



Journal of Applied Sciences

ISSN 1812-5654

science
alert

ANSI*net*
an open access publisher
<http://ansinet.com>



Research Article

A Survey on Faecal Management Practices and Associated Health Impacts among Residents in Selected Sub-Urban Communities in Ibadan, Nigeria

¹John Adedayo Olanrewaju, ¹Dorcas Oluwabukola Akinte,
¹Adewale Allen Sokan-Adeaga and ²Micheal Ayodeji Sokan-Adeaga

¹Department of Environmental Health Sciences, Faculty of Public Health, College of Medicine, Lead City University, Ibadan, Nigeria

²Department of Community Health and Primary Health Care, Faculty of Clinical Sciences, College of Medicine, University of Lagos, Lagos, Nigeria

Abstract

Background and Objective: The World Health Organisation enunciates that human excreta-related diseases account for over 2.2 million death annually among juveniles and indigents in developing countries. Consequently, proper faecal management and adequate sanitation have become the focal agenda globally. This survey investigated the faecal management practices and associated health impacts among residents in selected sub-urban communities in Ibadan, Nigeria. **Materials and Methods:** The study adopted a cross-sectional design and utilized a cluster sampling technique to select the sub-urban communities (Sango, Idi-Iroko, Saka, Gbagi, Egbeda) while the households and 250 respondents who participated in the study were randomly selected. A pre-tested semi-structured questionnaire was used to elicit information on respondents' socio-demographic variables, sanitary conditions, faecal management practices and perceived health impacts. Frequency tables, charts, mean and standard deviation were used to express the results. **Results:** Respondents' mean age was 33.8 ± 1.6 years, one-third (35.2%) earned \leq ₦10,000, nearly half (42.7%) have family size of 5-7 and a half (50%) of the respondents live in a face-to-face apartment. The majority of the respondents reported poor sanitary conditions. Faecal management practices by the respondents include: disposed in gorges (60.3%), thrown in bushes (50.2%) and buried in pits (47.7%). Major predisposing factors include low education, household financial constraints, overcrowding, poor sanitation enforcement and poor socio-cultural perception. Associated ailments reported by the respondents include Diarrhea (45%), Typhoid (34%), Dysentery (9%), Herpes and other infections (7%) and Syphilis (5%). **Conclusion:** The study concludes that most sub-urban settings in Ibadan lack adequate sanitary provisions and practice unwholesome faecal management, thereby at greater risk of human excreta-related morbidities.

Key words: Human excreta, sanitation, faecal management practices, predisposing factors, gastrointestinal infections, Nigeria

Citation: Olanrewaju, J.A., D.O. Akinte, A.A. Sokan-Adeaga and M.A. Sokan-Adeaga, 2022. A survey on faecal management practices and associated health impacts among residents in selected sub-urban communities in Ibadan, Nigeria. *J. Appl. Sci.*, 22: 107-116.

Corresponding Author: Adewale Allen Sokan-Adeaga, Department of Environmental Health Sciences, Faculty of Public Health, College of Medicine, Lead City University, P.O. Box 30678, Secretariat Ibadan, Oyo State, Nigeria Tel: +234-7039719329

Copyright: © 2022 John Adedayo Olanrewaju *et al.* This is an open access article distributed under the terms of the creative commons attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The health challenges related to occupational and environmental health risks are of major concern in low and middle-income countries where numerous people reside and work nearby to waste processing plants, discharge wastewater/effluent streams and disposal sites. For the populace whose livelihood relies on the collection, sorting and reusing of waste, measures to improve their daily working conditions and mitigate related health risks are essential. Numerous guidelines in the grey and peer-reviewed literature provide developing countries with specific recommendations to abate potential hazards exposure and integrated control measures along the waste chain¹⁻⁵. Furthermore, Blumenthal and Peasey⁶ conducted a review of epidemiological evidence on health impacts associated with human excreta and wastewater (WW), they established that the population working and living along the faecal sludge (FS) and WW chains are at higher risks of contracting gastro-intestinal infections.

Human excreta and poor sanitation have been linked to the conveyance of numerous communicable ailments viz ascariasis, cholera, cryptosporidiosis, hepatitis, polio, schistosomiasis and typhoid. The World Health Organisation enunciates that approximately 2.2 million mortality occurring yearly are due to diarrhoeal diseases and that a tenth of the population in the third world countries are severely infected with intestinal worms associated with indiscriminate excreta and waste disposal^{7,8}. The indigents and juveniles are the most vulnerable to human excreta-transmitted diseases. Most of the mortality associated with diarrhoea take place among children in poor economic nations⁹. The concentrations of ammonium, organic compounds, helminth eggs and solids particles in the faecal matter are typically greater by a multiple of 10 or more vis-a-vis than found in wastewater¹⁰. The chemical composition of excreta in % dry weight are cellulose 34.5, hemicellulose 6.0, crude protein 19.0, crude fat (lipids) 14.0, volatile solids 70.0, ash 34.0 and C/N ratio 4.5 are the source of surface and groundwater bodies contamination, with its attendant public health, social, environmental and economic impacts¹¹.

Studies conducted in third world nations⁸ show that collected faecal waste is released indiscriminately into the ambience causing deleterious health effects and aquatic pollution. For example, in urban centres of Lagos, water closet septic tanks and traditional pit latrines are the popular sanitation systems used in most residential areas of metropolitan Lagos. Albeit, the consequential environmental issues facing Lagos metropolis are the management of faecal

sludge and similar wastes. Although the use of bucket latrine in Lagos cosmopolitan has been prohibited, the government through the Sewage and Water Department of the State Ministry of Environment has presently not devised a methodical system of managing these wastes. Hence, the water bodies in Lagos and some instances groundwater serves as the final destination for all these wastes viz untreated excreta, industrial and commercial effluents. Consequently, this leads to pollution of water bodies and the annihilation of marine organisms and other aquatic food sources in the metropolis. The porosity of the soil also accentuates the propensity of the infiltration of underground water bodies (which serves as the major water source for many communities) by sewage and leachates from wastes¹².

Montangero and Strauss¹³ have highlighted factors associated with uncontrolled dumping of faecal waste and sludge in the urban setting. These include prohibitive emptying fees, inaccessible pits as well as long haulage distance. Other noticeable causative factors are lack of political will, legal barriers on faecal sludge management and lack of defined roles assigned to the different stakeholders as well as the non-integration of faecal sludge management in urban planning. As a result, excreta-related ailments are endemic in most urban areas of developing countries, thereby attenuating income and the quality of life of the urban population. Thus appropriate excreta disposal and improved sanitation are consequential to the protection of public health. In addition, environmental-friendly excreta disposal and handling methods help to occlude excreted pathogens from infiltrating into the ambience. Therefore for optimal healthy living, it is germane to treat and contain human excreta *in-situ* as possible before it is discharged into the environment¹⁴⁻¹⁶.

It is therefore momentous to study human excreta and waste management systems, especially in the urban areas of third world nations to find solutions and to pre-empt related environmental health risks. Therefore the health consequences of inappropriate human excreta management make this survey crucial. Ibadan is becoming a rapidly growing urban centre where urbanisation and sprawl have overhauled hitherto rural communities and settlements without complete transformation. Therefore, traditional human excreta management exists alongside contemporary excreta management systems. Thus, an exploration of the practice and frameworks of human excreta management becomes exigent in the light of inadequate housing and sanitation to see how they conform to standard procedures and guidelines for human excreta management. Based on the aforementioned goal, the survey was therefore designed to investigate the faecal management practices and associated

health impacts among residents in selected sub-urban communities in Ibadan, Oyo State, Nigeria.

MATERIALS AND METHODS

Study design and settings: The study employed a cross-sectional survey to elicit information on the faecal management practices in the selected sub-urban communities in Ibadan and their associated health impact on the communities residents. The study was carried out in Ibadan, the capital of Oyo State, in Nigeria. Strategically, positioned on longitude 3°5' East of Greenwich Meridian and latitude of 70°23N west of the equator. This ancient city is sited close to the forest grassland boundary of Southwestern Nigeria. In 1952, the landmass was estimated as 103.8 km², it stretched to 136 km² in 1987 and approximated as 400 km² in 2000¹⁷. The National Population Census estimated the population as 2,550,593 with a mean population density of 828 people per km²¹⁸. Administratively, it is divided into five local government areas and six local government areas in the metropolitan and rural areas, respectively. The choice of Ibadan as a study location for this survey is based on its defective sanitary conditions and environmental decadence^{19,20}.

Study population: The study population consists of people living and working within the selected sub-urban communities in Ibadan. The study used a cluster sampling technique in getting the sub-urban communities in Ibadan viz., Sango, Idi-Iroko, Saka, Gbagi, Egbeda.

Sample size and sampling technique: The sample size of the study comprises 250 respondents selected across the target locations (Sango, Idi-Iroko, Saka, Gbagi, Egbeda). A random sampling technique was used in the selection of the respondents. The sample frame was derived from the National Population Commission's 2006 population figures for the metropolitan areas which were projected to 2010 using the UNFPA growth rates of 3.46% for Ibadan. The final stage was

the determination of sample size for the household survey. Different percentages of the household total considered large enough for representation were adopted as sample size as shown in Table 1.

Instrument for data collection: Data collection was done through a pre-tested structured, self-administered questionnaire. The questionnaires were designed by the authors. The components of the questionnaire were categorized into 6 sections namely:

- Section A :** Socio-demographic information of respondents
- Section B :** Sanitary conditions of sub-urban communities in Ibadan
- Section C :** Perception on the impact of poor sanitary practices in the environment
- Section D :** Possible solution for the faecal management in sub-urban communities in Ibadan
- Section E :** Factors that influence faecal management practice in sub-urban communities in Ibadan
- Section F :** Perceived health implications of faecal management practices on dwellers in sub-urban communities in Ibadan

In addition to the questionnaires, we employed key informant interview (KII) to elicit information from community leaders, community health workers and other decision-makers who oversee the day-to-day environmental and health activities of the communities. A guide was prepared to obtain relevant information on the various methods of faecal management practice by the community dwellers, number and the frequently reported health conditions/ailments by the populace. The importance of the KII is to substantiate the information obtained from the respondents with the questionnaires.

Validity and reliability of the instrument: The questionnaire for this study was designed by the researcher. The instrument was rigorously checked by the project supervisor and other

Table 1: Sample size and sampling techniques

City	LGA	Wards/communities /districts	Population size	Selected number of household	No. of households per ward/district
Ibadan metropolis population: 1,546,423 (0.29%) of 327,675	*Ibadan North	12	354,490	190	16
	*Ibadan North West	11	176,594	189	17
	*Ibadan South West	12	326,516	190	16
Households in Ibadan metropolitan LGAs is included	*Ibadan South East	12	307,406	190	16
	*Ibadan North East	12	381,417	190	16
	Sub-total	59	1,546,423	949	81

Source: 2006 population figures projected

research experts, who made several corrections and inputs to the questionnaires after which it was validated. The instrument was pre-tested amidst community dwellers in Yemetu, a sub-urban area in Ibadan North Local Government Area of Oyo State. During the pretest, the questionnaire was administered only to consenting individuals living and working within the community. The Cronbach's alpha method was used to determine the instrument reliability. The alpha coefficient for the pre-test was 0.78, which was an indication of the reliability of the questionnaire.

Data collection procedure: The data was collected over 10 weeks and it was done either by face-to-face interview or through self-administration of the questionnaires. To ensure that we collect accurate information, the self-administered format was only permitted for respondents with tertiary education and who indicated a willingness to do so.

Data management and analysis: Data were entered and analyzed using SPSS Package version 24 (SPSS, Inc., USA). The use of frequency tables, percentages, chart presentation and descriptive statistics (mean and standard deviation) were utilized for result presentation.

Ethical considerations: An introductory letter was obtained from the Oyo State Ministry of Environment after studying the research proposal. This was subsequently approved by the Local Government Chairman of each selected community. Also, informed verbal consent was obtained from all participants after a thorough explanation of the research before being recruited into the study. The right to privacy and anonymity of the participants in the study were strictly adhered to by the researchers and respondents were assured that information obtained would be used for research only.

RESULTS

A total of 250 questionnaires were administered and of which only 199 were completed, returned and subsequently analyzed giving a response rate of 80%.

Respondents' socio-demographic characteristics: The baseline socio-demographic characteristics of respondents are shown in Table 2. The mean respondents' age was 33.8 ± 1.6 years. More than half (60.3%) of the respondents were female. Barely half (54.8%) of the respondents were married and the majority (67.3%) had higher education (tertiary and postgraduate). A higher proportion of the

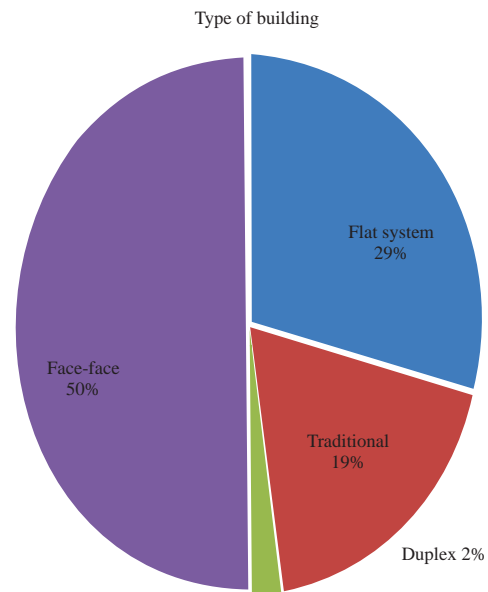


Fig. 1: Type of buildings occupied by respondents

respondents were traders (37.4%), followed by civil/public servants (26.3%), students (16.2%) with the least being artisans (7.6%). About one-third (35.2%) of the respondents earned less than or equal to #10,000 and nearly half (42.7%) of the respondents have a family size of 5 to 7. Figure 1 depicts the type of building occupied by the residents. Half (50%) of the respondents live in a face-to-face apartment.

Current sanitary conditions of the selected sub-urban communities in Ibadan: From Table 3, most of the respondents reported the following poor sanitary and environmental conditions in the selected sub-urban communities of Ibadan: Poor waste disposal (54.8%), air pollution (64.8%), overcrowding (70.4%), noise pollution (95.5%), poor housing conditions (75.4%), poor sewage disposal (70.4%), lack of potable water (54.8%), flooding (64.8%), erosion (65.3%) and water pollution (70.4%).

Perception on the impact of poor sanitary conditions on the environment: Table 4, depicts that most (90%) of the respondents strongly agreed that solid wastes serve as a breeding ground for vectors. Barely half (50.2%) of the respondents believed strongly that disease can be prevented if wastes are properly managed and reduced to the barest minimum. The majority (60.3%) of the respondents strongly agree that malodors from dumpsites can cause respiratory illness. Approximately half (47.7%) of the respondents strongly

Table 2: Socio-demographic characteristics of respondents

Variables	Frequency (N = 199)	Percentage
Age group (year)		
20-30	71	35.7
31-40	67	33.7
41-50	37	18.6
51-above	24	12.1
Gender		
Male	79	39.7
Female	120	60.3
Marital status		
Single	50	25.1
Married	109	54.8
Divorce	40	20.1
Educational qualification		
Primary	30	15.1
Secondary	35	17.6
Tertiary	75	37.6
Postgraduate	59	29.7
Occupation		
Farmers	25	12.6
Civil/public servants	52	26.3
Students	32	16.2
Traders	74	37.4
Artisans	16	7.6
Monthly income		
<#10,000	70	35.2
#10,000-#50,000	65	32.7
#51,000-#100,000	35	17.6
>#100,000	29	14.5
Household sizes		
≤2	65	32.6
3-5	53	26.6
5-7	25	12.6
8-10	26	13.1
≥11	30	15.1
Family sizes		
≤4	85	29.6
5-7	59	42.7
8-10	25	12.6
≥11	30	15.1

Table 3: Current sanitary conditions of the selected sub-urban communities

Sanitary conditions	Number (%)	
	Yes	No
Poor waste disposal	109 (54.8)	90 (45.2)
Air pollution	129 (64.8)	70 (35.2)
Overcrowding/dense population	140 (70.4)	59 (29.6)
Noise pollution	190 (95.5)	9 (4.5)
Poor urban housing	150 (75.4)	49 (24.6)
Poor sewage disposal	140 (70.4)	59 (29.6)
Poor drinking water	109 (54.8)	90 (45.2)
Deforestation	5 (25.1)	149 (74.9)
Climate model	109 (54.8)	90 (45.2)
Flooding	129 (64.8)	70 (35.2)
Erosion	130 (65.3)	69 (34.7)
Water pollution	140 (70.4)	59 (29.6)

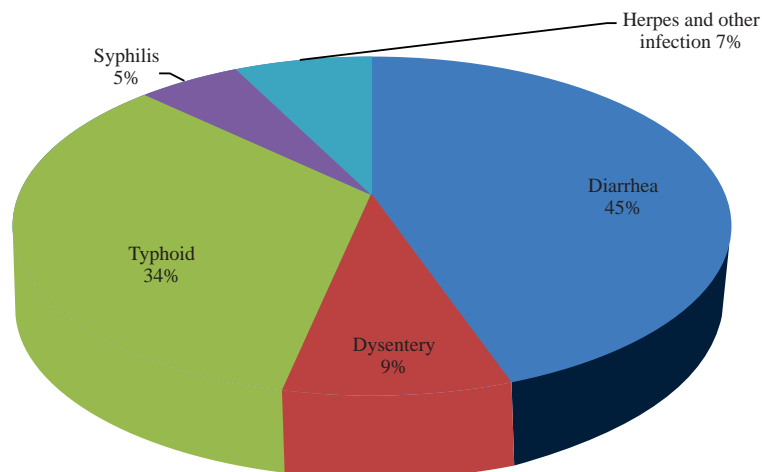


Fig. 2: Perceived health implications of faecal management practices on dwellers in sub-urban communities in Ibadan

Table 4: Perception on the impact of poor sanitary conditions on the environment

Items	Strongly agree No. (%)	Agree (No.)	Undecided No. (%)	Disagree No. (%)	Strongly disagree No. (%)
Solid waste is a breeding ground for disease vectors	90 (45.2)	40 (20.1)	0 (0)	30 (15.1)	39 (19.6)
Many diseases can be prevented if waste are properly administered and managed	100 (50.2)	50 (25.1)	0 (0)	27 (13.6)	22 (11.1)
Polluted air from refuse dumping sites brings out odour and causes respiratory diseases	120 (60.3)	70 (35.2)	0 (0)	4 (2.0)	5 (2.5)
Sources of water can be contaminated by 'water' flowing slowly from refuse dump	95 (47.7)	40 (20.1)	0 (0)	34 (17.1)	30 (15.1)
Solid waste causes aesthetic nuisance	100 (50.2)	50 (25.1)	0 (0)	27 (13.6)	22 (11.1)

Table 5: Possible methods of faecal management practices in the selected sub-urban communities in Ibadan

Items	Strongly agree No. (%)	Agree (No.)	Undecided No. (%)	Disagree No. (%)	Strongly disagree No. (%)
Disposed in the gorges	120 (60.3)	70 (35.2)	0 (0)	4 (2.0)	5 (2.5)
Disposed in bushes around	100 (50.2)	50 (25.1)	0 (0)	27 (13.6)	22 (11.1)
Buried in pits within the compounds	95 (47.7)	40 (20.1)	0 (0)	34 (17.1)	30 (15.1)

agreed that leachate from dumpsite can cause underground water pollution and just half (50.2%) of the respondents strongly agreed that indiscriminate solid waste dumping makes our environment unaesthetic.

Methods of faecal management practice in the communities: Some of the methods of faecal management practice by the respondents in the selected communities include disposed faecal waste in gorges (60.3%), disposed of in bushes within the vicinity (50.2%) and buried in pits within the community (47.7%) as depicted in Table 5.

Factors that influence faecal management practice in sub-urban communities in Ibadan: Various factors listed by the respondents that influence faecal management practice in the selected sub-urban communities were highlighted in Table 6.

Some of the factors include household financial constraints (54.8%), inadequate skilled manpower (64.8%), lack of provision of the ecological fund by local government authorities (70.4%), lack of proper health education by the community dwellers (95.5%), overpopulation (54.8%), poor sanitation enforcement regulation (64.8%) and poor socio-cultural perception towards faecal sludge (65.3%).

Perceived health conditions of faecal management practice on the community dwellers: Figure 2 showed the various perceived health conditions reported by the respondents in the selected sub-urban communities of Ibadan. The most common perceived ailments reported by the respondents is Diarrhea (45%), others are Typhoid (34%), Dysentery (9%), Herpes and other Infections (7%) and syphilis (5%).

Table 6: Factors that influence faecal management practices in sub-urban communities in Ibadan

Variables	Number (%)	
	Yes	No
Insufficient fund	109 (54.8)	90 (45.2)
Inadequate trained personnel	129 (64.8)	70 (35.2)
No financial sacrifices for environmental protection	140 (70.4)	59 (29.6)
Lack of proper education by the people	190 (95.5)	9 (4.5)
Poor equipment	150 (75.4)	49 (24.6)
Negligence of duty	140 (70.4)	59 (29.6)
Increasing population	109 (54.8)	90 (45.2)
Lack of adequate awareness on the part of the public on management of wastes	50 (25.1)	149 (74.9)
Lack of air pollution and control devices by industries	109 (54.8)	90 (45.2)
Poor enforcement of the waste management regulation	129 (64.8)	70 (35.2)
Culture of the people seems not to respect human dignity and decency	130 (65.3)	69 (34.7)
Increased industrialization and consumption of fresh raw materials	140 (70.4)	59 (29.6)

DISCUSSION

Recognising the relevance of copious sanitation as the foremost approach to solve environmental issues and developing an environmental sanitation system to mitigate the risk to pathogen-associated faecal waste in the environment is the trending global goal^{21,22}. Sanitation as defined by the National Environmental Sanitation Policy²³ is the strategic act of effecting salubrious and hygienic conditions in the environment to aggrandise public health and well-being, advance life quality and achieve a sustainable environment. Sanitation is nevertheless an exercise that encompasses waste disposition. It is from this point of view that the National Sanitation Guidelines²⁴ defines environmental sanitation as a process where people demand, evolve and maintain a clean and wholesome habitat for themselves, erecting impediments to nip in the bud disease transmission.

The findings from this study revealed that the general mean age of respondents from the various selected communities was 33.8±1.6 years and the age range was between 31-40 years, respectively. The majority of the respondents were females and the preponderance ethnic group belonged to the Yoruba. This is anticipated in a study of this nature since it was conducted in the Southwestern part of Nigeria. Also, a higher proportion of the respondents were traders, with most people earning a meagre monthly income, an average family size of 4-7 and living in a face-to-face apartment which demonstrate the high level of impoverishment and poor socio-economic status of the study population. This report is consistent with those of other authors²⁵⁻²⁷, who enunciated that most suburban communities in Nigeria are characterised by people who live a life of austerity and in abysmal poverty. However, there was a higher preponderance of people with tertiary and postgraduate

education. This finding negates that of Osumanu *et al.*²⁸, who reported that most sub-urban dwellers have a low level of literacy.

The majority of the respondents complained of poor sanitary conditions and inimical environmental ambiances such as air/noise pollution, indiscriminate waste disposal, lack of potable water, poor housing plan, overcrowding, water pollution, indiscriminate sewage disposal, incessant flooding and erosion. Like other urban sprawls in third world nations, Ibadan is confronted with huge sanitation problems which include inhumane housing conditions, a dearth of sanitary provision etc. The strategic location of the city makes it attractive to migrants from adjoining cities thereby contributing to the already deplorable state. A common phenomenon is piles of garbage which are scattered indiscriminately in major streets in the municipality¹⁹. Portable water is only accessible by 22.6% of the Ibadan population and barely 32.5% has accessibility to sanitary facilities²⁰. A larger proportion of the respondents strongly believe that unsanitary conditions encourage the breeding of vectors and spread of diseases, malodors and aerosols responsible for respiratory illness and the contamination of water bodies. All these perceptions strongly correlate the reports of Mara *et al.*²⁹ and Makinde²⁵, who separately reported that Ibadan cosmopolitan continues to witness epoch of developmental events, environmental hazards emanating from diverse sources which include vehicular emission, household biomass burning and industrial and power plants, contamination of terrestrial and aquatic bodies by solid wastes and faecal sludge, traffic congestion, accidents and noise. These problems have more explicit and acute effects on human wellbeing and safety, especially for the have-nots and on business prolificacy. The report from this study is further corroborated by Hammed *et al.*¹⁹, who reported that from visual inspection, sanitation facilities are in an abysmal state

and are inimical to human health. Specific indices enunciated by him are kitchen and bathroom constructed with zinc sheets and underground water pollution. Regrettably, students are the most susceptible groups of people to these sanitation challenges and health hazards in the municipal²⁰.

In terms of faecal management, the respondents thought that faecal matter/sludge should be disposed of in the gorges, bushes or buried in pits within the compound. All these suggested alternative methods of faecal management are environmentally hazardous and pose both immediate and long-term negative health impacts on the resident communities and ecosystem at large. This further corroborates the fact that sanitation provision in Ibadan is gravely impaired, similar to what is obtainable in most cities in Sub-Saharan Africa. Most residents are devoid of a hygienic toilet and consequently huge human excreta litter the environment². This report is further corroborated by Hammed *et al.*¹⁹, who reported that areas in Ibadan South West Local Government and other municipalities are noticeable for human excreta which are discharged into open drains, dumpsites, roadsides and open vicinities, moreover, there is also widespread of toilets discharging explicitly to open drains.

The survey revealed that several factors are responsible for the perpetuation of the improper management of faecal wastes/sludge by the communities' dwellers viz., low level of education and awareness, low level of income, overpopulation, political unwillingness, poor attitude of residents, underfunding of sanitation agencies, absence of facility plan and skilled manpower etc. Education is a vital tool for behavioural change. People who are well educated and adequately informed will take appropriate measures to safeguard their well-being. The low educational status of Ibadan residents influences their disposition to sanitary measures. This report agrees with those of previous authors³⁰, who reported that education is the prime determinant of the type of faecal management practice by an individual/community. Also, most of the people are low-income earners, hence they cannot afford standard sanitary facilities for the safe disposal of faeces. This factor might have influenced their indiscriminate and unhygienic practice of faecal disposal and management. Numerous authors have enunciated that high socio-economic households practice environmentally friendly methods of faecal disposal^{31,32}. Several authors also opined that lack of government commitment to the welfare of the local dwellers, underfunding of sanitation agencies, absence of facility plan, unsustainable government and poor developmental control are all factors responsible for these unwholesome practices^{19,26,33}.

Poor sanitation practices serve as a conduit for disease transmission through several channels. Human excreta may harbour diverse pathogenic organisms. When these pathogenic organisms invade the surrounding, they can remain transmissible for a longer duration and under certain conditions, they may proliferate in the surrounding. The invasion of pathogens poses a danger to mankind's sanity. Nonetheless, for a disease to occur, a copious infectious dose of the excreted pathogen must enter the human host. The most common perceived health conditions reported by the respondents are diarrhoea (45%), followed by typhoid (35%) and another varying degree of excreted related diseases. Globally, it is estimated that there are nearly 4 billion cases per annum (resulting in 2.2 million mortality), 200 million people with schistosomiasis and as many as 400 million people infected with intestinal worms^{7,34,35}. The aforementioned maladies are primarily excreta-borne. In poor economic nations, mortality and morbidity due to excreta-related diseases are exasperated by malnutrition and indigence.

Despite the high response rate and relevance of faecal management to public health, there are important limitations to this survey. Firstly, some of the respondents showed apathetic dispositions towards the study due to socio-cultural reasons. Secondly, 51 questionnaires were not properly filled, rendering them less useful. Thirdly, this survey was solely quantitatively with no opportunity for respondents to write down their comments or express their perspective outside the questions asked. Hence, future research should take into cognizance qualitative methodology to aggrandise findings in this area. Lastly, the use of cross-sectional design in the study only provides a snapshot of the situation and does not establish causal inference.

CONCLUSION

This study has appraised faecal management practices and their associated health impacts among residents in selected sub-urban communities in Ibadan, Nigeria. The study revealed that most communities in the sub-urban settings of Ibadan, Oyo State, practice open defecation and dispose their excreta into gorges, bushes and dug pits. These unwholesome practices escalate the already degraded environment and unsanitary conditions in the communities. Subsequently, the community residents experience and complained of several morbidities associated with indiscriminate human excreta disposal.

Hence, this study suggests that the Government at all levels should engage in wide publicity and sensitization programmes that will educate and improve the environmental

awareness of people on the need to properly manage human excreta and actively participate in sanitation exercises. Health education and sanitation studies should also be incorporated into schools' curricula to inculcate the maintenance of a safe environment at the early stage of life. Finally, a robust legal framework that will ensure compliance with environmental laws and sanitation should be developed.

SIGNIFICANCE STATEMENT

This study has shown that faecal-oral transmitted diseases are aggravated by indiscriminate and insanitary human excreta disposal and poor faecal sludge management. The study also revealed that numerous factors viz socio-economic variables, educational status, availability of infrastructures, the viability of sanitation laws and socio-cultural perception largely influence the faecal management practices adopted by a community/municipal. These vital findings are hitherto unknown or under-explored by many researchers working in this field. Thus, this study has contributed to the knowledge base through the aforementioned findings and also draws attention for more research to be done on the roles of socio-economic, cultural and institutional factors on faecal management practices

ACKNOWLEDGMENTS

We extend our sincere thanks and appreciation to all the community residents who participated in the study. We also extend our profound gratitude to the Oyo State Ministry of Environment and the Local Government authorities for their approval of the project and aiding easily accessibility to the local dwellers.

REFERENCES

1. Bünger, J., M. Antlauf-Lammersb, T.G. Schulza, G.A. Westphala, M.M. Müllera, P. Ruhnau and E. Halliera, 2000. Health complaints and immunological markers of exposure to bioaerosols among biowaste collectors and compost workers. *Occup. Environ. Med.*, 57: 458-464.
2. Bortoleto, A.P., K.H. Kurisu and K. Hanaki, 2012. Model development for household waste prevention behaviour. *Waste Manage.*, 32: 2195-2207.
3. Couth, R. and C. Trois, 2012. Sustainable waste management in Africa through CDM projects. *Waste Manage.*, 32: 2115-2125.
4. Drechsel, P., C.A. Scott, L. Raschid-Sally, M. Redwood and A. Bahri, 2010. *Wastewater Irrigation and Health: Assessing and Mitigating Risk in Low-Income Countries*. IWMI, London, ISBN: 9781844077960, Pages: 404.
5. Strenstrom, T.A., R. Seidu, E. Nelson and Z. Christian, 2011. *Microbial Exposure and Health Assessments in Sanitation Technologies and Systems*. Stockholm Environment Institute, Stockholm, Sweden, ISBN: 978-91-86125-36-3 Pages: 165.
6. Blumenthal, U.J. and A. Peasey, 2002. *Critical Review of Epidemiological Evidence of the Health Effects of Wastewater and Excreta use in Agriculture*. World Health Organization, London, England pp: 1-42.
7. Harhay, M.O., J. Horton and P.L. Olliaro, 2010. Epidemiology and control of human gastrointestinal parasites in children. *Expert Rev. Anti Infect. Ther.*, 8: 219-234.
8. Gelaw, A., B. Anagaw, B. Nigussie, B. Silesh and A. Yirga *et al.*, 2013. Prevalence of intestinal parasitic infections and risk factors among school children at the University of Gondar Community School, Northwest Ethiopia: A cross-sectional study. *BMC Public Health*, Vol. 13. 10.1186/1471-2458-13-304.
9. Osman, M., D. El Safadi, A. Cian, S. Benamrouz and C. Nourrisson *et al.*, 2016. Prevalence and risk factors for intestinal protozoan infections with *Cryptosporidium*, *Giardia*, *Blastocystis* and *Dientamoeba* among school children in Tripoli, Lebanon. *PLoS Neglected Trop. Dis.*, Vol. 10. 10.1371/journal.pntd.0004496.
10. Momodu, N.S., K.O. Dimuna and J.E. Dimuna, 2011. Mitigating the impact of solid wastes in urban centres in Nigeria. *J. Hum. Ecol.*, 34: 125-133.
11. Klingel, F., A. Montangero, D. Kone and M. Strauss, 2002. *Faecal sludge management in developing countries (A planning manual)*. Swiss Federal Institute for Environmental Science and Technology, Department for Water and Sanitation in Developing Countries.
12. Yusuf, M.A. and T.A. Abiye, 2019. Risks of groundwater pollution in the coastal areas of Lagos, southwestern Nigeria. *Groundwater Sustainable Dev.*, Vol. 9. 10.1016/j.gsd.2019.100222.
13. Montangero, A. and M. Strauss, 2002. *Faecal sludge treatment*. Swiss Federal Institute for Environmental Science (EAWAG), February 14, 2002. http://www.pseau.org/outils/ouvrages/eawag_faecal_sludge_treatment_2002.pdf
14. LeChevallier, M.W., T.J. Mansfield, J.M. Gibson, 2020. Protecting wastewater workers from disease risks: Personal protective equipment guidelines. *Water Environ. Res.*, 92: 524-533.
15. Naidoo, R. and B. Fisher, 2020. Reset sustainable development goals for a pandemic world. *Nature*, 583: 198-201.
16. Peasey, A., 2000. *Health Aspect of Dry Sanitation with Waste Reuse*. WELL, London, UK, ISBN: 0906055741 Pages: 36.
17. Laurent, F., 2003. *Urban slums reports: The case of Ibadan, Nigeria*. Institut Francais de Recherche en Afrique (IFRA), University of Ibadan. P.O. Box 21540, Oyo State, Nigeria. https://www.ucl.ac.uk/dpu-projects/Global_Report/pdfs/lbadan.pdf
18. Idike, A.A. and I.E., Okechukwu, 2015. Census politics in Nigeria: An examination of 2006 population census. *J. Policy Dev. Stud.*, 9: 47-72.

19. Olayiwola, H.A., L. AbuduLawal and K.A. Gbola, 2017. Effects of indiscriminate solid waste disposal and environmental issues in Ibadan South West Local government, Oyo state, Nigeria. *J. Natural Sci. Res.*, 7: 87-97.
20. Adekunle, M.M., A.Y. Sangodoyin and B. Wahab, 2020. Status of solid waste composition and quantity among varying households in Ibadan Metropolis, Nigeria. *Int. J. Edu. Res.*, 8: 133-156.
21. Langergraber, G. and E. Muellegger, 2005. Ecological sanitation-a way to solve global sanitation problems? *Environ. Int.*, 31: 433-444.
22. Dickin, S., L. Dagerskog, A. Jiménez, K. Andersson and K. Savadogo, 2018. Understanding sustained use of ecological sanitation in rural Burkina Faso. *Sci. Total Environ.*, 613-614: 140-148.
23. Ezeudu, O.B., 2020. Urban sanitation in Nigeria: The past, current and future status of access, policies and institutions. *Rev. Environ. Health*, 35: 123-137.
24. Ademiluyi, I.A. and J.A. Odugbesan, 2008. Sustainability and impact of community water supply and sanitation programmes in Nigeria: An overview. *Afr. J. Agric. Res.*, 3: 811-817.
25. Makinde, O.O., 2012. Housing: Central city slums, a case study of Ibadan. *J. Environ. Earth Sci.*, 2: 21-31.
26. Olanrewaju, S.O. and M.B. Afolabi, 2020. A review of sanitation challenges in Ibadan metropolis, Nigeria. *LAUTECH J. Civil Environ. Stud.*, 4: 134-142.
27. Oladapo, O.T., A.B. Tosin, S.A.A. Allen and S.A.M. Ayodeji, 2020. Knowledge and perceived health risks associated with heavy metals contamination in groundwater-A case study of Sagamu Local Government area, Ogun State, Nigeria. *Int. J. Health, Safety Environ.*, 6: 506-518.
28. Osumanu, I.K., E.A. Kosoe and F. Ategeeng, 2019. Determinants of open defecation in the Wa municipality of Ghana: Empirical findings highlighting sociocultural and economic dynamics among households. *J. Environ. Public Health*, Vol. 2019. 10.1155/2019/3075840.
29. Mara, D., J. Lane, B. Scott and D. Trouba, 2010. Sanitation and health. *PLoS Med.*, Vol. 7. 10.1371/journal.pmed.1000363.
30. Oloruntoba, E.O., O.E. Amubiyea, M. Adejumo and M.K.C. Sridhar, 2019. Status of sanitation facilities and factors influencing faecal disposal practices in selected low-income communities in Ibadan, Nigeria. *J. Environ. Pollut. Hum. Health*, 7: 62-72.
31. Azage, M. and D. Haile, 2015. Factors associated with safe child feces disposal practices in Ethiopia: Evidence from demographic and health survey. *Arch. Public Health*, Vol. 73 10.1186/s13690-015-0090-z.
32. Phaswana-Mafuya, N. and N. Shukla, 2005. Factors that could motivate people to adopt safe hygienic practices in the Eastern Cape Province, South Africa. *Afr. Health Sci.*, 5: 21-28.
33. Aliyu, A.A. and L. Amadu, 2017. Urbanizations, cities and health: The challenges of Nigeria-A review. *Ann. Afr. Med.*, 16: 149-158.
34. Tinuade, O., O. John, O. Saheed, O. Oyeku, N. Fidelis and D. Olabisi, 2006. Parasitic etiology of childhood diarrhea. *Indian J. Pediatr.*, 73: 1081-1084.
35. Mbae, C.K., D.J. Nokes, E. Mulinge, J. Nyambura, A. Waruru and S. Kariuki, 2013. Intestinal parasitic infections in children presenting with diarrhoea in outpatient and inpatient settings in an informal settlement of Nairobi, Kenya. *BMC Infect. Dis.*, Vol. 13. 10.1186/1471-2334-13-243.