Household Sanitation and Waste Disposal Practices during COVID-19 Pandemic in South-West Nigeria

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Abstract

This paper examined household sanitation and waste disposal practices during COVID-19 pandemic in South-West Nigeria with a view to suggesting policy responses in furtherance of a sustainable environmental health practices in the study area and others with similar background in Africa. Two states (Lagos and Oyo) were selected for questionnaire administration and 173 residents were selected for survey. The result revealed that respondents of both states share similar socioeconomic characteristics. Also, information from the study revealed that wearing of face masks, obedience to social distancing guidelines and use of hand sanitizers were the most practiced preventive measure to curtail the spread of COVID-19 while hand washing with soap and water was the least practiced measure against the spread of the disease.

The study established that 60% of the respondents had water supply in their homes while 75.0% had toilets in their house. Across the study area, the mean travel distance to sources of water by respondents was 143metres while the average per capita water consumption in Lagos and Oyo states were 14.6 litres, and 11.8litres. Findings also established that respondents generated more waste during the pandemic however; waste disposal practices were environmentally unfriendly thus predisposing them to the infestation of diseases vectors aside from the COVID-19 virus. It recommends that the government should investment in policies aimed towards adequate provision of water and waste disposal facilities at neighbourhood levels. Also, the government, non-governmental organizations (NGOs) and community based organization (CBOs) should embark on environmental health awareness campaigns on inherent dangers associated poor sanitation and waste disposal practices in the study area.

Keywords: COVID-19, pandemic, sanitation, waste, waste disposa, Nigeria

1.0 Introduction

Access to improved sanitation and disposal of waste is fundamental to health and the prevention of many diseases across the world (WaterAid, 2019). Over the years, issues pertaining to sanitation have become a glaring challenge in most urban centres in Nigeria (Daramola, Olowoporoku & Popoola, 2017). This can be attributed to inadequacy of environmental amenities, poor sanitary behaviour, population growth among others (Olowoporoku, 2017; Owoeye & Adedeji, 2013; Olanrewaju & Ilemobade, 2009). According to World Health Organization (WHO) (2020), sanitation is a group of methods to collect human excreta and urine as well as community waste waters in a hygienic way such that human and community health is not altered. It aims to decrease the spread of diseases by adequate elimination of excreta and other wastes from sight and proper handling of water and food in order to restrict the spread of disease (WaterAID, 2020; World Bank 2020; Olowoporoku, 2014).

Waste generation and disposal are among the pressing public health issues in Africa. Wastes are useless by-product of human activities which physically contains the same substance that is available in the useful product (Amasuomo & Baird, 2016; Achor, Ehikwe & Nwafor, 2014). It is broadly classified into three types based on its physical attributes. These are liquid, solid and gaseous waste. At the household level, the most common type of waste generated is solid and liquid wastes. Household generation of waste has been intricately correlated with changing lifestyle, consumption pattern, population growth, civilization and urbanization among others (Afon, 2012; Momodu, Dimuna & Dimuna, 2011; Awoso, Taiwo, Gladebo & Arimoro, 2010). On the other hand, waste disposal is defined as the methods of discarding any product or material which is useless to the producer (Amasuomo & Baird, 2016). Since the advent of the COVID-19 pandemic, neighbourhoods in Nigerian have been grappling with mounting heaps of indiscriminately disposed wastes.

Nigeria a densely populated country with low healthcare infrastructure and multiple pre-existing fragilities is currently battling to manage the pandemic (Nigeria Centre for Disease Control, 2020). Since the emergence of the COVID-19 pandemic, the Nigerian governments and all other concerned stakeholders have made various efforts to flatten the curve of the spread of the disease (Mustapha, Adedokun & Abdullahi, 2020; Olanrewaju & Olowoporoku, 2020). Efforts made by the government to manage the spread of this disease include population disaggregation with stay at home orders, closure of learning institutions, restrictions/ban on public gatherings, public awareness for the promotion of proper sanitation habits, social distancing etc. (Bassey & Akaninyene, 2020; Ozili, 2020). These actions popularly known as the lockdown in the country has led to change in household waste generation, disposal and sanitation behaviour. For instance, the types, components, volume and characteristics of wastes changed as household members were compelled to stay and perform their daily activities from homes (United Nations, 2020). This change has significantly influenced the management of wastes at both household and communal levels.

Sanitation and waste disposal preferences during COVID-19 are different from the conventional practices (World Bank, 2020). This is because people generate more waste of different components because of their stay at home. The impact of poor waste disposal practices and sanitation during pandemics is particularly felt in the urban areas in Nigeria because people live in proximity to each other. A cursory glance at the city scape during the COVID-19 pandemic reveals that a huge volume of wastes are generated daily without adequate form of management. This provokes strong concerns in order to protect the environment and the population from the transfer of the virus and outbreak of other diseases. This deplorable and dehumanizing conditions of physical environment calls for sober reflections as the coverage of government and private sector efforts to provide these services have remained insufficient (Olowoporoku, 2017; Achor, Ehikwe & Nwafor, 2014).

Therefore, perceived and actual inadequacies in terms of access to environmental amenities during COVID-19 could lead to dissatisfaction with sanitation options which invariably have negative impacts on peoples' health and environmental condition.

A meticulous examination of the sanitation and waste disposal practices Nigerian cities indicates that sanitation has remained consistently poor for a long time. Studies such as Anijah-obi et al (201) and Olowoporoku (2017) have established that inadequacy of basic sanitation increases the cost of treating and prevention of diseases. For instance, poor disposal of waste in urban centres leads to intrusion, offensive stench or odour and serves as breeding ground for disease pathogens (WHO, 2004; Federal Ministry of Environment, 2005). Therefore, policies to improve waste disposal and sanitation practices during and after pandemics will uplift the living condition, health of residents, quality and aesthetic of the environment and prevents outbreak of other diseases (Achor, Ehikwe & Nwafor, 2014; Owoeye, 2013). Therefore, adherence to safe sanitation and waste disposal practices will to help to prevent human-to-human transmission of the virus that causes COVID-19 and other diseases (WHO, 2020a).

Issues pertaining to sanitation practices and waste disposal have aroused the interest of researchers in Nigeria (Olanrewaju & Ilemobade, 2009; Afon, 2012; Owoeye & Adedeji, 2013; Achor, Ehikwe & Nwafor, 2014; Olowoporoku, 2014; Olowoporoku, 2017; Daramola, Olowoporoku & Popoola, 2017). However, they have only focused on the various aspects of sanitation and waste disposal before the outbreak of the COVID-19 pandemic, hence the peculiarity of a composition, types and volume of waste generated and disposed and sanitation practices during pandemics were not considered. Other studies that have issues bothering on COVID-19 pandemic in Nigeria include (Bassey & Akaninyene, 2020; Mustapha, Adedokun & Abdullahi, 2020; Ozili, 2020; Olanrewaju & Olowoporoku, 2020). These studies focused on national capacity to respond and economic implication of the

pandemic on the nation. They did not extensively discuss sanitation practices, quantity of waste and disposal methods with respect to the pandemic. Also, the availability waste and sanitation facilities were not considered. The intent of this study is therefore to examine household sanitation practices and waste disposal during COVID-19 pandemic in Nigeria. This type of study is imperative as it will examine the socioeconomic attribute of citizens, elucidate the environmental challenges confronting them during the pandemic and proffer solutions to their management.

2.0 Materials and Methods

2.1 Study Area

South West is one of the geopolitical zones of Nigeria. It has six states; Ekiti, Lagos, Ogun, Ondo, Osun and Oyo. It is the major Yoruba speaking area in the country. The area lies between longitude $2^0\ 3^1$ and $6^0\ 00^1$ East and latitude $6^0\ 2^1$ and $8^0\ 37^1$ N with a total land area of 77,818 km^2. According to the National Population Commission, (2007), the geopolitical zone is inhabited by 27, 511 892 (14 049 594 males and 13 462 298 females). The South West zone has two distinct seasons which are: rainy season (April-October) and dry season (November-March) while the temperature zone ranges between 21 and 28 (^{0}C). The focused states for this study are discussed in the following sub-sections.

2.2.1 Lagos State

Lagos State is situated between Latitudes 6° 23’ and 6° 41’ North of the Equator and Longitudes 2° 42’ and 3° 42’ East of the Greenwich Meridian. It is the fastest urbanizing state in Nigeria and ranks as the 19th most populated urban agglomeration in the world (World Population Review, 2017). The National Bureau of Statistics (2016) estimated the population of the state to be 17,500,000 persons. The average population density in the state is over 20,000 persons per square km. The physical growth and development of the state can be attributed to its expanding economic and political roles, which are aided by its explosive

population growth. On the 27th of February 2020, the Federal Ministry of Health confirmed the first coronavirus disease (COVID-19) case in Lagos State, Nigeria after the outbreak of the disease in China in January 2020. So far, Lagos has been the epicentre of the pandemic in the country. As at 18th of August, 2020, Lagos State has recorded the highest number of confirmed cases of COVID-19 (16, 710) in the country.

2.2.2 Oyo State

Oyo State was one of the three States carved out of the former Western State of Nigeria in 1976. It is located within 8.1574° N, 3.6147° E. The state covers a total of 28,454 square kilometres of land mass. The National Bureau of Statistics (2016) estimated the population of the state to be 7,840,864 persons. It is bounded in the south by Ogun State, in the north by Kwara State, in the west it is partly bounded by Ogun State and partly by the Republic of Benin, while in the East by Osun State. The landscape consists of old hard rocks and dome shaped hills, which rise gently from about 500 meters in the southern part and reaching a height of about 1,219 metres above sea level in the northern part. On March 17th, 2020, Oyo State recorded her first case of COVID-19 through a United Kingdom returnee. As at 18th of August, 2020 Oyo State recorded second highest number of cases of COVID-19 (2,967) in the south-west and the third highest number of cases in the country

2.2 Methodology

In recognition of the various restrictive measures such as lockdown, curfew etc. introduced by Federal and State governments in Nigeria which hinder the face to face data collection in questionnaire administration, online-based survey design and administration of research instrument was employed because it has recently gain popularity in academic research. Non-probability sampling method was used to sample internet users across the country. The convenience internet or electronic survey technique allows for the use of one-time survey that invite and gives right to all residents' participation from any part of the

country who have access to the online invitation. The questionnaire was administered to Nigerian residents as online survey using Google form. The link for the Google form was generated and shared widely using social and professional media platforms such as Whatsapp, Twitter, Facebook and LinkedIn. The spread was based on the contacts of the researchers and also those that are in their contacts to reach a significant population of respondents within a window period of six weeks for the survey. 234 responses were received at the end of the six weeks period of the survey. Lagos and Oyo states had the highest responses respectively. Responses from other states in the geo-political zone and other staes in the country were excluded. A total of 173 responses emanating from Lagos and Oyo states were considered for this study. Data collected were analysed using descriptive and inferential statistics.

3.0 Research Findings

This section discusses the profile of the respondents. It also contains discussions on and waste management sanitation practices during the pandemic in the study area. The variables considered include; age, educational status, household size, occupation and monthly income.

3.1 Socio-economic attributes of residents

Age is expected to play a significant role in environmental consciousness. Studies such as (Daramola & Olowoporoku 2019; Odunsi 2016; Schultz et al, 2005; Mayer & Frantz 2004) have established that elderly age has a direct relationship with sanitation and hygiene consciousness. Therefore, age plays a significant role in hygiene practices during and after the COVID-19 pandemic. For ease of presentation, the age of the respondents was grouped into three. young adults (less than 35 years); adults (35 to 60 years) and elderly adult (60 years and above). Findings revealed that 42.0% of the sampled respondents in Lagos State were less than 35 years, 35.2% were between ages 26-60 years while the remaining (19.9%)

were above 60 years. In Oyo State, 47.6% of the respondents sampled were less than 35 years, 32.9% were between ages 36-60 years while 19.5% were above 61 years. The minimum age of respondents sampled in Lagos State was 22 years while the maximum age was 66 years. In Oyo State, the minimum age of respondent sampled was 21 years while the maximum age was 69 years. The mean ages in Lagos and Oyo States were respectively 33 years and 34 years.

Another important factor to consider in sanitation and waste disposal practices is educational status. Studies such as Daramola and Olowoporoku (2016); Daramola (2012; 2015), Afon (2011) have established that educational status have strong link with hygiene and waste disposal practices. Findings on educational attainment revealed that all the respondents acquired formal education. In Lagos State, 19.8% of the respondents had secondary education, 52.7% had tertiary education while 27.5% had tertiary education. In Oyo State, 12.2%, 62.2% and 25.6% of the respondents respectively had secondary, tertiary and postgraduate education. These findings revealed that educational levels in the two states are similar.

Investigations were made into household size of residents in the study area. A household was defined as a person or group of people with shared cooking and living arrangements. Thus, household size was measured by the number of people living together with common eating arrangement. Based on this, the household size of the residents was categorised into two. The household sizes of one to five members were categorised as small while those with more than six members was categorised as large. Findings from Lagos State revealed that 51.6% of the respondents had small a household size while 48.4% had large household size. In Oyo State, 45.1% of the respondents had a small household size while the remainder (54.9%) had a large household size. The computed mean household size in Lagos State was 5 persons while mean household size in Oyo State was 6 persons. The result of T-

test [T (173) 11.73; < 0.05] revealed that there was a significant difference in household sizes of respondents across the two states.

Table 1. Socioeconomic Attribute of Residents in the Study Area

Attribute	Lagos Frequency (%)	Oyo Frequency (%)	Total Frequency (%)
Age			
≤ 35	41 (42.0)	39 (47.6)	80 (46.2)
36-60	32 (35.2)	27 (32.9)	59 (34.1)
≥ 61	18 (19.9)	16 (19.5)	34 (19.7)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Education Status			
Secondary	18 (19.8)	10 (12.2)	28 (16.2)
Tertiary	48 (52.7)	51(62.2)	99 (57.2)
Post graduate	25 (27.5)	21 (25.6)	46 (25.6)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Household Size			
≤ 5	47 (51.6)	37 (45.1)	84 (48.6)
≥ 6	44 (48.4)	45 (54.9)	89 (51.4)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Average Monthly Income			
≤₦30,000	43 (47.3)	33 (40.2)	76 (43.9)
₦31,000- ₦80,000	37 (40.6)	41 (50.0)	78(45.1)
≥₦81,000	11 (12.0)	8 (9.8)	19 (11.0)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Occupation			
Students	26 (28.6)	23 (28.0)	49 (43.9)
Public/Privately Employed	38 (41.8)	39 (47.6)	77(44.5)
Self-employed/Artisans	12 (13.2)	12 (14.6)	24 (11.0)
Retiree	15(16.4)	8 (9.8)	23 (100.0)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**

Findings were made on the average monthly income of residents across the two states. For easy analysis, the initial quantitative data on residents' average monthly income were grouped into three. Incomes below ₦30,000 were categorized as low income. This is based on the prevailing Civil Service Salary Scale across the two states. The next category is income between ₦31,000 to ₦80,000 categorized as middle income while the third category is for high income earners (above ₦80,000). Across the two states, 43.9% of the respondents

earn less than ₦30,000, 45.1% earn between ₦31,000- ₦80,000 while 11.0% earn above ≥₦81,000. Closely related to income of respondents is occupation. Across the two states, 28.3% of the respondents were students, 44.5% were public/privately employed, 13.9% were artisans while 13.3% of the respondents were retirees.

3.2 Residents' Awareness of COVID-19 Pandemic and Sanitation Practices in the Study Area

Sequel to the discussion of socio-economic characteristics of the respondents across the two states, their level of COVID- 19 knowledge and sanitation practices in the study area is presented in this section. On awareness of COVID-19 pandemic, all respondents across the two states were aware of the pandemic and the various measures put in place by the government to manage the spread of the disease. Findings were made into respondents' compliance with the various preventive guidelines of the government to manage the spread of COVID-19 virus

Table 2. Residents' Preventive Measure against COVID-19

States		Preventive Measure					Total
		A	**B**	**C**	**D**	**E**	
Lagos	Frequency	69	61	31	51	81	293
	%	23.5	20.8	10.6	17.4	27.6	100.0%
Oyo	Frequency	57	46	27	63	72	265
	%	21.5	17.4	10.2	23.8	27.2	100.0%
Total	Frequency	116	107	58	114	153	548
	%	21.2%	19.5%	10.6%	20.8%	27.9%	100.0%

***The total exceeded 173 because of multiple responses**
A= Social Distancing; B= Frequent Hand washing without soap; C= Frequent Hand washing with soap
D= Use of Hand Sanitizers; E= Use of Facemasks

Presented in Table 2 are findings on the preventive measures embarked upon by respondents to protect themselves from the spread of COVID-19 virus. In Lagos State, 23.9% of the respondents obeyed social distancing regulations, 20.8% frequently washed their hand without soap only, 10.3% engaged in hand washing with soap and water, 17.4% make use of hand sanitizers while 26.7% make use of face masks. In Oyo State, 21.5% of the respondents obeyed social distancing rules, 20.8% washed their hand with water only, 10.2% frequently

was their hands with soap and water, 23.8% engage the use of hand sanitizers while 27.2% make use of face masks. Across both states, the most adhered preventive measure employed by respondents to reduce the spread of COVID-19 were use of face masks (27.9%) obedience to social distancing rules (21.2%) and use of hand sanitizers (20.8%).

Presented in Table 3 are findings on availability of sanitation facilities and practices. An adequate sanitation practice is strongly hinged on availability of water in homes. Investigation into availability of water in residents' homes revealed that 56.0% of the residents in Lagos State had water in their homes/yard while 44.0% did not have water in their homes. In Oyo State, 64.6% of the respondents had water in their homes/yard while 35.6% of the respondents do not have water in their homes. The overall percentage of residents with water supply in their homes in the study area was 60.1%. On the sources of water supply, 3.3% 58.2% and 38.5% of respondents in Lagos State identified tap, hand-dug well and borehole as the sources of water respectively. In Oyo State, findings were similar as 4.9%, 58.5% and 36.5% respectively indicated tap, hand-dug well and borehole as the sources of water . On the provider of water used in respondents' homes, 52.6% of the water used in houses in the study area was provided by landlords. Community groups/ association were responsible for 16.2% of the water in homes while government provided 4.6% of the water in the study area. The remaining 26.0% of the residents claimed water vendors provided the water used in their homes.

Also considered relevant to this study is the distance from respondents home to source of water supply. Findings revealed that 31.9% of the residents in Lagos state lived within a distance less than 100m to their source of water, 26.7% of the respondents live within 101-200m from their home to the source of water while 38.4% live at a distance above 200m from their source of water. In Oyo State, 34.1% of the respondents live less than 100m from their source of water supply, 40.2% live at a distance between 101-200m from their household

source of water supply while 25.7% live at a distance above 200m from their source of water supply. Across the two states, the mean distance respondents' travel to their source of water was 143metres. Travelling this distance to have access to water could negatively impact on respondents' sanitation practices during and after the pandemic in the study area.

The Institute Water for Africa (2006) and UNESCO (2006) noted that a human being needs 50 litres of water per day in order to prepare meals, have enough for personal hygiene in order to avoid diseases and retain efficiency. Findings were made on daily household water consumption of residents before and during the COVID-19 pandemic in the study area. The initial quantitative data were categorized into three: 1-100litres, 101-200litres and 200litres and above. On quantity of water consumed daily for household activities before the pandemic, 67.1% of the respondents use less than 100 litres in their homes, 19.1% used between 101-120 litres of water daily in their homes while 13.8% of the residents used above 200 litres of water daily in their homes. The calculated average daily water used in respondents' homes was 86 litres and 85 litres in Lagos and Oyo States respectively. On the household consumption of water daily during the COVID-19 pandemic, 75.7% of the respondents use less than 100 litres in their homes, 13.9% used between 101-120 litres of water daily in their homes and 10.4% of the residents used above 200 litres of water daily in their homes.

The mean value of consumption of water during the COVID-19 pandemic in Lagos and Oyo state were 73 litres and 71 litres respectively. This decrease in the volume of household water usage during the pandemic could be attributed to poor proximity of water source to respondents' homes especially during the lockdown as some landlords in neighbouring buildings could restrict access to their compound or yards. Also, water vendors were unable to supply to households during the lockdown orders while respondents may be access communal water sources out of the fear of the pandemic. The average per capita

consumption of water during the COVID-19 pandemic was determined using the average household sizes in each state. It was revealed that the average per capita water consumption in Lagos State was 14.6 litres, while the average per capita water consumption in Oyo State was 11.8 litres. This revealed that the residents of both Lagos and Oyo States did not consume the benchmark of 50 litres needed to prepare meals, have enough for personal hygiene.

Investigations were made into availability of toilets in respondents' homes. Findings revealed that 75.7% of respondents in Lagos State had toilets in their homes leaving almost a quarter using other alternatives as toilets. The case was similar in Oyo state as 76.3% had toilets in their homes while the remainder 23.2% did not have toilet in the homes. Unavailability of toilets could inform unhygienic means of defecation by respondents. The unhygienic means of defecation in neighbourhoods especially before and during the pandemic predispose the residents to health threats such as odour within neighbourhoods breeding of disease vectors, outbreak of disease such as cholera, dysentery and snake bites while defecating in bushes, among others. On types of toilets, 77.9% of the respondents in Lagos State have flush toilets in their homes while 22.1% have pit latrine. In Oyo state, 88.9% had flush toilets in their homes while 11.2% had pit latrine.

Table 3. Residents Sanitation Facilities and Practices

Facilities	Lagos	Oyo	Total
	Frequency (%)	Frequency (%)	Frequency (%)
Availability of Water in Homes			
Yes	51 (56.0)	53 (64.6)	104 (60.1)
No	40 (44.0)	29(35.6)	69 (39.9)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Source of Water Supply			
Tap water	3 (3.3)	4 (4.9)	7 (4.0)
Well water	53 (58.2)	48 (58.5)	101 (58.4)
Borehole	35 (38.5)	30 (36.5)	65 (37.6)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Provider of Water			
Landlord	48 (52.7)	43 (52.4)	91 (52.6)
Community	15(16.5)	14 (17.2)	29 (16.8)
Government	5 (5.5)	3 (3.6)	8 (4.6)
Water vendors	23 (25.3)	22 (26.8)	45 (26.0)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Distance form Source of Household Water (metres)			
≤ 100	29 (31.9)	28 (34.1)	57 (34.9)
101-200	27 (26.7)	33 (40.2)	60 (34.7)
≥ 200	35 (38.4)	21 (25.7)	56 (32.4)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Average Quantity of Water Used Daily before the Pandemic (litres)			
≤ 100	61 (67.0)	55 (67.1)	116 (67.1)
101-200	17 (18.7)	16 (19.5)	33 (19.1)
≥ 200	13 (14.3)	11 (13.4)	24 (13.8)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Average Quantity of Water Used Daily during the Pandemic (litres)			
≤ 100	72 (79.1)	59 (71.9)	131 (75.7)
101-200	8 (8.8)	16 (19.5)	24 (13.9)
≥ 200	11 (12.1)	7 (8.6)	18 (10.4)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Availability of Toilets in Homes			
Yes	68 (75.7)	63 (76.8)	131 (75.7)
No	23 (25.3)	19 (23.2)	42 (24.3)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Types of Toilets			
Flush Toilet	53 (77.9)	56 (88.9)	109 (83.2)
Pit Latrine	15 (22.1)	7 (11.2)	22 (16.8)
Total	**68 (100.0)**	**63 (100.0)**	**131 (100.0)**

3.3 Residents' Waste Disposal Practices

Findings were made on residents' waste disposal practices in the study area (see Table 4). Findings revealed that 56.7% of the residents had waste storage facilities in their homes. Impliedly, majority of the residents in the study area had designated containers for dumping solid wastes in their homes. Unavailability of household waste storage facilities by respondents could inform indiscriminate disposal of filth and waste around homes. This invariably attracts diseases vectors and could become an eyesore around homes. Investigation into the type of waste storage facility in respondents' home revealed that 33.7% of the respondents in Lagos State store their household wastes in containers without lids, 16.9% store their wastes in containers with lid, 41.6% make use of polythene bags to store wastes while 7.8% store their waste in sacks/baskets. Findings from Oyo State revealed that 28.8% store wastes in containers without lids, 9.6% store wastes in containers with lids while 46.6% and 15.0% of the respondents in this state store their wastes in polythene bags and sacks/baskets respectively. The most prominent waste storage facility in homes in the study area was polythene bags. Household waste especially during the pandemic are usually made up of left over biodegradable food products and children waste and they are likely to attract various disease vectors such as rats, rodents, flies, mosquitoes, cockroaches among others to households if not properly disposed on time.

Closely associated findings on household waste storage facilities are frequency of waste disposal across the two states. Findings were made into the frequency of waste disposal before and during the pandemic. On frequency of waste disposal before the COVID-19 pandemic in Lagos State, 15.6%, 52.7%, 25.3% and 5.5% of the residents dispose their household wastes twice daily, daily, twice weekly and weekly respectively. In Ogun State, 17.2% of the respondents dispose their waste twice daily, 52.4% dispose their waste weekly, 26.8% disposed their waste twice in a week while 3.6% dispose their wastes weekly. In

general, majority (52.6%) of the respondents engage in daily household waste disposal. Investigation on the frequency of disposal waste during the COVID-19 pandemic revealed that 73.6% of the respondents in Lagos State dispose their household waste twice daily while 19.8% and 6.6% dispose their waste daily and twice a week respectively. In Oyo State, 78.0% of the respondents dispose their waste twice daily, 17.1% dispose their wastes daily while 4.9% dispose their household waste twice a week. Findings revealed that the frequency of waste disposal across the two states significantly increased during the pandemic. This connotes an increase in the generation of waste in households as a result of the restrictions in movements of household members by the stay at home orders of the government.

Information into means of waste disposal in Lagos State revealed that 21.6% engage the services of waste collector services, 12.3% burn their wastes while majority (28.7%) of dump their waste in hand-dug pits in their homes. Also 16.0% dispose their waste in water bodies while 21.4% dispose their wastes in communal waste disposal sites. In Oyo State, 14.7% engage the services of waste collectors, 10.7% burn their waste while 30.6% dispose their wastes in hand-dug pits in their homes. Other waste disposal methods in the state were dumping of waste in water bodies (9.3%) and dumping of waste in neighbourhood waste disposal sites (34.7%). Across the two states, the most predominant waste disposal means employed by residents in the study area were dumping of waste in neighbourhood waste disposal sites and dumping of waste in a hand-dug pit in homes. Disposal of biodegradable food waste and other waste in hand-dug pits in homes, along water bodies or in neighbourhood waste disposal sites are not environmentally friendly and could cause odourous condition around residences. These predominant waste disposal methods could attract disease vectors and predisposes respondents to contamination of food and spread of diseases. On the illness experienced during the pandemic, 36.9% of the respondents had malaria, 20.6% indicated they treated typhoid, 23.3% treated diarrhoea while 16.6% had

treated cough. Illness experienced by respondents during the pandemic could be attributed to poor waste disposal practices and sanitation behaviour engaged in by residents.

Table 4. Waste Disposal Practices

Facilities	Lagos Frequency (%)	Oyo Frequency (%)	Total Frequency (%)
Availability of Waste Storage Facilities			
Yes	77 (84.6)	73 (89.0)	150 (86.7)
No	14 (15.4)	9 (11.0)	23 (13.3)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Type of Waste Storage Facility			
Container without lid	26 (33.7)	21 (28.8)	47 (31.3)
Container with lid	13 (16.9)	7 (9.6)	20 (13.3)
Polythene bag	32 (41.6)	34 (46.6)	66 (44.1)
Sack/Basket	6 (7.8)	11(15.0)	17 (11.3)
Total	***77 (100.0)**	***73 (100.0)**	***150 (100.0)**
Frequency of Waste Disposal before the pandemic			
Twice Daily	15(16.5)	14 (17.2)	29 (16.8)
Daily	48 (52.7)	43 (52.4)	91 (52.6)
Twice in a Week	23 (25.3)	22 (26.8)	45 (26.0)
Weekly	5 (5.5)	3 (3.6)	8 (4.6)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Frequency of Waste Disposal before the pandemic			
Twice Daily	67 (73.6)	64 (78.0)	131 (75.7)
Daily	18 (19.8)	14 (17.1)	32 (18.5)
Twice in a Week	6 (6.6)	4 (4.9)	10 (5.8)
Total	**91 (100.0)**	**82 (100.0)**	**173 (100.0)**
Means of Waste Disposal			
Waste collection services	58 (21.6)	33 (14.7)	91 (18.5)
Burning	33 (12.3)	24 (10.7)	57 (11.6)
Dump in a hand-dug pit in homes	77 (28.7)	69 (30.6)	146 (29.6)
Dump in water bodies	43 (16.0)	21 (9.3)	64 (13.0)
Neighbourhood waste disposal sites	57 (21.4)	78 (34.7)	135 (27.3)
Total	****268 (100.0)**	****225 (100.0)**	****493 (100.0)**
Illness Treated during the Pandemic			
Malaria	72 (39.5)	66 (35.6)	138 (36.9)
Typhoid	53 (29.0)	34 (17.8)	77 (20.6)
Diarrhoea	31 (16.9)	56 (29.3)	87 (23.3)
Cough	27 (14.6)	35(18.3)	62 (16.6)
Total	****183 (100.0)**	****191 (100.0)**	****374 (100.0)**

**** Total exceeded 173 because of multiple responses; * Total was less than 173 because some residents did not have such facilities**

Conclusion

This study assessed household sanitation and waste disposal practices during COVID-19 pandemic in Lagos and Ogun States Nigeria. Findings from both states revealed that

respondents shared similar socioeconomic attributes. The study established that wearing of face masks was the most practiced preventive measure against the spread of COVID-19 while hand washing with soap and water was the least practiced by residents. The study also established that the average per capita water consumption during the pandemic in Lagos and Oyo States were 14.6 litres, and 11.8 litres respectively while the overall mean distance travelled to have access to water was 143 metres . The average per capita water consumption is less than the benchmark of 50 litres needed to prepare meals and ensure personal hygiene as stated by (UNESCO, 2006). The study further established that residents generated more waste during the pandemic, however, waste management practices engaged in by respondents pre and during the pandemic were not environmentally friendly and predisposes residents to infestation of diseases vectors aside from COVID-19 virus. Implication of these are high financial and economic cost of treatment of diseases on households, exacerbation of poverty, increased medical associated costs, abandonment of residential areas, loss of productivity and high curative cost on government to combat epidemics (Olowoporoku, 2014; WHO, 2011; WWF, 2002).

Based on these findings, the following recommendations are provided in improving household sanitation and waste disposal practices during and after the pandemic in the study area.

- Households should be provided with sufficient water supply through the provision of water supply facilities in the neighbourhood by the government, non-governmental organizations (NGOs) and community based organization (CBOs) in order to ensure effective observance of sanitation practices at all times;
- The government should promulgate laws to ensure provision of water in homes as a requirement for building approval by developer. Also the government should enforce

existing sanitation regulations in order to sanction house owners without basic environmental sanitation facilities;

- The government, NGOs and CBOs should provide public toilets to cater for the households who do not have toilets in their homes while concerned stakeholder should be encouraged to invest in efficient waste management practices.
- The government, NGOs, CBOs and concerned advocates should embark on public enlightenment and sanitation education for all residents of the city. The sensitization campaign should present the benefits and inherent dangers that are attached to poor sanitation and waste disposal practices in households.

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