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ISSN NUMBER: 2971_611X

**ARCHIVES OF PHARMACEUTICAL
SCIENCES AND BIOTECHNOLOGY****FACULTY OF
PHARMACEUTICAL SCIENCES
KADUNA STATE UNIVERSITY, KADUNA**

VOLUME 3 ISSUE 2

DECEMBER 2023

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ARCHIVES OF PHARMACEUTICAL SCIENCES AND BIOTECHNOLOGY JOURNAL**VOLUME 3 ISSUE 2, December 2023****ISSN 2971 – 611X****©ALL RIGHTS RESERVED****Published by the Faculty of Pharmaceutical Sciences, Kaduna State
University, Kaduna**

OPEN DEFECATION PRACTICES AND ASSOCIATED FACTORS AMONG WAMAKKO LGA RESIDENTS OF SOKOTO STATE

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ABSTRACT

Introduction: The study was carried out to assess practice and factors associated with open defecation among residents of Kalambaina area in Wamakko local government area of Sokoto State. The study was descriptive, and cross-sectional.

Aim: The study was carried out in Kalambaina area in Wamakko LGA from 1st of March to 30th of April 2023.

Method: A semi-structured questionnaire was used to generate useful information that addressed variables of the subject matter. Data were analyzed using GraphPad Prism 10.0.2 (232). The association between the dependent and independent variables was measured using $p < 0.05$ to determine statistical significance.

Results: A total of 142 participants took part in the study. The age group 35 – 39 years had the highest respondents (28.9%). Hausa tribe accounted for 101 (71.1%), while Igbo accounted for 4 (2.8%). Secondary school certificate holders were 68 (47.9%), and tertiary education accounted for 14 (9.9%). At 95% Confidence Interval (CI), the level of education was statistically significant to the practice of open defecation. All respondents knew that open defecation is practiced, with 23.2% practicing open defecation. The relationship between awareness and practice of open defecation shows [$p < 0.0001$; $OR = 6.078$; $CI = 3.557$ to 10.20]. On health implications, a very high percentage of the respondents (80.3%) accept that open defecation is a threat to public health with 79.6% accepting that open defecation harms our overall sanitation. The awareness of open defecation with health implications of open defecation shows [$p > 0.9999$; $OR = 0.9609$; $CI = 0.5449$ to 1.689]. With OR of 0.9609, the likelihood of knowing health implications of open defecation is insignificant with the level of awareness of open defecation.

Conclusion: Open defecation is practiced in the study area, and respondents are aware of its threat and health implications. The need to have an environment open defecation-free can never be overemphasized.

Keywords: Open defecation, Awareness, Practice, North-west, Nigeria

INTRODUCTION

Open defecation refers to the practice of people defecating in open spaces, such as fields, bushes, or bodies of water, instead of using toilets or other sanitation facilities. It is a widespread problem in many developing countries, particularly in rural areas, where access to sanitation facilities is limited (1,2). Open defecation entails that untreated human wastes are exposed or disposed of in ways that people can easily come into contact with the pathogens inherent in the fecal matter (3). The World Health Organization (WHO) and United Nation Children and Education Fund (UNICEF) have noted that up to 1 billion people across the world delves into open defecation. The peak amount occurs in India, with around 490 million people, Indonesia with 54 million prevalence, Pakistan 41 million, Nigeria 39 million, Ethiopia 34 million and Sudan 7 million (1). According to WHO, an estimated 2.4 billion people worldwide do not have access to basic sanitation facilities, and around 946 million people practice open defecation (4). From 2015 to 2020, WHO/UNICEF reported that the population practicing open defecation decreased by a third, from 739 million people to 494 million, with 85% of this drop occurring in rural areas, and 92% of the population practicing open defecation living in rural areas (5).

The United Nations (UN) has set a goal of achieving universal access to basic sanitation by 2030, as part of its Sustainable Development Goals (SDGs). Hence, in achieving the universal access to safely managed services by 2030, it will require a 4 times increase in current rates of progress (5). To further buttress on that, target 6.2 has

called on countries who are parties to the SDGs to end open defecation by 2030. In addition to that, the government of Nigeria has set a goal and commit to end open defecation in the country by 2025 through the formulation of a National Road Map and the Partnership for Expanded Water Supply, Sanitation and Hygiene (PEWASH) (6).

To further achieve open defecation free status by 2025, Nigeria has been able to record 76 local government areas from 12 states out of the 36 States and FCT that are open defecation free (7). Parts of the condition of attaining the open defecation free status, communities must have eliminated open defecation by 100 per cent toilet use, increased ownership and sustainability of hygiene and sanitation services and imbibed total sanitation practices, which include personal, environmental and domestic hygiene (7).

Open defecation can have serious health consequences most especially on human well-being and environmental health, and can lead to the spread of diseases such as cholera, typhoid, and diarrhea, which can be fatal, particularly among children (8,9). It can also contribute to the spread of parasites and other infections as well as a major risk to children's health and development (10). A report by Nwokolo & Nwokolo, stated that the WHO in 2017 has warned that there is worldwide spread of hepatitis B and it is currently a key global public health concern that need immediate attention and one major way to contain the threat is to avoid open defecation and improve environmental sanitation (8). The practice of open defecation remains widespread phenomenon in Nigeria (11), which is a primary factor that leads to poor

access to improved water and hygienic environment, leading to increased vulnerability to water-borne diseases, especially diarrhea outbreak. Some global health agencies have stressed that Nigeria needed to launch a serious campaign against open defecation to attain Goal 6 of the UN SDGs 2030 (8).

Several factors contribute to the problem of open defecation, including poverty, demographic and social factors like age, sex, marital status, household site, education, attitudes, occupation, income, lack of access to clean water and sanitation facilities, traditional beliefs, taboos, norms and values, and cultural or religious beliefs (7,11–13). The geographical location of residents was observed to be a significant factor in the practice of open defecation (14), where rural dwellers were about four times more likely to practice open defecation than urban dwellers. Demerits and effects of open defecation include and are not limited to aspect of health, safety, shame and dignity, violence, and education (15).

Addressing the problem of open defecation requires a multi-faceted approach, including improving access to sanitation facilities, promoting hygiene and sanitation education, and changing cultural attitudes towards open defecation. This study was aimed to assess practice and factors associated with open defecation among residents of Kalambaina area in Wamakko local government area in Sokoto State.

METHODOLOGY

Study Area

Sokoto State has a land area of 28,232.37sq kilometer and is located between longitudes 11°30' to 13° 50' East and latitude 4° to 6° North. It is bordered in the North by Niger Republic, Zamfara State to the East and

Kebbi State to the South and West. In terms of vegetation, the State falls within the savannah zone. Rainfall starts late and ends early with mean annual falls ranging between 50mm to 1,300mm. There are two major seasons in the State namely, wet, and dry. The harmattan, a dry, cold, and dusty wind is experienced in the State between November and February. Heat is more severe in the State in March and April. But the weather in the State is always cold in the morning and hot in the afternoon except at the peak of harmattan (<http://www.nigerianstat.gov.ng/>).

As at 2006 population census, Sokoto State has a population of 3,702,676 and ranked 17th most populated State in Nigeria. Children in the age bracket of 0 – 4 years accounted for 20.21%, while the least in percentage (0.43%) were above 85 years of age. In terms of estimated toilet facilities in Sokoto, pit latrine was the highest toilets facility used (57.48%, 13,882,485). This was followed by near-by bush/field which was 21.49% (5,581,159). Water closet and public toilets accounted for 5.09% and 6.57% respectively. Well water (65.87%) is the main water source in Sokoto. Pipe borne water inside-dwelling and outside-dwelling accounted for 7.01% and 4.48% respectively, while borehole is 3.50% (16).

Wamakko LGA is a semi-urban town doubling as the administrative center for Wamakko LGA. It has an area of 697 km² and a population of 179,619 at the 2006 census. Wamakko local government is mainly populated by Hausa people. The inhabitants are mostly farmers and animal rearers but the initial inhabitants were Sulubawa but now the area were dominated by Hausa (17).

Study Design and Data Collection Tool

The study was descriptive, and cross-sectional. A semi-structured questionnaire consisting of closed-ended questions was developed and used to generate useful information that addresses variables of the subject matter of the study. The questionnaire was divided into different sections in a chronological order.

Inclusion and Exclusion Criteria

Households without numbers were not included in the study, while non-residential houses were excluded. Households that are visitors were excluded from the study, and any household members less than seven in a household was excluded from the study.

Sample Size Determination

Using 9.2% prevalence from a previous study by Abalaka & Tokula (18), the sample size was estimated using the Cochran formula for sample size calculation at 95% CI and 10% attrition/no response rate.

$$N = (Z_{\alpha})^2 Pq/d^2$$

N = minimum sample size

Z_{α} = standard normal deviate corresponding to level of significance: 1.96 at α (Type 1 error) = 5%

P = rate of occurrence or prevalence at 9.2% = 0.092

$$q = 1 - P = (1 - 0.092) = 0.908$$

d = desired level of person = 5% = 0.05 (maximum sampling error allowed)

$$N = (1.96)^2 \times 0.092 \times 0.908 / 0.05^2$$

$$N = 3.8416 \times 0.083 / 0.0025 = 0.318853 / 0.0025 = 128.36 \approx 128$$

Accepting 10% non-response rate, the sample size = $N \times 1 / 1 - \text{non-response}$
 $128 \times 1 / 1 - 0.9 = 142.22 \approx 142$

Thus, a minimum sample of 142 respondents was used in this study.

Sampling Technique and Sample Selection

This study selected some enumeration areas (EAs), which are the smallest statistical sample unit in a national census and are usually defined according to the number of a house and its occupants. The boundaries typically follow physical features such as roads, rivers, and fence lines for easy identification.

Locality lists were generated, and the localities were classified into urban and rural. Various categories of roads were used during the exercise. Information on road names, class, and type obtained prior to the study were used to guide in the research and collection of data. Socio-economic amenities and landmarks such as financial, educational, health, recreational, traditional, religious, commercial, military and para-military institutions were identified.

A pre-test of the questionnaire was carried out in a community in Sokoto South to identify areas where there is need for adjustment in the questionnaire. To ensure that the objectives, and strategy are maintained, the survey methodology and data collection tools were properly explained to the participants before the commencement of the survey.

Data Analysis

Data were checked, entered, sorted, coded, cleaned and analysed using GraphPad Prism 10.0.2 (232). Descriptive statistics such as proportions and frequencies were used to perform descriptive statistics on the data obtained for the study variables. Therefore, tables, charts, and summaries of the numbers were used to convey the descriptive findings for the study. The association between the dependent and independent variables was

measured using Chi-square with $p < 0.05$ or 5% used to determine statistical significance.

RESULTS AND DISCUSSION

Socio-Demographic Characteristics of the Participants

A total of 142 participants took the survey. The age group with the highest respondents was 35 – 39 years (28.9%). This was followed by 40 – 44 years (13.4%), while 5.6% was accounted for in 45 – 49 years. There were no respondents in the age group 55 – 59 years and 65 years and above. A total

of 126 (88.7%) of the respondents were male, while 16 (11.3%) were females. Hausa tribe accounted for 101 (71.1%), while Igbo accounted for 2.8% of the study participants. On level education, participants with secondary school certificates were 68 (47.9%), and the least were respondents with tertiary education 14 (9.9%). An 83.8% of the respondents were married. On employment, 74.6% were employed, with predominantly practicing agriculture (34.5%) and livestock farming (32.4%). Table 1 provides details on participants' characteristics.

Table 1: Socio-demographic Variables and Distribution of Participants (N = 142)

Variable	Frequency	Percentage (%)
<i>Age</i>		
20 – 24	18	12.7
25 – 29	12	8.5
30 – 34	17	11.9
35 – 39	41	28.9
40 – 44	19	13.4
45 – 49	8	5.6
50 – 54	16	11.3
55 – 59	0	0
60 – 64	11	7.7
65 and above	0	0
Total	142	100
<i>Ethnicity</i>		
Hausa	101	71.1
Fulani	36	25.4
Igbo	4	2.8
Others	1	0.7
Total	142	100
<i>Level of education</i>		
No formal education	30	21.1
Primary school certificate	15	10.6
Secondary education	68	47.9
Tertiary education	14	9.9
Others	15	10.6
Total	142	100
<i>Religion</i>		



Islam	137	96.5
Christianity	5	3.5
Total	142	100
<i>Occupation</i>		
Employed	106	74.6
Unemployed	36	25.4
Total	142	100
<i>Categories of employment</i>		
Agriculture	49	34.5
Informal employment	36	25.4
Formal employment	1	0.7
Livestock	46	32.4
Trading	10	7.0
Total	142	100
<i>Marital status</i>		
Married	119	83.8
Divorced	0	0
Widowed	0	0
Single	23	16.2
Others	0	0
Total	142	100

Awareness of Open Defecation

On awareness of open defecation by the respondents, all respondents know that open defecation is practiced with same also accept the fact that open defecation expose men's and women's privacy. Figure 1 showed details of response on awareness of open defecation by respondents.

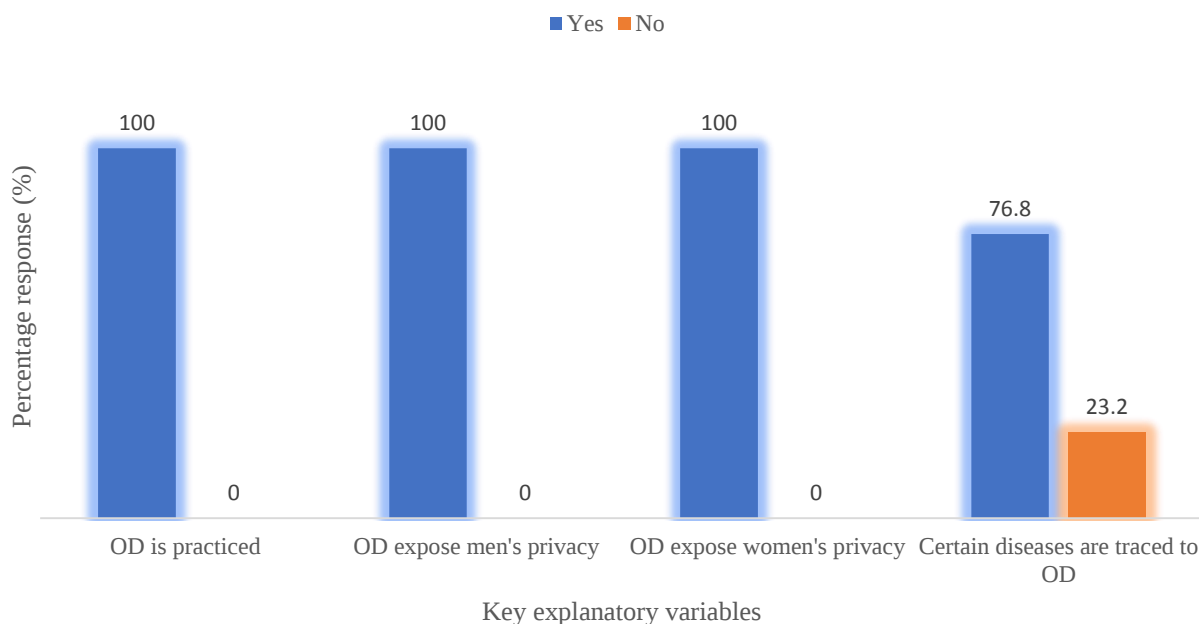


Figure 1: Awareness of open defecation

Key: OD = Open Defecation

Practice of Open Defecation

The practice of open defecation by respondents showed that 23.2% practice open defecation, while 93.7% defecate in their own houses with 64.8% who do not dispose feces into nearby bushes, public refuse bins and canals. Details of the response of respondents on practice of open defecation is shown in Figure 2.

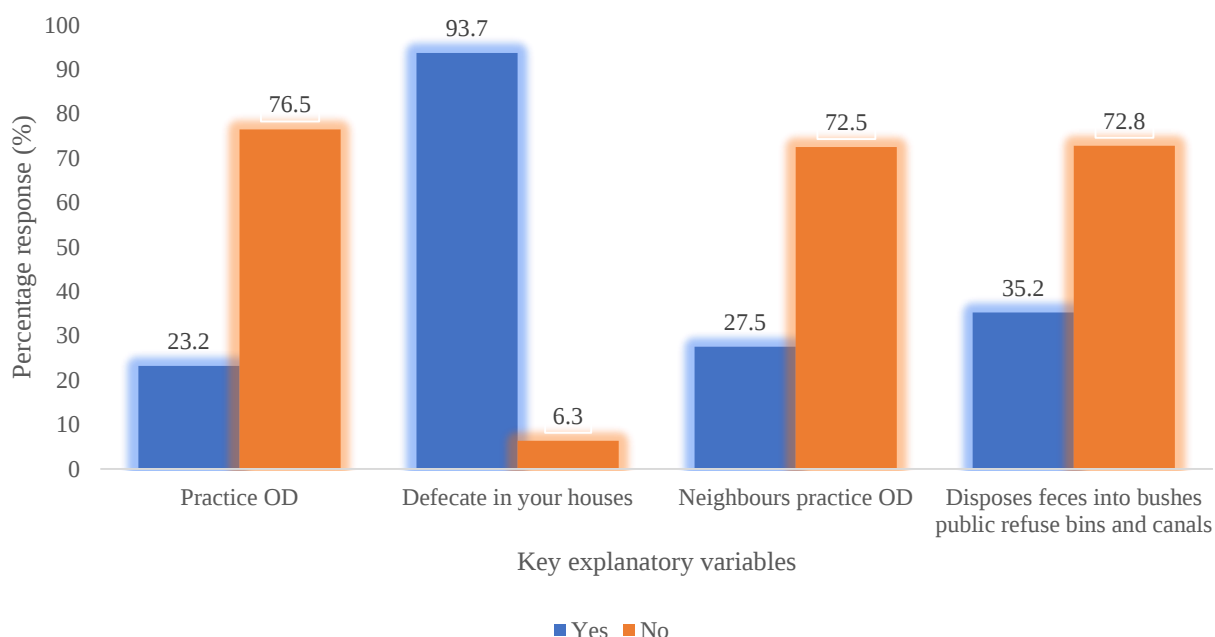


Figure 2: Practice of Open Defecation

Key: OD = Open Defecation

Relationship between awareness and practice of open defecation

On the relationship between awareness and practice of open defecation, the p value <0.0001, and is statistically significant at $p < 0.05$. Moreover, at odd ratio 6.078 for awareness on open defecation, the tendency for practice of open defecation increases. Yes/No in the question of whether awareness on open defecation and the practice of open defecation can be said to be statistically significant.

Health implication of open defecation

On health implications, a very high percentage of the respondents (80.3%) accept the fact that open defecation is a threat to public health with 79.6% open defecation harm our overall sanitation. A 77.5% accepted that open defecation is dangerous to health and leads to diseases. Table 2 shows the response of participants on the health implications of open defecation.

Table 2: Health Implications of Open Defecation

Description of variables	Yes N (%)	No N (%)
Is open defecation a threat to public health?	114 (80.3)	28 (19.7)
Is open defecation a threat to achievement of SDGs?	113 (79.6)	29 (20.4)
Does open defecation lead to water pollution?	110 (77.5)	32 (22.5)
Is open defecation dangerous to health and leads to diseases?	110 (77.5)	32 (22.5)
Does open defecation facilitate fecal-oral transmission of diseases?	109 (76.8)	33 (23.2)

Factor of diarrhea, cholera, typhoid, hepatitis, trachoma, and other diseases	110 (77.5)	32 (22.5)
Does open defecation harm our overall sanitation?	113 (79.6)	29 (20.4)

Relationship between Awareness and Health Implications of Open Defecation

The awareness on open defecation with health implications of open defecation revealed p value > 0.9999 and is not statistically significant where the odd ratio is 0.9609. The likelihood of having the knowledge on health implications of open defecation is insignificant with the level of awareness of open defecation. Respondents with awareness of open defecation were less likely to have knowledge on health implications of open defecation [odd ratio = 0.9609, (95% CI = 0.5449 to 1.689) p > 0.9999].

Relationship of Level of Education and Practice of Open Defecation

The Chi-square test revealed the Chi-square value of 72.83 and df = 5. At 95% CI, level of education is statistically significant to practice of open defecation. See statistical presentation below.

P value and statistical significance

Test	Fisher's exact test		
P value	<0.0001		
P value summary	****		
One- or two-sided	Two-sided		
Statistically significant (P < 0.05)	Yes		
Effect size	Value	95% CI	
Relative Risk	2.180	1.730 to 2.798	
Reciprocal of relative risk	0.4587	0.3574 to 0.5779	
Attributable risk (P1 - P2)	0.4155	0.2989 to 0.5162	
NNT (reciprocal of attrib. risk)	2.407	1.937 to 3.346	
Odds ratio	6.078	3.557 to 10.20	
Reciprocal of odds ratio	0.1645	0.09799 to 0.2811	
Data analyzed	Yes	No	Total
Awareness	109	33	142
Practice of OD	50	92	142
Total	159	125	284
Percentage of row total	Yes	No	
Awareness	76.76%	23.24%	
Practice of OD	35.21%	64.79%	
Percentage of column total	Yes	No	



Awareness	68.55%	26.40%
Practice of OD	31.45%	73.60%
Percentage of grand total	Yes	No
Awareness	38.38%	11.62%
Practice of OD	17.61%	32.39%

Key: OD = Open defecation

Taking each level of education, tertiary education had a significant association with practice of open defecation, $p < 0.0001$. Level of education was observed to be a significant factor in the practice of open defecation [odd ratio = 26.21, (95% CI = 13.23 to 51.62, $p < 0.0001$]. See the summary below.

P value and statistical significance			
Test	Fisher's exact test		
P value	>0.9999		
P value summary	Ns		
One- or two-sided	Two-sided		
Statistically significant ($P < 0.05$)	No		
Effect size	Value	95% CI	
Relative Risk	0.9909	0.8704 to 1.128	
Reciprocal of relative risk	1.009	0.8869 to 1.149	
Attributable risk ($P1 - P2$)	0.007042	-0.09521 to 0.1095	
NNT (reciprocal of attrib. risk)	142.0		
Odds ratio	0.9609	0.5449 to 1.689	
Reciprocal of odds ratio	1.041	0.5920 to 1.835	
Data analyzed	Yes	No	Total
Awareness	109	33	142
Health implications of OD	110	32	142
Total	219	65	284
Percentage of row total	Yes	No	
Awareness	76.76%	23.24%	
Health implications of OD	77.46%	22.54%	
Percentage of column total	Yes	No	
Awareness	49.77%	50.77%	

Health implications of OD	50.23%	49.23%	
Percentage of grand total	Yes	No	
Awareness	38.38%	11.62%	
Health implications of OD	38.73%	11.27%	

Key: OD = Open defecation

For respondents with secondary education only, they were two times less likely to practice open defecation [odd ratio = 1.573, (95% CI = 0.9559 to 2.600) $p = 0.0990$], and it is not statistically significant. See below.

P value and statistical significance	
Test	Chi-square
Chi-square, df	72.83, 5
P value	<0.0001
P value summary	****
One- or two-sided	NA
Statistically significant ($P < 0.05$)	Yes
Data analyzed	
Number of rows	6
Number of columns	2

Primary certificate holders had a significant association with practice of open defecation, $p < 0.0001$. Here, the level of education was observed to be a significant factor in the practice of open defecation [odd ratio = 0.1165, (95% CI = 0.05079 to 0.2842), $p < 0.0001$] as shown below.

P value and statistical significance			
Test	Fisher's exact test		
P value	<0.0001		
P value summary	****		
One- or two-sided	Two-sided		
Statistically significant ($P < 0.05$)	Yes		
Effect size	Value	95% CI	
Relative Risk	3.308	2.555 to 4.388	
Reciprocal of relative risk	0.3023	0.2279 to 0.3914	
Attributable risk ($P1 - P2$)	0.6338	0.5302 to 0.7143	
NNT (reciprocal of attrib. risk)	1.578	1.400 to 1.886	
Odds ratio	26.21	13.23 to 51.62	

Reciprocal of odds ratio	0.03816	0.01937 to 0.07557	
Sensitivity	0.7679	0.6985 to 0.8253	
Specificity	0.8879	0.8177 to 0.9333	
Positive Predictive Value	0.9085	0.8497 to 0.9457	
Negative Predictive Value	0.7254	0.6467 to 0.7921	
Likelihood Ratio	6.852		
Data analyzed	Yes	No	Total
Tertiary	129	13	142
Practice of OD	39	103	142
Total	168	116	284
Percentage of row total	Yes	No	
Tertiary	90.85%	9.15%	
Practice of OD	27.46%	72.54%	
Percentage of column total	Yes	No	
Tertiary	76.79%	11.21%	
Practice of OD	23.21%	88.79%	
Percentage of grand total	Yes	No	
Tertiary	45.42%	4.58%	
Practice of OD	13.73%	36.27%	

Respondents with no formal education had a significant association with the practice of open defecation, $p < 0.0001$. Here, the level of education was observed to be a significant factor in the practice of open defecation [odd ratio = 0.1165, (95% CI = 0.05079 to 0.2842), $p < 0.0001$].

Reasons and Factors Responsible for the Practice of Open Defecation

On reasons responsible for open defecation, 76.1% agreed that lack of proper knowledge of hygiene is one of the reasons of open defecation with as high as 84.5% disagreed that unavailability of toilets in the living area was a reason of open defecation. Respondents agreed (93.4%) that good knowledge of hygiene, but careless lifestyle was also a reason for open defecation.

On factors responsible for the practice of open defecation, 93.7% of the respondents disagreed that overpopulation leads to insufficiency of toilets facilities, while 17.6% disagreed that filthy/dark/smelling/unattractive toilets are responsible for the practice of open defecation. All respondents disagreed that cultural/habitual/religious preferences are responsible for the practice of open defecation. In addition to that all respondents

agreed that no toilet at the place of work and open defecation is done voluntarily or involuntarily are responsible for the practice

of open defecation. Table 3 gave the details of reasons and factors responsible for the practice of open defecation.

Table 3: Reasons and factors Responsible for the Practice of Open Defecation

Description of variables	Agree N (%)	Undecided N (%)	Disagree N (%)
Lack of proper knowledge of hygiene	108 (76.1)	0 (0)	34 (23.9)
Non-availability of toilets in living areas	22 (15.5)	0 (0)	120 (84.5)
Good knowledge of hygiene but careless lifestyle	134 (93.4)	0 (0)	8 (5.6)
Government refusal to provide toilet facilities	140 (98.6)	0 (0)	2 (1.4)
Overpopulation leads to insufficiency of toilets facilities	9 (6.3)	0 (0)	133 (93.7)
Toilet is filthy/dark/smelling/unattractive	30 (21.1)	87 (61.3)	25 (17.6)
Diarrhea/there is no time to visit toilet	11 (7.7)	0 (0)	131 (92.3)
Toilet distance	51 (35.9)	0 (0)	91 (64.1)
Cultural/habitual/religious preference for open defecation	0 (0)	0 (0)	142 (100)
No toilet at the workplace	142 (100)	0 (0)	0 (0)
Ignorance of the benefit of a toilet	0 (0)	0 (0)	142 (100)
Dilapidated toilet	91 (64.1)	0 (0)	51 (35.9)
Risk to personal safety	142 (100)	0 (0)	0 (0)
Open defecation done voluntarily or involuntarily	142 (100)	0 (0)	0 (0)
Finance	52 (36.6)	0 (0)	90 (63.4)
Lack of land and space	4 (2.8)	0 (0)	138 (97.2)

DISCUSSION

As seen from the results, more than 80% of the respondents were males. This may be attributed to the area of study where culture plays an integral role in their lives. Culturally, the study area being in the north, with dominance by Muslims, does not allow free access of women or the mixing/coming together of opposite sex, let alone an outsider or interviewer to be allowed to come in direct contact with the opposite sex.

In addition to that, our findings also revealed that more than 70% of the respondents are Hausa, with 25% Fulani, and 2.8% Igbos. Moreso, more than 90% of the respondents are Muslims. With these factors (ethnicity and religion), they might contribute to the higher number of males in this study. It is also

worth mentioning that people with no formal education or farmers tend to be conservative in their manners of approach or practice. This is also supported by a study in Izzi LGA of Ebonyi south-east Nigeria, where they reported that rural people/farmers who have no formal education tend to be more conservative in their practices (20).

The predominant employment of the respondents is agricultural and livestock farming i.e., mostly farmers and pastoralists that either stay on their farms or move around in most part of the day with their animals. This may likely give them less time to visit toilets since they are mostly in the field. Rather they may resort to the use of nearby bushes, farmlands, or nearby enclosure to defecate.

Our study documented that all respondents (100%) knew that open defecation is practiced, and it also exposes men's and women's privacy. There are several reports that all the respondents in the various studies agreed that open defecation is an ongoing practice in the communities (1,11,14,21–23). However, Inah *et al.*, reported a slightly lower (83.1%) knowledge on open defecation (19). On the other hand, exposure of privacy is reported in both sexes. A similar study was conducted also cited evidence to show how women who defecate in the open fields experience several tangible threats to their privacy and dignity throughout their life time (24).

Certain diseases are carried or traced to open defecation as reported from this study is in line with reports from numerous studies. Some studies reported a higher awareness of open defecation than our study. For example, Sule (2021) reported 96% (25) of the respondents to be aware that open defecation is traced to certain diseases, while we reported 76.8%. A similar study in Wa, Ghana where they also reported that large proportion (50%) of Ghana's health burden is caused by environmental-sensitive diseases such cholera, diarrhea, and malaria, especially in northern Ghana where public provision for water and sanitation services are inadequate (13). It has been established that infectious diseases are mostly fecal-oral in nature and are transmitted via stool and other means. Here, the stool is left open where vectors like flies can transmit disease of any kind to man and may likely lead to disease outbreak in some situation.

The practice of open defecation as reported in our study showed that one third of the respondents are practicing the act of open defecation. This is evident that they are either involved directly or family members, or

neighbours are involved. Similarly, as far as feces disposal into nearby bushes, public refuse bins and canals, more than half of our respondents admitted that they do not dispose feces into nearby bushes.

However, the practice of open defecation and disposal of feces into nearby bushes by our respondents, the response is low. This might be attributed to the environment where the respondents admitted that open defecation exposes privacy of both men and women, and therefore find it difficult to practice it. Hence, the possibility of lower percentage of the respondents practicing open defecation and disposing feces into the nearby bushes and public refuse bins and canals. In another study which is in line with our findings, the wish for privacy among women and cultural practices that exclude women from undue exposure of their body parts in the open space may be partly responsible for the undesirable relationship between the practice of open defecation (14). They further noted that this could also be due to the vulnerability of female gender to various forms of harassment, especially physical and sexual harassment while practicing open defecation in the open space (14).

Since the respondents agreed that they do not practice feces disposal into nearby bushes and public refuse bins, they also reported a similar percentage of their neighbours practicing open defecation.

The health implications of open defecation can never be overemphasized. Our study also revealed that more than 80% of the respondents are aware that open defecation is a threat to public health, and continue to be a critical health challenge globally, affecting almost 1 billion people worldwide and contributing significantly to an estimated 842,000 people who die yearly from sanitation-related diseases (13). Various

studies reaffirmed that open defecation is a threat to public health (12,15,20,23,25–29). Knowledge on the health implications of open defecation from our study also revealed more than 70% of our respondents know the health implications, and leads to diseases, facilitating fecal-oral transmission of diseases, like diarrhea, cholera, typhoid, hepatitis, trachoma, and other diseases. In addition to that, open defecation is also reported to harm our overall sanitation and can even be a threat to achievement of sustainable development goals. There are many studies linked to the above-mentioned implications (15,19,22–25,30). Prominent among them is a report from a similar study in Gwadabawa Sokoto State by SarkinGobir & SarkinGobir (1). From the above, open defecation constitutes a great threat to the general wellbeing of man and his environment.

The bigger question is that despite the knowledge of the respondents on the health implications of open defecation, yet they still practice it. From our study, there are reasons or better put as factors that are responsible for the practice of open defecation. While the respondents agree that they have a good knowledge of hygiene, they are careless about their health and that of their environment. In addition to that, majority revealed that they also lack proper knowledge of hygiene and therefore they practice open defecation. It was reported by Gbadegbesin & Akintola that good hygiene practice is an important aspect of environmental public health as the absence of the knowledge and practice of such brings difficulty in disease prevention and control, especially as it concerns waterborne diseases as well as sanitation related diseases (11,31). Lack of provision of toilet facilities by the government is said to be one of the reasons

for open defecation. This was also corroborated by Gbadegbesin & Akintola (31) in a similar study. However, our study revealed majority of the respondents reporting that the government refused to provide toilet facilities. This is contrary to the study by Ufomba and co-workers where they reported that the least percentage of the respondents blames the government for not providing toilet facilities to the communities (11).

Previous studies have adduced the high burden of open defecation to barriers that vary with socio-cultural environments, most of which are usually not factored into the planning of most interventions that have been implemented. The significant-high burden of open defecation in Nigeria despite the local and global intervention indicates the likelihood of subtle barriers yet to be captured in the existing interventions, which include the provision of public toilets and regular sensitization. This calls for a more comprehensive review of determinants of open defecation in Nigeria (14).

Another factor responsible for the practice of open defecation in our study area is the filthy, dark, smelling, and unattractive nature of toilets. Several studies reported that some of that factors that lead to the practice of open defecation include but not limited to filthy and unattractive nature of the toilets they are using (11,13,19,20,32). Dilapidated toilet facility is also a reason for the practice of open defecation in our study. In a nutshell, the condition of toilets influences the use of toilets, because users find it difficult to use it, and hence resort to open defecation. All respondents disagreed that they are ignorant on the benefit of a toilet, as same agreed that there is no toilet at the place of work.

Only a few percentages of the respondents agreed that lack of land and space to build

toilet is the reason they practice open defecation, while more than 60% disagreed that finance is the reason why they practice open defecation. This means that even though they have the means to build toilet/latrine, yet they practice open defecation. This may be link to some of them seeing open defecation as a norm and as earlier mentioned the careless attitude of some of the respondents. On level of education and the practice of open defecation, our study revealed inconsistency in the outcome. As reported in some studies that level of education usually determines the open defecation. For example, as reported by Onyemachi *et al.*, that most households that have male and or female head of households with either secondary or tertiary education practice a more sanitary means of sewage disposal while a significant handful of households with lower levels of education practice open defecation (14). This could be because those with higher levels of education are more likely to be more knowledgeable about the harmful effect of open defecation. Our study gave a rather a skewed outcome with those in primary school less practicing open defecation, while more with tertiary education practice open defecation.

CONCLUSION

The practice of open defecation is still a challenge of public health importance despite various interventions in the past. It has been established from this study that both sexes' privacy is exposed in the practice of open defecation. Also established is that open defecation is threat to public health, and can lead to water pollution, dangerous to health and leads to diseases. There is awareness on good knowledge of hygiene by respondents, but they are careless about their health. Cultural, habitual, and religious preference are not reasons for open defecation, likewise

voluntary or involuntary open defecation is a choice by the respondents. The need for constant public health promotion and awareness should be encouraged most especially through traditional and religious leaders. Environmental sanitation should be encouraged, and enforcement should be in place for any infraction by the people.

Acknowledgement

The authors wish to sincerely express their profound gratitude and appreciation to Pharmacist Arthur K. Chukwu, the regulatory affairs manager of Neimeth International Pharmaceuticals for the advice, contribution, and timely guidance during the course of this work that led to its actualization.

Competing Interests

Authors have declared that no competing interests exist.

Authors' Contributions

'Author A' designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript, 'Author B' designed the study, wrote the protocol, and wrote the first draft of the manuscript. 'Author C' and 'Author D' managed the analyses of the study. 'Author E', 'Author F', and 'Author G' managed the analyses and literature searches. All authors read and approved the final manuscript."

Consent

Verbal and written informed consent were sought from each respondent after an adequate explanation of the objectives of the study. Confidentiality and data security were assured. Participation was made voluntary as each participant will be at liberty to opt out at any point in the study. All data related to the study were kept with utmost confidentiality.

Ethical approval

Ethical approval was obtained from the Research and Ethics Units of the Sokoto State Ministry of Health (SMoH) with reference number SMH/1580/V.IV and approval number (SKHREC/028/2023).

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