

# Patterns and Determinants of Child Faecal Handling Among Mothers of Under-5 Children in Osun State, South-West Nigeria

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**Abstract:** Diseases with faeco-oral route of transmission remain a problem of public health importance, majority of which can be attributed to unsanitary handling of child faeces. This study aimed to assess the patterns and determinants of sanitary handling of child faecal matter among mothers of under-5 children in Osun State, Nigeria. A descriptive cross-sectional study design was employed to study 598 mothers in Osun State. A multistage sampling technique was adopted for the recruitment. Data were collected using an interviewer-administered questionnaire and a checklist was used to assess the sanitation of the houses. Determinants of sanitary disposal of child faeces were assessed using binary logistic regression. Sanitary handling of child faeces was practiced by 337 (56.4%) mothers. Knowledge of the harmful effects of improper child faecal handling, sanitation index, and religion were observed to be significant determinants of sanitary disposal of child faeces. Increase in the knowledge score increased probability of sanitary child faecal handling ( $B=0.403$ , 95%  $CI=1.088-2.060$ ,  $p=0.013$ ). Poor sanitation index had a negative relationship with the practice of sanitary child faecal handling ( $B=-0.180$ , 95%  $CI=0.789-0.885$ ,  $p<0.001$ ). The Muslims were 1.7 times more likely to practice sanitary disposal of child faeces than Christians (Odds ratio=0.6, 95%  $CI=0.352-0.872$ ,  $p=0.011$ ). A significant number of mothers still practice unsanitary handling of their children's faeces which predisposes the duo to diseases. Strengthening health promotion programmes in this regard is imperative.

**Keywords:** Child Faecal Disposal, Sanitary Faecal Handling, Under-5 Children, Osun State

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## 1. Introduction

Unhygienic handling of child faecal matter is as harmful as unhygienic handling of adult faecal matter. The burden of diseases spread through the faeco-oral route like diarrheal disease, cholera, and poliomyelitis are mainly from improper handling of child faecal matter [1, 2]. Child faeces is unfortunately perceived not to be harmful in some cultural settings, including Osun State. The cultural values that believe in the idealness of a child defecating on the mother or

caregiver's body indicate the likelihood of mothers adopting less sanitary measures in handling children's faeces compared to their response in the handling of adult faecal matter. Based on the degree of contact with fresh faecal matter, handling of the children faeces can be classified into sanitary and unsanitary means of sewage disposal.

The prevalence of sanitary disposal of faeces varies in numerous studies that have been conducted. [3, 5] A multiple indicator cluster survey conducted in Nigeria showed that only 58.1% of the children surveyed had their stool safely disposed

off before the survey. The survey also established a gap in the practice of sanitary disposal of faeces across rural and urban communities. [4] A survey in Ile-Ife, a community in South-West Nigeria showed a diurnal-nocturnal variation in the prevalence of sanitary disposal of child faeces. The practice of safe disposal of faeces was more in the night, 69.0%, compared to 19.7% during the day. [3]

Previous studies have identified various determinants of the practice of safe disposal of child faeces; some of which slight variations were observed across socio-cultural environments where the studies were conducted. Household access to safe disposal of sewage, level of education of mothers, wealth index, and geographical location (rural/urban) were common factors that have been identified as determinants of safe child faecal disposal practices. [6-9] Other less common determinants that have been identified in some studies were religion, level of education of heads of households, and age of heads of households. [5-10] This study assessed the entire spectrum of child faecal handling rather than focusing on the disposal methods. The determinants of the patterns of faecal handling were assessed within the socio-cultural context of the state where the study was conducted. The study population has socio-cultural values that are homogenous with the entire South-West of Nigeria. Hence, findings from the study can be a basis for intervention programmes and policy formulation to control unsanitary handling of child faecal matter in the South-West region of the country.

## 2. Materials and Methods

### 2.1. Study Area

This study was conducted in Osun State, South-West Nigeria. The state lies in the tropical rainforest covering an area of approximately 14,875 square kilometres, 7°30' N 4°30' E. According to the national population census, it had a total population of 3,423,535 as of 2006, with a 2020 population projection figure of 5,320,967 based on an annual growth rate of 3.2%. The state comprises 30 Local Government Areas (LGAs) classified into an equal proportion of rural and urban local government areas. Both the rural and urban local government areas in Osun State have good access to communication infrastructures that are being used for the dissemination of health information. The common means of communication include radio, television, posters, and health education or sensitization conducted by healthcare workers in the communities.

The population relies mainly on private drinking water systems due to the moribund public water supply system in the state. Also, the means of sewage disposal is mainly private because there is no sewerage system in any part of the state or sewage treatment plant. Each local government area has an environmental health unit saddled with the responsibility of enforcing existing laws that make it mandatory that all private houses and public buildings should have facilities for sanitary means of sewage and refuse disposals.

### 2.2. Study Design and Population

This study was conducted using a descriptive cross-sectional study design. Participants in the study comprised mothers of under-5 children in the selected households in the selected local government areas. Mothers that were visitors in the study area at the time of the study were excluded. The data were collected between August and September 2021.

### 2.3. Sample Size and Sampling Technique

The sample size (N) was calculated to get an absolute precision of  $\pm 5\%$  using the sample size formula for comparison between two proportions. After correcting for an anticipated non-response rate of 10%, the sample size was 79. The sample size was calculated based on the proportion of households in the rural and urban areas of Nigeria that used improved toilet facilities, 39%, and 74% respectively. [12] However, to ensure the robustness of the study, a total of 598 households completed the study; 299 households in the rural local government area (Atakumosa West LGA) and 299 from the urban LGA (Ife East LGA).

The participants were selected via a multistage sampling method. The list of local government areas in Osun State was stratified into two groups-rural and urban. A local government area each was randomly selected from the two groups using a simple random sampling method, the balloting technique. Each selected LGA has eleven wards, out of which three wards were selected per LGA, by a simple random sampling method. Alternate households were selected and a willing eligible mother per household was enrolled in the study. The sample size was proportionally allocated to the LGAs based on the projected population of the selected local government areas. A total of 598 households participated in the study; 299 households in the rural local government area (Atakumosa West LGA) and 299 from the urban LGA (Ife East LGA). The mothers of the households were enrolled in the study. Where the mother of the selected household was not available, the next available mother in the next household was enrolled. Only one household was enrolled per house.

### 2.4. Data Collection

Data were collected using an electronic interviewer-administered questionnaire, Kobo Collect. The questionnaire was structured mainly as close-ended while room was given for other responses not captured in the close-ended response to each question in the form of an open-ended response. The questionnaire comprised three sections: Section A contained questions on the socio-demographic variables while section B assessed the household assets used for determining the socio-economic status of the households. This section also included questions on their sources of water. Section C contained questions on means of sewage disposal, their accessibility, and functionality. Section D contained questions that assessed the practice of child faeces handling by mothers while section E assessed the mothers' level of knowledge of the health effects of improper handling of child faecal matter.

## 2.5. Data Analysis

Data were analysed using IBM SPSS version 26 for windows. Categorical variables like the level of education of the mothers, ethnicity, and the means of child faeces disposal were summarized using frequencies and percentages. Numerical data like age and the number of people per household were subjected to a test of normality using the Shapiro Wilk test and summarized using the median and interquartile range. The wealth index of households was calculated based on the assets of the households, means of sewage disposal and refuse disposal (both classified into sanitary and unsanitary means of disposal), and sources of drinking water supply. The wealth index was calculated using the principal component analysis.

The handling of child faeces was classified into sanitary or unsanitary based on their response to three questions: sites where the child or children passed stool, means of faecal disposal, and whether the surface where the child passed stool was cleaned thereafter. Categorical variables like the wealth index and level of education were compared across groups of mothers that handle child faeces in a sanitary or unsanitary way using Pearson Chi-Square. Numerical variables like age and the number of under-5 children per household were compared across the rural and urban study areas using the Mann-Whitney U test. Determinants of the practice of sanitary handling of child faeces were assessed using binary logistic regression. A p-value of <0.05 was considered statistically significant.

## 3. Results

An equal proportion of respondents were recruited from rural and urban communities, 299 (50.0%) respectively. The median age of the mothers was 30 years (IQR=25.0–35.0) while the median age of male heads of households was 36.0 years (IQR=30.0–41.0). The average monthly earning per household was 25000 (IQR=10,000–45,000) naira. Majority of respondents were Christians, 479 (80.1%) and married, 584 (97.7%). About one-tenth, 71 (11.9%) of the respondents married into polygamous family settings while 520 (87.0%) were married in a monogamous setting. Seven respondents (1.2%) were single mothers. Majority of the mothers were traders, 317 (53.1%), followed by mothers that were artisans 181 (28.2%). About 1 out of 10 mothers that participated were full-time housewives, 59 (9.9%). Majority of the male and female heads of households had secondary levels of education, 319 (53.3%) and 324 (54.2%) respectively. The proportion of female heads of households with a tertiary level of education, 185 (30.9%) was higher than the proportion of male heads of households with a similar level of education, 130 (21.7%). Almost equal proportions of male, 19 (3.2%) and female 20 (3.3%) heads of households had no formal education. The households were well distributed across the wealth index calculated based on the households' assets using principal component analysis.

Hand-pumped borehole was the most common source of drinking water of the households, 271 (56.1%); followed by households that drank water from protected dug wells, 176 (33.3%). The least used source of water for drinking was

rivers, 7 (1.3%). Burning was the most common means of refuse disposal, 426 (72.0%). Some of the households also practiced open dumping of refuse, 261 (35.0%). Less than one-tenth, 56 (9.5%) of the households registered with government-accredited refuse management agencies that collect refuse from house to house. About one-fifth of the households had no access to toilet facilities, 116 (19.4%). The most common means of sewage disposal was through water closets, 245 (41.0%). This was followed by the use of pit latrine, 222 (37.1%). About one-fifth of the households practiced open defecation, 116 (19.4%).

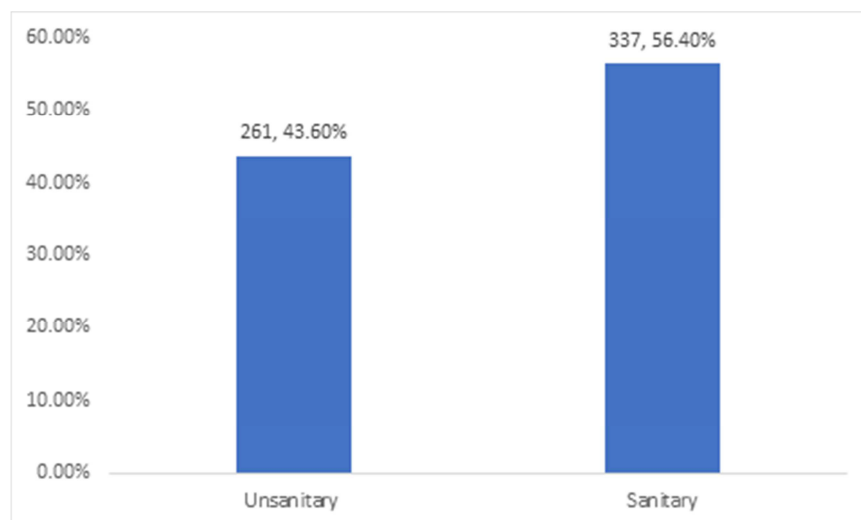
In terms of the handling of child faecal matter, majority of the under-5 children pass stool in the potty, 403 (67.4%). This was followed by the proportion that pass stool in diapers or pants, 129 (21.6%). Passage of stool on the bare floor within the compound was observed in 25 (4.2%) households. The least practiced method was the passage of stool on the floor within the latrine cubicle, 2 (0.3%). Most mothers of under-5 children, 354 (59.2%) disposed of their under-5 children stool in latrines, 354 (59.2%). A significant proportion of the mothers of under-5 children disposed of their children's stool in unsanitary ways like disposal in a refuse dump, 83 (13.8%), throwing into an open field 39 (6.5%), and disposal into a canal or drain, 16 (2.7%). Other least commonly used means of child faecal disposal were burying and feeding faecal matter to animals. About half of the households, 210 (52.2%) washed the surface where a child defecates with water and soap, while one-third, 136 (33.8%) washed the surface with water only. A large number of mothers, 196 (32.8%) using single-use diapers for their children had no cause to wash surfaces where their children defecate. Details are shown in Table 1.

**Table 1.** Child Fecal handling among Mothers of Under-5 Children.

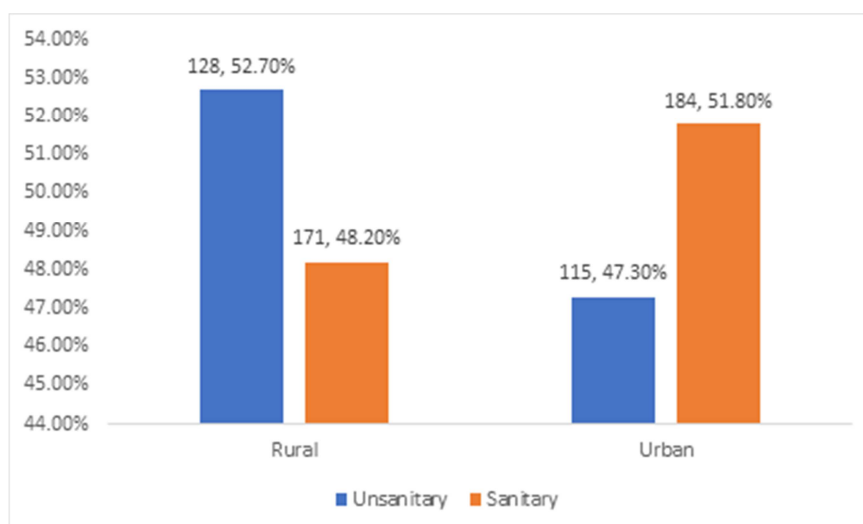
Variables	N (%)
Common site of passing stool	
Potty	403 (67.4)
Diaper/pant	129 (21.6)
Bare floor within the compound	25 (4.2)
Nappy	8 (1.3)
Latrine	6 (1.0)
Bare floor inside the house	5 (0.8)
Floor within the latrine cubicle	2 (0.3)
Bed	3 (0.5)
Others	17 (2.8)
Means of faecal disposal	
Dispose in the latrine	354 (59.2)
Dispose into garbage/refuse dump	83 (13.8)
Thrown into the open field	39 (6.5)
Thrown into canal or drain	16 (2.7)
Buried	5 (0.8)
Fed to animals	3 (0.5)
Left in the open space where the child defecates	2 (0.3)
Others	96 (16.1)
Cleaning of the surface where child passes stool	
No	39 (6.5)
Yes	559 (93.5)
Common surface cleaning agents (n=402)	
Water only	136 (33.8)
Water with soap	210 (52.2)
Water with soap and antiseptics	29 (7.2)
others	27 (6.7)

Based on the site of passing stool, means of faecal disposal, and cleaning of surfaces where a child passed stool, more than

half of the mothers of under-5 children, 337 (56.4%) handled child stool in a sanitary way. Details are shown in figure 1.



**Figure 1.** Child Faecal Handling among Mothers of Under 5 Children in Osun State.



**Figure 2.** Rural-Urban Comparison of Means of Child faecal Disposal.

Figure 2 showed the pattern of child faecal handling across the rural and urban areas of the study area. The sanitary handling of child stool was higher among mothers in the urban

communities, 184 (51.8%) compared with the proportion of mothers who practice sanitary handling of child faecal matter in the rural area, 171 (48.2%).

**Table 2.** Association between Participants characteristics and Handling of Child Faeces.

Variables	Handling of Child Faecal Matter		Statistics
	Unsanitary n (%)	Sanitary n (%)	
Religion			
Christianity	223 (46.6)	256 (53.4)	$X^2=8.286$ $p=0.004$
Islam	38 (31.9)	81 (68.1)	
Level of education of male head			
No formal education	6 (31.6)	13 (68.4)	$X^2=18.742$ $p<0.001$
Primary	78 (60.0)	52 (40.0)	
Secondary	128 (40.1)	191 (59.9)	
Tertiary	49 (37.7)	81 (62.3)	
Level of education of female head			
No formal education	7 (35.0)	13 (65.0)	$X^2=1.576$ $p=0.665$
Primary	32 (46.4)	37 (53.6)	
Secondary	146 (45.1)	178 (54.9)	
Tertiary	76 (41.1)	109 (58.9)	

Variables	Handling of Child Faecal Matter		Statistics
	Unsanitary n (%)	Sanitary n (%)	
House Ownership			
No	215 (45.2)	261 (54.8)	$X^2=1.576$
Yes	46 (37.7)	76 (62.3)	$p=0.138$
Water Sources			
Unsanitary	18 (58.1)	13 (41.9)	$X^2=2.764$
Sanitary	243 (42.9)	324 (57.1)	$p=0.096$
Wealth Index			
1	57 (48.3)	61 (51.7)	
2	50 (41.7)	70 (58.3)	
3	56 (46.3)	65 (53.7)	$X^2=4.872$
4	43 (35.8)	77 (64.2)	$p=0.301$
5	55 (46.2)	64 (53.8)	
Age of female head of household	30.0 (25.0–35.0)	31.5 (26.0–36.0)	$U=37626.0, p=0.002$
Age of male head of household	35.0 (30.0–40.0)	38.0 (31.0–42.0)	$U=37053.0, p=0.004$
Sanitation Index	5.0 (3.0–8.0)	3.0 (2.0–6.0)	$U=29882.0, p<0.001$
Number of people per household	4.0 (3.0–5.0)	4.0 (3.0–5.0)	$U=39859.0, p=0.061$
Number of females per household	2.0 (1.0–3.0)	2.0 (1.0–3.0)	$U=40482.5, p=0.080$
Number of males per household	2.0 (2.0–3.0)	2.0 (1.0–3.0)	$U=42441.0, p=0.445$
Knowledge of health effects of improper sewage handling	5.0 (4.0–5.0)	5.0 (5.0–5.0)	$U=39490.5, p=0.004$

$X^2$ =Chi-square,  $U$ =Mann Whitney U Test.

Table 2 showed associations between participants' households characteristics and sanitary disposal of child faeces. The practice of sanitary disposal of child faeces was significantly higher among mothers that practice Islam, 81 (68.1%) compared with the proportion of mothers that were Christians practicing sanitary disposal of child faeces, 256 (53.4%),  $p=0.004$ . The level of education of male heads of households was significantly associated with sanitary disposal of child stools,  $p<0.001$ . Sanitary disposal of child stools was observed to be practiced more when the male head of the household had at least a secondary level of education. There were also significant associations between the ages of male and female heads of households, and sanitary disposal of child faecal matter,  $p=0.004$  and  $p=0.002$  respectively. Households with older male and female heads tend to practice sanitary disposal of child stool compared with households with younger male and female heads. There was a significant association between households' sanitation index and sanitary disposal of sewage,  $p<0.001$ . Households with a good sanitation index were observed to have a higher practice of sanitary disposal of child faeces compared to households with a poor sanitation index. The practice of sanitary disposal of child faeces was also observed to be higher among mothers

who scored higher in the assessment of their knowledge about the harmful health effects of improper handling of child faecal matter,  $p=0.004$ .

A binary logistic regression of association between households' characteristics and sanitary disposal of child faecal matter showed that knowledge of harmful effects of improper sewage disposal, sanitation index, and religion were significant determinants of the practice of sanitary child faecal disposal. A unit increase in the knowledge score increased the probability of practicing sanitary disposal of child faecal matter ( $B=0.403, p=0.013, 95\% \text{ CI}=1.088-2.060$ ). There was a negative relationship between sanitation index score and practice of sanitary disposal of child stool ( $B=-0.180, p<0.001, 95\% \text{ CI}=0.789-0.885$ ). Mothers of under-5 children from Islamic households were 1.7 times more likely to practice sanitary disposal of child stool relative to mothers from Christian households, Odds ratio=0.6,  $p=0.011, 95\% \text{ CI}=0.352-0.872$ . Age of male and female heads of households, place of residence (rural or urban), number of females, and the total number of persons per household were not significant determinants of the practice of sanitary disposal of child stool. Details are shown in Table 3.

**Table 3.** Binary logistic Regression of Association Between participants' characteristics and sanitary disposal of child faeces.

Variables	B	p-value	95% CI
Knowledge of harmful effects of improper fecal handling	0.403	0.013	1.088–2.060
Age of male head of households	-0.004	0.166	0.987–1.077
Age of female head of households	0.031	0.797	0.963–1.029
Number of persons per household	0.109	0.142	0.964–1.289
Number of females per household	0.022	0.818	0.847–1.233
Sanitation index	-0.180	<0.001	0.789–0.885
Place of residence			
Rural	1.2		
Urban	Ref	0.432	0.808–1.644
Religion			
Christianity	Ref		
Islam	0.6	0.011	0.352–0.872

## 4. Discussion

Though more than half of the mothers of under 5 children adopt sanitary means of child faecal disposal, a significant proportion of mothers still practice unsanitary means of child faecal disposal. The finding was similar to the observation from a national assessment where almost the same proportion of children had safe disposal of faeces. [5] The prevalence of sanitary disposal of child faeces was lower than the prevalence observed in a study conducted in the same study area where about 7 out of 10 mothers practiced safe disposal of child faeces. [3] However, the prevalence of practice of safe faecal disposal in the latter study was poor during the day (less than one-fifth of the mothers). This could be due to variations in the method of data collection as direct observation was used for some of the data collections. [3] The overall prevalence of sanitary disposal of children's faeces in this study is similar to the prevalence observed in a multicountry study conducted in Sub-Saharan Africa. [11] The study was however conducted using secondary data from each country and the prevalences varied among the countries. The prevalence of households that practice safe disposal of child faeces showed a very low figure in Sub-Saharan Africa (less than one-third of the under 5 children) in another multicountry study. [7] This may however not reflect the exact prevalence in Nigeria due to the pulling effects of other countries in the region with poorer prevalences; in addition, the country-specific prevalences were not published.

The most common means of child faecal disposal was disposal into a pit latrine despite the water closet being the most common means of sewage disposal. This could be due to a significant proportion of children using single-use diapers that could not be disposed in the water closet to prevent blockage; therefore, making disposal into the garbage or refuse dumps the next available option. This pattern of sewage disposal was also observed in a study conducted in selected countries of Sub-Saharan Africa. [11] Similar studies conducted in India and Bangladesh however showed higher rates of disposal into the garbage. [6, 10] This could be due to variation in access to means of sewage disposal and cultural practices across the geographical regions.

There was a wide gap in the proportion of mothers adopting sanitary means of child faecal disposal across rural and urban communities. This could be due to a gap in access to amenities like toilet facilities and enlightenment programmes on safe handling of child faecal matter. This is supported by the rural-urban gap in the sanitary disposal of sewage generally and a higher proportion of rural dwellers practicing open defecation relative to urban communities' dwellers. [4, 12] Similar rural-urban gaps were observed in various national and multicountry studies with safe disposal of child faeces being less practiced in the rural areas relative to the urban areas. [5, 7, 11]

Knowledge of the harmful effects of improper sewage handling, including children's faeces, was observed to be a significant determinant of the practice of safe child faeces

disposal. An increase in knowledge score increased the probability of practicing safe faecal disposal. This could be due to the likely effects the knowledge may have on their perceptions, especially the perceived susceptibility and severity of diseases that might result from the unsafe disposal of children's faeces in this study. A study conducted at Ife Central Local Government, one of the study areas for this study, observed a similar association between knowledge of health effects of improper faecal handling and practice of safe child faecal disposal. [3] Some studies assessed the association between the mother's level of education (as a proxy measure of the level of knowledge) and the safe disposal of child faeces. [5, 13-15] Most of these studies observed a significant association between maternal level of education and the safe disposal of child faeces. This is contrary to the findings from this study where there was no significant association between mothers' level of education and practice of safe disposal of child faeces. There was however a significant association between fathers' level of education and safe disposal of child faeces. These variations in findings could be due to differences in cultural values of the study areas; this study was conducted in communities where the father makes major decisions regarding the households including the construction of sewage disposal facilities for their households.

There was an association between observing general sanitation and the probability of practicing safe disposal of child faeces. The sanitation index used in this study is interpreted as the higher the index, the poorer the level of sanitation. The sanitation index is a broad assessment of hygiene and sanitary status of a household that considers water sources, the presence of sanitary toilet facilities, refuse management, and the general hygiene condition of the house. The association between good sanitation index and practice of safe disposal of child faeces can therefore be partly due to household access to sanitary means of sewage disposal as observed in previous studies. [5, 15, 16] However, access to toilets, either improved or unimproved, had no significant effect on the practice of safe faecal disposal in a study conducted in Bangladesh. [17]

Religion was also a significant determinant of the practice of safe child faecal disposal. This could be due to the common doctrine of major religions in the study area that preach cleanliness as part of holiness especially with a common saying that "cleanliness is next to Godliness". A similar result was observed in a study conducted in Nigeria using secondary data from a national survey. [5, 15]

## 5. Conclusion

A significant proportion of mothers still practice unsafe disposal of faecal matter which can predispose both the children and adults to diseases, especially those transmitted through the faeco-oral route. The gap observed between the rural and urban areas in terms of the practice of safe faecal disposal calls for more focused attention on health promotion

in the rural areas, not leaving out the urban communities too. Since knowledge was an important determinant of safe faecal disposal practice, health education intervention will be key in efforts to improve safe child faecal disposal practices.

## 6. Recommendation for Future Study

An assessment of the determinants of child faecal handling using a mixed method is desirable. This will further explore the factors affecting child faecal handling in order to develop a comprehensive health-promoting approach aimed at improving the adoption of sanitary means of sewage handling.

## Funding

No funding was received for this study.

## Conflict of Interest

All the authors do not have any possible conflicts of interest.

## Ethical Approval

Ethical approvals were obtained from the Research and Ethics Units of Ife East Local Government Area and Atakumosa West Local Government Area. Confidentiality and data security were assured. Participation was made voluntary as each participant was at liberty to opt-out at any point in the study.

## Consent to Participate

Informed consent was sought from each respondent after an adequate explanation of the objectives of the study.

## Consent for Publication

Not applicable.

## Availability of Data and Materials

The dataset for this study is not publicly available but it will be made available via communication with the corresponding author.

## Code Availability

Not applicable.

## Contributions

All authors contributed to the conceptualization of the study. OSB, APA, and AND coordinated the implementation of the study. APA conducted the data analysis. OSB and APA wrote the first draft of the manuscript which was reviewed by ADN and ONE. All authors, OSB, APA, AND, and ONE

reviewed and approved the final manuscript.

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