Lagos. The area of Ilaje site is about 22 hectare and its perimeter is 3 kilometres. The built-up areas covers about 91% of the total land areas, while the remaining 9% are accounted for by open spaces and marshy spots.

5. Literature Review

A. Water Supply and Sanitation System in Slums

The importance of the water supply and sanitation system has been a subject of serious attention reflected in the measurement of human development and in their inclusion in the Millennium Development Goals (MDGs).This priority treatment follows official reports estimating about one billion people in the world living without access to improved potable water supplies while 2.6 billion people live without adequate sanitation (Lane, 2012; WHO, 2010; WHO/UNICEF, 2010; UNICEF and WHO, 2004 and UN -Habitat, 2003). Nearly 80% of the people using water from unimproved sources are reportedly concentrated in three regions namely, sub-Sahara Africa, Eastern and Southern Asia. For sanitation, overall levels of use of improved facilities are noted to be far lower than for potable water (WHO and UNICEF, 2006). These represent serious global health burdens especially when viewed in terms of the consequences associated with a lack of access to potable water, inadequate sanitation and poor hygiene. Although some countries, especially in the less developed realm, are making significant progress in addressing the challenges of water supply and sanitation, reports on sub-Sahara Africa is particularly not encouraging as only 36% of the population was officially estimated to have access to basic sanitation (UNICEF and WHO, 2004) while 37% of the population still relies on unimproved sources of water (Onabolu et al, 2011).

Nigeria is one of the countries in sub-Sahara Africa whose records on general access to water supply and sanitation facilities by the citizens remain very poor. Lagos State in particular is fraught with inexorable rise of squatter settlements, overcrowding dwellings, breakdown of waste disposal arrangements, air and water pollution and inadequate water and sanitation services. This in turn adversely affects the health status of inhabitants (Yusuf, 2007). Poor health conditions in poor communities is normally associated with poor sanitation, lack of waste disposal facilities, the presence of vermin, and poor indoor air quality due to poor ventilation and the use of cheap fuels that emit particulate matter. Accidents, particularly involving children, are also far more common in households with open fires or accessible boiling water, and the results of these can be horrific when no medical care is available. In Manila and Philippines, children living in squatter settlements were found to be nine times more prone to tuberculosis (TB) than children living in other areas (Fry et al., 2002). Overcrowding in slums is common cause of psychological stress and increases the rate of disease transmission due to frequent contact (Sundari, 2003).

A large proportion of diarrhoea diseases are caused by faecal-oral pathogens. In the case of infectious diarrhoea, transmission routes are affected by interactions between physical infrastructure and human behaviours. If sanitation or related hygiene is poor, e.g. when hand washing facilities are inadequate, or when faeces are disposed of improperly, human excreta may contaminate hands, which can then contaminate food or other humans (person-to-person transmission). Faecal pathogens are frequently transferred to the waterborne sewage system through flush toilets or latrines, and these may subsequently contaminate surface waters and groundwater. Human excreta also can directly contaminate the soil and enter into contact with people; flies may carry pathogens from excreta to food, for example. Through these pathways, drinking-water, recreational water or food may be contaminated and cause diarrhoea disease following ingestion. Animal excreta also transmit pathogens. The predominant route will depend upon the survival characteristics of the pathogen, as well as local infrastructure and human behaviour.

WHO recently estimated that 88% of all cases of diarrhoea globally were attributable to water, sanitation and hygiene (WHO, 2002; Pruss-Ustun and Corvalan, 2006). The risk factor was defined as “drinking-water, sanitation and hygiene behaviour”, as well as aspects of food safety that are related to water, sanitation and hygiene (i.e. food contamination by unsafe water, or the lack of domestic hygiene). Very little disease was transmitted through pathways other than those associated with water, sanitation and hygiene, or food (e.g. airborne transmission), and about 94% (84—98%) of all cases of diarrhoea around the world were attributable to the environment, resulting in more than 1.5 million deaths annually. Kuntala et al, (2011)

Attack rate of ARI (Acute Respiratory Infections) and ADD (Acute Diarrhoeal Diseases) was found to be 14.6% and 7.73%, respectively in (less than 5 years) children of Gokalpuri slums of Delhi. This illness was attributed to lack of sanitation and lack of potable water for drinking (Gupta et al., 2007). Rahman (2006) advocated that there is a strong relationship between environmental conditions and occurrence of diarrhoea. The incidence of diarrhoea among urban poor of Aligarh city was reported to be 96% which was attributed to outdoor defecation, use of manual latrines, lack of sanitation, buying prepared cheap food items from vendors. Likewise, prevalence of diarrhoea among children in the slums was found to be 32%, compared to 13% in Nairobi as a whole, and 17% in rural areas (Klimani et al., 2007). One fifth of the girls (21.6%) had history of diarrhoea in urban slum of Surat city of Gujrat within last 15 days of study as compared to 10.6% in MIG (Middle Income Group) area, which was due to prevailing insanitation in the slum areas (Vipul et al., 2008).

B. Environmental/Housing Conditions in Slums

An interesting body of literature has developed, including some work in Melbourne, tracking the connections between housing and neighbourhoods. The research examines the impact of neighbourhoods on health after controlling for the socio-economic status of residents.

The work of Hou and Myles (2005) highlights the impact of neighbourhood income equality. They measured a negative

relationship between average neighbourhood health and neighbourhood income equality. Cohen, Farley and Mason (2003) highlight the impact of two neighbourhood variables on premature mortality. The two neighbourhood variables are collective efficacy (a measure of willingness to help out for the common good) and broken windows (boarded-up stores and homes, litter and graffiti). In an Australian study, Warr et al. (2009) use a Melbourne case to show that perceptions of neighbourhood safety were associated with poorer health. They conclude that the findings suggest incorporating complementary placed-based approaches when tackling poor health outcomes in low-income communities. Using the British Household Panel Study, McCulloch (2001) employed measures of social capital at the neighbourhood level and compared these with health outcomes. The study found that people in the lowest categories of social capital had increased risk of psychiatric morbidity. Those in the lowest categories of social disorganisation had lower rates of some health problems

C. State of Infrastructure in Urban Slums

Urban poverty is one of the major challenges of our times. As opined by Nyametso, (2010) citing Matovu (2000), greater percentage of slum dwellers' population are poor people trying to eke out a living. This they achieve by using scavenged items or buying substandard building materials for the construction of their houses on illegally acquired land. As a result of this, slum communities usually exhibit certain characteristics in their outlook. Generally, there are two principal groups of environmental problems that are peculiar to urban slums. The first is the presence in the human environment of pathogens because of lack of basic infrastructure and services like sewers, drains or services to collect solid and liquid wastes and safely dispose of them.

The second is crowded, congested, and cramped living conditions in which the people live (UN-Habitat, 1998). It was further submitted that lack of infrastructure, readily available drinking water, sewerage connection (or other system to dispose human wastes hygienically), garbage collection and basic measure to prevent diseases and provide primary health care ensure many deliberating and endemic conditions among poorer households (Owoeye and Omole, 2012).

In most developing countries, the slum communities are characterized by degraded, and abysmal environmental conditions with increasing problems of encroachment on unauthorized land especially on river banks and flood plains. These slums are often regarded as places of poor infrastructural facilities such as pipe borne water, solid waste disposal, sewage disposal, and drainages which lead to degradation of the environment. The incompetence of the municipal government to collect garbage, and also the inadequacy of community toilets compel slum dwellers into engaging in open defecation, and disposal of garbage at every nook and cranny of the slum settlement. The uncollected wastes often accumulate in drainages and over time block the drainage facility. This has resulted into the muddy and impassable environment in the slum settlement especially during rainy season, and it is also an eyesore.

Citing Kimani et al. (2007), Bhagat and Malaviya (2013) recounted that poor living conditions including lack of affordable house, clean water, inadequate toilet facilities, poor garbage disposal and drainage mechanism characterizes the slum settlements in Nairobi. In Ghana, the provision of toilets facilities was reported to be related to household wealth, with pit latrines being common in the low-income households and water closets common in the wealthy groups; this has made the situation of sanitation a serious concern. Also in Ghana, it was discovered that human excrement, garbage and wastewater were usually disposed into surface drains, open spaces and streams, while in Tmale, slum dwellers were found to store solid waste inside their houses for at least 24 hours before taking them outside (Bhagat and Malaviya citing Osamuna 2007).

Slums areas of Delhi are characterized by clogged drains, and children defecating in the open. There is poor solid waste management with 67% households reported as having no arrangement for the safe disposal of waste while only 27% have access to municipality dustbins whereas, 6% were found disposing their garbage by burning and thereby constituting a form of air pollution (Jamwal 2004). The slum of Jiapur was found to be littered with garbage as slum dwellers dispose off garbage near their dwellings after collection. In Dharavi, the major infrastructural concerns were of water, drainage, garbage disposal and pollution. Garbage are discarded along street sides and this degrades the quality of life and also pollutes the surrounding environment (Sharma 2009).

Owoeye and Omole, (2012), in a study, discovered that slums in Akure were characterized by poor housing construction materials, poor housing maintenance behaviour and inadequate housing technology, and facilities. The study reported that majority of these houses were constructed with mud and zinc, and even at that, these buildings are still old and dilapidated. The main sources of water in these slums are untreated hand dug wells which poses great risk of spreading water borne and other health related diseases. 62.2% of these slum dwellers use pit latrine, 10% use modern day WC, while the rest engage in open air defecation in streams, drainage, bushes and dunghills. The condition of refuse disposal is generally absurd in spite of the government efforts to control indiscriminate refuse disposal. Residents deposit garbage by burning, dumping on road sides and into gutters. This hinders the free flow of run-off and creates comfortable breeding grounds for flies, mosquitoes, rodents and other health infested animals that could contribute to spread of diseases.

Uwadiegwu (2013) examined an insider's perception of the structural profile of the socio economic and housing problems of the slum areas in Enugu city, Nigeria. The study aims at the identification of the structural profile of the socio-economic and housing problems of the slum areas. Five slum areas in Enugu City were chosen for the study consisting of three core and two peripheral spontaneous slum areas, namely Coal Camp, Obiagu, and Ogui Urban (core slum areas), Ngenevu and Jamboree (peripheral slum areas). 412 slum dwellers randomly selected from the chosen areas participated in the study. Principal Component Analysis (PCA) version of Factor

Analysis (FA) statistical technique was employed for the data analysis. The technique reduced the 17 variables used for the study to 7 components or factors. The PCA also produced the structural profile of the variables with lack of housing amenities being the paramount. This is followed in descending order by household size, lack of job and low income, accommodation, tenancy and lastly security problems. It is therefore recommended that programme for the improvement of the slum areas in Nigeria should be phased in accordance with this structure.

Adeniran, Kemiki, and Ayoola (2012) reported that despite the several regulations and the level of education, many buildings in the slums of Ibadan are still densely populated as 80% of the respondents said that they are more than 3 in a room. Methods of sanitary and refuse disposal were still primitive and main sources of water were the wells which are either untreated or unsafe for human intake. Accessibility to these slums are substandard; either unmotorable or through paths. This has thus allowed for further clustering of houses and hence further growth of the slums.

In many cities, slums are not merely marginalized neighbourhoods that house a few people. On the contrary, they are home to a large proportion of the urban population, and are growing as fast as cities themselves. In the developing worlds, one out of every three people living in cities lives in a slum. A study by Ferguson (1996) established that this high density in these slum communities lack adequate infrastructures which play a fundamental role in environmental and health conditions. In particular, high densities make low-cost sanitation, i.e. non-sewer sanitation, environmentally hazardous. This complies with international experience which has shown that non-sewer sanitation solutions begin to seriously threaten residents' health and the environment when densities exceed 40-60 persons per acre (100-150 persons per hectare) given typical soil conditions. The lack of improved sanitation facilities, including toilets, showers, and sewage disposal has been well documented in Kibera slum by Mutisya and Yarime (2011). Ninety four percent of the populations in the slum do not have access to adequate sanitation. Up to sixty per cent of the population in Kibera must share pit latrines with approximately fifty others. Even when toilet facilities are available, people complain that they are not conveniently located, that they are unclean, or that using them at night poses a security risk.

Again, Ferguson (1996) in a study of the environmental impacts and public costs of unguided informal settlement in Montego Bay found that many household in the squatters rely on pit latrines and septic tank systems or have no sanitation. The study stated that the public health authorities in Montego Bay indicate that many informal settlement residents who say they have pit latrines have, in fact, no access to any sanitation facility. These residents who have no sanitation facilities - possibly 5-10 per cent of the total population - put their faeces in plastic bags and throw these bags into nearby gullies or bushes.

In 2004, the World Health Organization (WHO) and UNICEF estimated that 961 million urban dwellers worldwide must gain access to an improved water supply by 2015 to achieve the Millennium Development Goal of halving the proportion of people without access to safe water. Water insecurity is associated with adverse health outcomes, especially in urban slum communities (Hunter, MacDonald, and Carter, 2010). For example, multiple studies of urban slums in Africa and South Asia have found diarrhoea to be one of the top two causes of morbidity and mortality for children under five.

Most slums dwellers have three main concerns with water: access, cost and quality. They complain about the limited access to water points, which are often located far from their houses, some landlords ration water such that it is only available on specific days of the week and at specific times (Mutisya and Yarime, 2011). This is a limitation especially for people who have children and would require high amounts of water. However, for those who have access they decry the high cost of buying water in the slums. This is costly especially relative to the slum residents' income levels.

Slum dwellers in Kibera Nairobi were reported by Mutisya and Yarime (2011) to have used sewerage water for bathing and washing. They also use borehole, rainwater, and sometimes draw water from broken pipes. This water is highly contaminated and filthy especially when plastic pipes burst and can potentially cause contagious diseases. Subbaraman et al., (2013) in a study of the social ecology of water in a Mumbai slum: failures in water quality, quantity, and reliability-revealed severe deficiencies in water-related health and social equity indicators. Depending on season, households spend an average of 52 to 206 times more than the standard municipal charge of Indian rupees 2.25 (US dollars 0.04) per 1000 litres for water, and, in some seasons, 95% use less than the WHO-recommended minimum of 50 litres per capita per day. During the monsoon season, 50% of point-of-source water samples were contaminated. Despite a lack of point-of-source water contamination in other seasons, stored drinking water was contaminated in all seasons, with rates as high as 43% for E. coli and 76% for coliform bacteria. In the multivariate logistic regression analysis, monsoon and summer seasons were associated with significantly increased odds of drinking water contamination. It further showed that all bacterial contamination of drinking water occurred due to post-source contamination during storage in the household, except during the monsoon season, when there was some point-of-source water contamination.

Kuntala et al, (2011) in an exploratory study on water quality and sanitary practice in rural and urban communities of Siliguri, Darjeeling, West Bengal, reported that out of 137 drinking water sources visited, only 24.8% could attain the sanitary condition. More than 65% of families used to cover water vessels during their carriage and storage in both the areas but only 17.4% cleaned the storage vessels daily. Out of 181 household 37.8% neither boiled nor filtered water before consumption. 45.3% families habituated to sink the glass into storage container. Out of total water sample analysed, 50% of rural sources were contaminated with Coliform.

Afsar (1999) reported that urban slum dwellers in Bangladesh were devoid of water supply to their homes and the

average time required to collect water from a common standpipe or well was 30 minutes per trip and at least two trips were necessary just to collect a bucket of drinking water. Further Osamanu (2007) reported that most of the urban poor of Tmale city of Ghana collect water from sources located distantly. In another study, the municipal water supply to the 128 migrant households in Tirupur slums was found to be of poor quality and unfit for human consumption (Sundari, 2003). Goyle (2004) observed that the two squatter settlements of Jaipur city had to go more than a kilometre to bring a bucket of drinking water. In another study, Karwsara (2005) revealed that more than half (56.50%) of the slum dwellers of Delhi utilized shallow dug hand pump water containing lot of sand particles and impurities. Gupta et al. (2007) reported that the residents of urban areas of Chandigarh were more conscious about their health as 94% households treated their water before drinking in the form of filtration, boiling etc. However, the rural and slum households were least bothered about these things as, only 10.8% and 2% used these techniques, respectively to make water safe for drinking.

Living with inadequate amount of water, inadequate infrastructure, and unsanitary bathroom and kitchen facilities, the urban poor often find themselves the victims of water related, water washed, water based and water borne diseases. This is because health issues are aggravated by factors such as living near polluted waterways, having no sewage disposal or sanitation in communities, poor personal hygiene due to the lack of water availability, and the lack of environmental and health education.

6. Research Methodology

The study adopted a cross sectional type of survey research design due to the nature of the research question. Health information observed among the respondents were used to describe the health characteristics that exist in the study area. Thus, the study collected self-reported health data from respondents and also data on the availability and access to water supply in the study area.

Using a simple random sampling procedure, 391 questionnaire were administered and analysed with the use of descriptive statistics (frequency tables) and inferential statistics (Pearson Chi-Square). Attempts were made to identify and examine access to water supply, sanitary/hygienic behaviours of respondents, and also the relationship between access to water supply and environmental health status of respondents in the study area.

A. Test of Hypotheses

The hypothesis and the inferential technique that was used for testing them are:

H_0: There is no significant relationship between household access to water supply and reported health problems in the study area.

H_1: There is a significant relationship between household access to water supply and reported health problems in the study area.

To verify this hypothesis, this study examined if there is any significant relationship between household access to water and reported health problems in the study area using Pearson Chi-Square Test to test for relationship and the Cramer's V symmetry measure to understand the nature of the relationship.

Dependent variables: = Health condition

Independent variable: = Household source of water supply.

7. Summary of Findings

This study has been able to examine the level of access to water supply of respondents in Ilaje; their sanitary and hygienic behaviours; the environmental health conditions of Ilaje slum dwellers and has also been able to explain the nature of relationship between access to water supply, and prevalent water-related, water-washed, water-based and water-borne infections in the study area. Thus, the summary of major findings of this research is presented as follows;

The major type of dwelling building in the study area is rooming houses and as synonymous with most slums in developing countries around the world, the housing and environmental conditions in Ilaje was also found to be in a deteriorating state with inadequate or no housing facilities. It was found that only 27.4% of the respondents have flush toilets in their houses while the remaining 72.6% make use of other less modern types of toilet facilities like pit latrines and open defecation. These may cause ground water contamination depending on the soil characteristics and distance between the water sources and latrines. 59.6% respondents reported to have no bath shelter and water from baths run freely into the yards. Over population cannot be denied as number of household per building range from 5 and above households, with majority of them having 1 – 2 rooms exclusive for household use.

Outdoor kitchen space is still used in Ilaje and the kerosene stove is the major source of energy for cooking of which about 3.3% of the respondents still use firewood for cooking. The outdoor kitchen space, kerosene stove, and firewood cannot be considered very hygienic methods for cooking. The major source of energy for power is from the PHCN but the supply is said to be inadequate by the respondents. The drainage condition in Ilaje is also pour with most of the drainages either blocked or not available at all. Indiscriminate methods of garbage disposal like dumping on the street and gutters are highly practiced and is quite evident in the nuisances and eyesore this garbage create in Ilaje. 75.4% of the respondents reported to have stagnant water around their houses and apart from the squalor they create, they also lay breeding beds for diseases transmitting, and disease bearing organisms.

Access to water supply and hygienic behaviours of respondents in the study area was analysed and it revealed that in spite of good hygienic knowledge, the practice has been found to be significantly low among the slum dwellers. The study showed that the water supply and sanitation condition are improving very slowly. Majority slum people use borehole water for household daily activities. For lack of sufficient water sources, some people resort to unsafe water sources like wells, lagoons and rain water, which causes sufferings from diseases. Although majority (59.1%) of the respondents claims to treat their water before use, the treatment methods they engage in are

not fully hygienic and these methods may include boiling and addition of bleach or chlorine.

Water is mostly stored in plastics and usually not always covered. It was also discovered that water storage containers are not used exclusively for water storage but are also used for other practices like bathing and washing. Only 24.3% of the respondents claim to use the two-cup system in their households. This system represents a situation where a cup is designated solely for fetching water from water storage containers and pouring into other containers. All these only stand to reveal unhygienic practices in the study area.

Water contamination at source was found to be as a result of many factors but majorly animals (26.1%), children (21.0%) and storm water (25.3%), while 40.4% of water contamination at home was found to be as a result of unhygienic water handling practices within the households. For reasons best known to these slum dwellers, children's faeces are not properly disposed as 26.9% of the respondent's rinse or wash faeces into ditches and gutters. Hand washing behaviour was also found to be poor in the study area 58.1% of the respondents do not wash their hands with soap after using the toilet.

Based on the analysis on prevalent water-related, water-based, water-washed and water-borne infections, results showed high rate of malaria infection (100%) and diarrhoea infection (100%) occurrence among households in the study area. This is followed by dysenteries, typhoid fever and worms, with 93%, 87%, and 85.1% respondents respectively who reported a monthly/yearly occurrence of these infections within the household. 221 respondents representing 56.0% reported monthly/yearly occurrences of scabies infection, 177 respondents representing (45%) reported ulcer occurrences, 101 (26.0%) for Lice, and 104 (27%) for cholera infection. This goes to show a higher rate of occurrence of water-related, water-based and water-borne infections within the study area.

Furthermore, 61 respondents representing 16% of the sample size reported to have recorded deaths as a result of these water-related, water-washed, water-based, and water-borne infections within the study area. It was also revealed from the study that majority of these deaths occurred amongst children within the age range of 0 – 5 years.

A. Relationship Between Source of Water Supply and Health Status

This was employed to address the research question of the study (what is the nature of relationship between sources of water supply and slum health status) using Pearson Chi Square Test to determine if a relationship exists and the Cramer's V to determine the measure of the relationship if any. The major findings for water related diseases revealed with a P value of p=.000 and Cramer's V=.473 that there is a statistical significant moderate relationship between respondent households' source of water and the rate of suffering water related infections – Malaria.

Major findings for water-based diseases revealed through a P value of p=.000 and Cramer's V=.439 that there is a significant moderate relationship between source of water and rate of suffering water-based infections – Worms.

Investigating the nature of relationship between household source of water and water washed infections represented by the rate of suffering Scabies, Ulcer, Lice and Dysenteries revealed that household source of water has a significant relationship with the rate of suffering these health conditions. The strengths of these relationships are evident through their P values: with Scabies p=.000, Cramer's V=958; Ulcer, p=.003, Cramer's V=.301; Lice p=.005, Cramer's V=.383 and Dysenteries P=.019, Cramer's V=.179.

Furthermore, investigating the nature of relationship between household source of water and water borne diseases represented by the rate of suffering Cholera, Diarrhoea, and Typhoid Fever revealed that household source of water have significant relationships with the rate of suffering these above health conditions. The strengths of these relationships are visible through their P-Values: with Cholera p=.008, Cramer's V=.365; Diarrhoea p=.000, Cramer's V=.339, and Typhoid Fever P=.007, Cramer's V=.204.

The study therefore rejects the null hypothesis which states that 'there is no significant relationship between household sources of water supply and prevalent health conditions in Ilaje.

8. Conclusion

In conclusion, the study inferred that household water supply conditions influence environmental health status of slum settlement households. Thus, the study therefore rejects the null hypothesis which states that 'there is no significant relationship between household access to water supply and prevalent health conditions in Ilaje. The study and also calls for a deliberate policy to provide good water supply conditions that will encourage sanitary and hygienic behaviour adequate enough for slum households to have improved environmental health condition.

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