Demographic and socioeconomic impact of water, sanitation, and hygiene in occurrence of diarrheal disease among pediatric age group in Abia state

Chioma A Ohanenye[1], Chinasa Orie Amadi[2], Okorie Alison Ede[3], Awa Ukony Offiah[4], Amadi Agwu Nkwa[2], Okechukwu Iro[5], Augustine A Nwazunku[3], Nneka Chioma Okoronkwo[1]

From Departments of [1]Paediatric, [4]Pathology, [5]Environmental Health Science, College of Medicine and Health Sciences, Abia State University Teaching Hospital, Aba, Abia State, [2]Department of Public Health, Federal University of Technology, Owerri, [3]Department of Environmental Health Science, College of Health Sciences and Technology, Nnamadi Azikiwe University, Nnewi Campus, Nnewi, Nigeria

Correspondence to: Okorie Alison Ede. E-mail: edeokorie@gmail.com

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ABSTRACT

Background: Potable water, good sanitary conditions, and good hygienic practices are essential for the survival and development of children. **Objective:** The study aimed to determine the demographic and socioeconomic effect of water, sanitation, and hygiene (WASH) in the occurrence of diarrheal disease among pediatric age group in Aba, Abia State. **Materials and Methods:** The study adopted a descriptive cross-sectional survey design to assess the environmental sanitation in the selected study areas. The survey was designed with the use of questionnaire which was administered to a sample size of 360 participants. The collected data were entered into computer software called Statistical Package for the Social Sciences (SPSS) Version 20.0 and analyzed using descriptive statistical analysis. **Results:** The results were displayed in frequency tables and charts. The relation between variables was determined with Fisher's exact test and the findings showed that 267 (74.1%) of the participants reported with 1–5 times episodes of diarrhea/year and 204 (56.7%) participants had available water supply and the major source of water supply was borehole in 227 (63.1%) participants. In terms of water treatment, 255 (70.8%) reported of not boiling water before use; 100 (27.7%) did not wash hands after defecation, 225 (62.5%) did not wash hands after touching pet animals, and only 32 (8.8%) reported of not washing fruits/vegetables before eating or cooking. A total of 264 (73.3%) had the knowledge of treating children with diarrhea at health center. **Conclusion:** WASH had impact in the occurrence of diarrheal disease among pediatric age group in relation to demographic and socioeconomic factors. However, the available and functional sanitary facilities do not meet the required standards. Therefore, awareness should be generated on the importance of WASH practices in all local governments in Abia State.

Key words: *Diarrhea, Hygiene, Pediatric, sanitation*

Children are more vulnerable to the health hazards associated with contaminated water and poor sanitation [1]. Therefore, it is necessary to maintain a healthy and sanitary environment to prevent or control a variety of diseases during their course of development. Access to unimproved water and sanitation in children is a serious public health problem in many countries that are developing, especially Nigeria [2].

Water, sanitation, and hygiene (WASH) is a key public health issue within international development and is the focus of Sustainable Development Goal 6. Sanitation is the starting point of many other development challenges as poor sanitation influences public health, education, and the environment [3]. According to the UNICEF [4], WASH practices are usually grouped together due to their interdependent nature. Potable drinking water, hygiene, and sanitation play a key role in maintaining health.

Sanitation is one of the basic amenities people must have as it has a direct link to food hygiene. Good sanitation and hygiene practice mitigate contamination of water and soil and thereby prevent diseases among children, mostly communicable/infectious diseases [5]. In relationship to impact of WASH, waterborne infectious diseases, such as cholera, typhoid, and dysentery, are caused by drinking water containing infectious viruses or bacteria which often come from human or animal waste [6]. Water-related insect vectors, such as mosquitoes, breed in or near water and spread diseases, including dengue and malaria; although, this category is not directly related to water supply or quality [7].

More than 1 billion people worldwide are linked to poor sanitation, inadequate hygiene, ingestion of and contact with unsafe water, and lack of access to adequate amounts of safe water [8]. Many water-related infectious diseases have been referred to as the "neglected diseases of neglected populations," because they receive little attention and disproportionately affect poor people in developing nations [9]. Countries throughout the world are concerned with the effects of unclean drinking water because water-borne diseases are

a major cause of morbidity and mortality [10,11]. Clean drinking water is important for overall health and plays a substantial role in infant and child health and survival [9,12,13].

In reference to the WHO [11] statistics, every second a child death is reported in Nigeria due to poor sanitation and it is the most significant cause of childhood morbidity and mortality. Sanitation plays a major role in endemic disease transmission in Nigeria and globally [14]. The major causes of under-five mortality include pneumonia, diarrhea, and malaria, which are linked to sanitation and hygiene [15].

In Africa, more than 50% of every reported case of hospitalization has been tied to water-related problems [16]. In addition, there are 1.7 billion cases of diarrhea, 171 million cases of malaria, and 152 million cases of pneumonia annually in Nigeria [17]. In most part of Nigeria like Aba in Abia State, there is no conventional solid waste management system. Therefore, this study sets out to determine the demographic and socioeconomic effect of WASH in the occurrence of diarrheal diseases among the pediatric age group.

MATERIALS AND METHODS

The research study employed a cross-sectional descriptive design in the occurrence of diarrheal disease among pediatric age group (children <18 years old) in Abia State. A multistage simple random sampling technique was employed to get three government primary health centers in Aba North and Osisioma Local Government Area. The permission was granted by the officer-in-charge for the conduct of a sensitization workshop and subsequently the conduct of this study.

Within the primary health centers, 120 caregivers/mothers were selected at random in each of the selected primary health center. A written informed consent was taken from them. During the second visit, the questionnaires for the study were distributed to the mothers and caregivers. The exclusion criteria included children who had a debilitating disease except diarrhea, children whose parents did not give an informed consent, and children who recorded their first visit in the study areas and did not have caregivers/mothers.

The sample size was calculated using the formula.

$$N = \frac{(z)^2 \times p(1-p)}{e^2}$$

Where, N=the required sample size; Z=confidence interval of 95% (z=1.96); p=the population of the children (80%); and e=random error of 5% (type 1 value of 0.05).

Sample size=$(1.96)^2$ (0.80) (0.20)/$(0.05)^2$=245.9. To cover large portion of the population, adding an iteration of 50% to

Table 1: Demographic and socioeconomic impact of WASH

Statement	Osisioma Primary Health Centre	Primary Health Centre, Aba North	School of Health, Aba	Total (%)
	Freq. (%)	Freq. (%)	Freq. (%)	
Sex of child				
Male	54 (26.5)	70 (34.3)	80 (39.2)	204 (56.7)
Female	56 (35.8)	50 (32.1)	40 (25.6)	156 (43.3)
Total	120 (33.3)	120 (33.3)	120 (33.3)	360
Age of child (years)				
0–5	15 (34.8)	12 (27.9)	16 (37.2)	43 (11.9)
6–10	65 (32.6)	72 (36.1)	62 (31.1)	199 (55.3)
11–15	32 (32.3)	33 (33.3)	34 (34.3)	99 (27.5)
16–18	8 (42.1)	3 (15.6)	8 (42.1)	19 (5.2)
Total	120	120	120	360
Education of caregiver/mother				
Primary	34 (46.5)	21 (28.7)	18 (24.6)	73 (20.2)
Secondary	64 (34.5)	59 (31.9)	62 (33.5)	185 (51.3)
Tertiary	18 (19.5)	34 (36.9)	40 (43.4)	92 (25.5)
None	4 (40)	6 (60)	0 (0)	10 (2.7)
Total	120	120	120	360
Residence of child				
Rural	83 (44.1)	55 (29.2)	50 (26.5)	188 (52.2)
Urban	37 (21.5)	65 (37.7)	70 (40.6)	172 (47.8)
Total	120	120	120	360
Income of caregiver/mother				
≤₦30,000	20 (44.4)	10 (22.2)	15 (33.3)	45 (12.5)
₦31–N40,000	55 (54.4)	26 (25.7)	20 (19.8)	101 (28.1)
₦41–N50,000	25 (21.9)	54 (47.3)	35 (30.7)	114 (31.6)
>₦ 50,000	20 (20)	30 (30)	50 (50)	100 (27.8)
Total	120	12	120	360

Table 2: Level of WASH practices of mothers/caregivers

Statement	Osisioma Primary Health Centre	Primary Health Centre, Aba North	School of Health, Aba	Total (%)
	Freq. (%)	Freq. (%)	Freq. (%)	
Method of refuse disposal				
Open dumps	84 (23)	84 (22.7)	95 (25.2)	263 (71.1)
Bucket with lid	4 (15.3)	12 (46.1)	10 (38.4)	26 (7.2)
Bucket without lid	22 (50)	16 (36.3)	6 (13.6)	44 (12.2)
Burying	0 (0)	0 (0)	0 (0)	0.0
Burning	10 (37)	8 (29.6)	9 (33.3)	27 (7.5)
Total	120 (33.3)	120 (33.3)	120 (33.3)	360 (100)
Type of toilet facility				
Open defecation	12 (54.5)	2 (9)	8 (36.3)	22 (6.1)
Pit latrine	85 (62.5)	25 (18.3)	26 (19.1)	136 (37.8)
VIP latrine	13 (9.3)	45 (34.8)	71 (55)	129 (35.8)
Water cistern	10 (13.6)	48 (65.7)	15 (20.5)	73 (20.2)
Total	120 (33.3)	120 (33.3)	120 (33.3)	360 (100)
Handwashing before food				
Yes	75 (31.3)	85 (35.5)	79 (33)	239 (66.3)
No	45 (37.7)	35 (28.9)	41 (33.8)	121 (33.7)
Total	120 (33.3)	120 (33.3)	120 (33.3)	360 (100)
After defecation				
Yes	54 (31)	64 (36.7)	56 (32.1)	174 (48.3)
No	40 (40)	36 (36)	24 (24)	100 (27.7)
Sometimes	26 (30.2)	20 (23.2)	40 (46.5)	86 (23.8)
Total	120 (33.3)	120 (33.3)	120 (33.3)	360 (100)
After touching pet animals				
Yes	42 (31.1)	48 (35.5)	45 (33.3)	135 (37.5)
No	78 (34.7)	72 (32)	75 (33.3)	225 (62.5)
Total	120 (33.3)	120 (33.3)	120 (33.3)	360 (100)
Materials to wash hands with				
Only water	4 (50)	2 (25)	2 (25)	8 (2.2)
Water and soap	80 (29.6)	98 (36.2)	92 (34)	270 (75)
Water, soap, and disinfectant	36 (43.9)	20 (24.3)	26 (31.7)	82 (22.7)
Water and ash	0 (0)	0 (0)	0 (0)	0.0
Total	120 (33.3)	120 (33.3)	120 (33.3)	360 (100)
Heard about WASH				
Yes	75 (42.8)	65 (37.1)	35 (20)	175 (48.6)
No	45 (24.3)	55 (29.7)	85 (45.9)	185 (51.4)
Total	120 (33.3)	120 (33.3)	120 (33.3)	360 (100)

draw valid conclusions, to give an adequate reflection of the study population (50%×245.9)=122.5. The sample size to the nearest hundred=245.9+122.5=367.9.

By ensuring an appropriate sample design as well as a large enough sample size, sample error could also be decreased. Then, it was approximated to 368 and within the primary health centers, 360 caregivers/mothers were used from different health-care centers. The study highlighted the demographic factors, socioeconomic impact of WASH, quality of water supply, sanitation practices, and prevalence of occurrence of diarrheal diseases among pediatric age as the variables of interest.

The collected data were analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. The results were presented in frequency tables and charts. The Chi-square tool was used to determine the statistical influence of the variables. $p<0.05$ was considered statistically significant.

RESULTS

Out of the total of 360 participants, there were 156 (43.3%) females and 204 (56.7%) males. Most of the mothers had secondary education. They were more respondents from the rural areas.

Table 3: Occurrence of childhood diseases and its association

Statement	Osisioma Primary Health Centre	Primary Health Centre, Aba North	School of Health, Aba	Total (%)
	Freq. (%)	Freq. (%)	Freq. (%)	
Number of episodes of diarrhea per year (times)				
1–5	93 (34.8)	88 (32.9)	86 (32.2)	267 (74.1)
6–10	17 (26.1)	24 (36.9)	24 (36.9)	65 (18.0)
>10	10 (35.7)	8 (28.5)	10 (35.7)	28 (7.7)
Total	120	120	120	360 (100)
Do wash fruits/vegetables before eating or cooking				
Yes	102 (31)	115 (35)	111 (33.8)	328 (91.2)
No	18 (56.2)	5 (15.6)	9 (28.1)	32 (8.8)
Total	120	120	120	360 (100)
Number of times you mop the house floor in a week				
None	0 (0)	0 (0)	0 (0)	0.0
Everyday	45 (49.4)	35 (38.4)	11 (12)	91 (25.2)
Once	65 (29.2)	75 (33.7)	82 (36.9)	222 (61.6)
Twice	10 (28.5)	8 (22.8)	17 (48.5)	35 (9.7)
Thrice	0 (0)	2 (16.6)	10 (83.3)	12 (3.3)
Total	120	120	120	360 (100)
Practice of exclusive breastfeeding				
Yes	95 (38)	75 (30)	80 (32)	250 (69.5)
No	25 (22.7)	45 (40.9)	40 (36.3)	110 (30.5)
Total	120	120	120	360 (100)
Type of diarrhea treatment for children				
Treated with ORS	2 (28.5)	3 (42.8)	2 (28.5)	7 (1.9)
Chemist with antidiarrheal drugs	6 (75)	0 (0)	2 (25)	8 (2.2)
At health center	92 (34.8)	82 (31)	90 (34)	264 (73.3)
At hospital	20 (24.6)	35 (43.2)	26 (32)	81 (22.5)
Total	120	120	120	360 (100)
Quantity of household water used per pay				
1–4 buckets	61 (49.5)	41 (33.3)	21 (17)	123 (34.1)
5–10 buckets	49 (38.2)	49 (38.2)	30 (23.4)	128 (35.5)
>10 buckets	10 (9.1)	30 (27.5)	69 (63.3)	109 (30.2)
Total	120	120	120	360 (100)

Table 1 presents the demographic and socioeconomic effect of WASH.

Table 2 depicts the level of WASH practices of mothers/caregivers. Most of the participants used open dumps. A total of 136 (37.8%) participants used pit latrine, whereas 22 (6.1%) used the open defecation system. Most of the participants washed their hands before food. On the point of hearing about WASH, 175 (48.6%) agreed while 185 (51.4%) was against it.

Table 3 presents occurrence of childhood diseases and its association; where most of the participants reported 1–5 times of diarrhea occurrence.

The use of Fisher's exact test showed a significant relationship of at $p<0.05$ between sex age of child, education of mother, and number of episodes of diarrhea/year. The results in Table 4 showed relationship between sex, age of child, education of child, and number of episodes of diarrhea/year.

DISCUSSION

The study showed that majority of the children had childhood diarrhea up to 1–5 times/year. In relation to demographic and socioeconomic impact of WASH, majority of the respondents were males and the most common age group that was affected with childhood diarrhea was 6–10 years. The residence in this study was grouped into two and they were rural and urban setting [4]. The findings indicated that the majority of respondents living in the rural area had a poor practice of WASH which may lead to increased incidence of diarrhea. The above results can be attributed to the difference in the availability of resources in the urban areas, compared to the rural areas such as potable water, improved sanitation, waste disposal, and hospital facilities. Furthermore, people in the urban areas are more likely to be educated than those in the rural areas.

Table 4: Relationship between sex, age of child, education of mother, and number of episodes of diarrhea per year

Statement	Number of episodes of diarrhea per year (times)			Statistical test		Total
	1–5 s	6–10 s	>10	Fisher's exact test	p-value	
Sex of child						
Male	204	0	0			204
Female	63	65	28			156
Total	267	65	28	192.203	<0.05	360
Age of child (years)						
0–5	43	0	0			43
6–10	199	0	0			199
11–15	25	65	9			99
>16	0	0	19			19
Total	267	65	28	337.516	<0.05	360
Education of caregiver/mother						
Primary	73	0	0			73
Secondary	185	0	0			185
Tertiary	9	65	18			92
None	0	0	10			10
Total	267	65	28	358.715	<0.05	360
Residence of child						
Rural	188	0	0			188
Urban	79	65	28			172
Total	267	65	28	165.454	<0.05	360
Income of caregiver/mother						
<₦30,000	45	0	0			45
₦31–N40,000	101	0	0			101
₦41–₦40,000	114	0	0			114
> ₦ 50,000	7	65	28			100
Total	267	65	28	337.186	<0.05	360
Practice WASH through washing fruits/vegetables before eating or cooking						
Yes	267	61	0			328
No	0	4	28			32
Total	267	65	28	178.048	<0.05	360

In relation to income of the caregivers/mothers of the children, the financial status of the people in the rural areas does contribute to the higher incidence of diarrhea, this is because there is practically no national health insurance scheme readily available to the people in the rural area compared to hospitals operated on a cash and carry basis; therefore, the insufficient amount of money may deprive mothers and caregivers access to good and standard health facilities or intervene appropriately.

For the method of refuse disposal, majority of the respondents practiced open dumping and such practice is associated with higher incidence of diarrhea among children and adults. The above explanation to these disparities could be attributed to these various methods of waste disposal as enumerated by the caregivers and mothers. Due to the fact that large percentages of the respondents practice open dumping of refuse, they also engaged in open defecation.

Meanwhile, at the bottom of the range was the open defecation system with the maximum exposure of flies, rodents, and other bacterial carrying organisms to the fecal matter, with 74.1% and more related to 1–10 times occurrence of diarrhea as enumerated by the respondents [18]. The improved WASH activities had enormous impact on child morbidity and mortality. The methodologically rigorous studies showed 55% (20–82%) expected reduction in child mortality from improved WASH activities [19].

There was 65% reduction in diarrhea from improved WASH activities. These were on the basis of the report by participants that they do not wash hands before food, wash fruits/vegetables before eating, wash hands after defecation, and wash hands after touching pet animals [20]. The differences could be due to basic education because level of education of the caregivers helped to reduce the childhood diarrhea and caused improvement in WASH practices.

The study had a few limitations. The study was limited to children attending primary health centers and highlighted the demographic factors, socioeconomic effect of WASH, sanitation practices, and prevalence of occurrence of diarrheal diseases among pediatric age in limited areas.

CONCLUSION

The high prevalence of WASH-related diseases like diarrhea among children further confirms the problems created by risky WASH-related behavior among mothers and caregivers. This study also revealed a significant association between the demographic and socioeconomic effect of WASH and occurrence of children diarrhea. Therefore, this research has accomplished its broad and specific objectives and found the WASH situation in the Aba in Abia State as unsatisfactory.

RECOMMENDATIONS

Based on the findings from this study, the following recommendations were made:

1. Workshops, seminars, and conferences should be organized periodically on the importance of WASH practices in all local governments in Abia State. These should include training to make the people living in the rural areas aware of the WASH practices and its importance to good health.
2. Media and social media should be used to disseminate and spread the message of WASH to the population.
3. Prompt and early treatment is advised with an early referral for complications of moderate and severe dehydration arising from diarrheal diseases to prevent mortality.

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