RESEARCH ARTICLE

Sociodemographic factors associated with diarrhea in children under 2 years in Ile-Ife, Nigeria

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Akinwumi F, Igbeneghu OA , Oyelami OA, et al. Sociodemographic factors associated with diarrhea in children under 2 years in Ile-Ife, Nigeria. J Clin Microbiol Infect Dis. 2022;5(5):40-44.

ABSTRACT

Objective: This study gathered information about participants' knowledge of diarrhea to determine the sociodemographic parameters connected to infantile diarrhea in Ile-Ife.

Method: In order to gather the essential information about respondents' social standing and living circumstances, this study used a well-designed questionnaire. In total, 222 respondents representing the parents or guardians of 115 children (aged 0 months -24 months) who appeared to be healthy and 107 children (aged 0 months-24 months) who presented with diarrhea were recruited for this study.

Results: Of the 107 participants in the study overall, more (60.7%) male children than female children presented with diarrhea at the medical facilities. The majority of the children that showed up at the clinics (49.5%) were their parents' first-borns. Drinking untreated well water was discovered to be substantially linked with diarrhea symptoms ($p<0.05$). The presentation of diarrhea was unrelated to education level.

Conclusion: Diarrhea-related infant mortality can be avoided if parents, caregivers, and the government take preventative steps.

Key Words: *Diarrhea; Ile-Ife; Infantile diarrhea; Nigeria; Sociodemographic factors*

INTRODUCTION

Diarrhea, a condition marked by the passing of frequent watery stools, is one of the deadliest illnesses for children between the ages of 0 years and 5 years, particularly in developing nations where basic social amenities are either nonexistent or ineffective [1]. According to reports, Nigeria accounts for one-fifth of all child deaths in sub-Saharan Africa, with diarrhea being a major cause of both deaths and morbidity [2,3]. In 2015, reports by Akinnibosun and Nwafor states that approximately 300,000 children under the age of five die in Nigeria every year as a result of diarrhea [4]. Research has shown that diarrhea is most prevalent in the first two years of life, after which a drop is seen as children get older [2].

Despite efforts by public health officials to lower the prevalence of diarrhea, it continues to be a significant burden on the nation's healthcare system, in part because there is a lack of statistically valid data on the etiology and epidemiology of the condition.

Numerous research has demonstrated that parasites, bacteria, fungi, and viruses are the aetiologic causes behind diarrhea [5-8]. However, it has also been noted that viruses do not always cause diarrhea in children living in low- and middle-income countries; rather, several behavioral, socioeconomic, and environmental factors interact to produce the condition [9]. Age, gender, maternal education, water sources, and personal and environmental hygiene have all been identified as risk factors for diarrhea in some studies [1,2, 10-14].

Understanding how these socio-demographic factors interact can help us better understand the pathogenic aetiology of childhood diarrhea. In this study, children aged 0 months to 24 months in Ile-Ife will have their childhood diarrhea determinants identified.

METHODS

Ethical approval

Informed consent was obtained from the parents or legal guardians of the children before enrolment in the study, and the Obafemi Awolowo University Teaching Hospitals Complex's Ethical Research Committee approved (ERC/2012/10/04) to carry out the study.

Sampling

The study was conducted at the town of Ile-Ife in the Nigerian state of Osun, which is located between latitudes 7 and 8 north of the equator and 4 and 5 east of Greenwich. The Obafemi Awolowo University Teaching Hospital (Urban Comprehensive Health Centre) Eleyele, located in the Ife Central Local Government Area, and the State Hospital, Okeogbo, located in the Ife East Local Government Area, are the two health centers where subjects recruited to the study visited in Ile-Ife, Osun state, Nigeria. If a child had acute diarrhea, which is characterized by frequent, watery stools that may or may not contain blood or mucus, they were all eligible to participate in the trial [15].

Diarrhea was identified during this investigation by caregivers, nurses, and/or doctors caring for the children in the medical facilities. Children between the ages of 0 months and 24 months who attended immunization clinics at the same health centers served as the control group.

Administration of questionnaire

The socio-demographic status, current hygiene habits, and experience of managing diarrhea among mothers and guardians were all investigated using a standard questionnaire. Most of the responders were mothers or caregivers of eligible children between the ages of 0 months and 24 months. All information was treated with confidentiality.

Statistical analysis

The Statistical Package for Social Scientists (SPSS, version 16.0) was used to analyze the data obtained. The level of significance of the test organisms was calculated using the two-way ANOVA test at a level of significance of 5%, or 95% confidence intervals.

RESULTS

Level of education

Less than 2% (1. 87%) of caregivers in the study population had no formal education. The majority (71.03%) of the caregivers in the study group with formal education had at least secondary school education. About the same proportion (2.6%) of guardians in the control group had no formal

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Received: 29-September-2022, Manuscript No. PULJCMID-22-5432; Editor assigned: 1-Oct-2022, Pre QC No. PULJCMID-22-5432 (PQ); Reviewed: 20-Oct-2022, QC No. PULJCMID-22-5432 (Q); Revised: 23-Oct-2022, Manuscript No. PULJCMID-22-5432 (R); Published: 31-Oct-2022,, DOI: 10.37532/puljcmid.2022.5(5).40-44

education whereas 78.26% of those with some form of formal education in this group, had a minimum of secondary education. Secondary school education was found to be significantly associated with the health of the children (p=0.03415) **(Table 1)**.

Socio-environmental factors

Water and sanitation

A major issue in many Nigerian rural and suburban communities has been the insufficient provision of drinking water [15,16]. According to reports, volunteers got their drinking water from a variety of places, as shown in **Table 2**. It was discovered that drinking untreated well water was substantially related to diarrhea (p=0.01824).

Housing

Of the 107 respondents in the study group, 39 (36.4%) had at least two separate rooms in their residences. Fifty-nine (55.2%) of the volunteer families lived in a single-room apartment, sharing toilets with other families within a compound. Living in a single-room apartment with more than one family sharing a toilet was found to be significantly associated with diarrhea (p=0.03128). It is worthy of observation that none of the study participants lived in standard three-bedroom flats suggestive of a significant level of affluence.

In the group of children with diarrhea, seventy-four of them were not exclusively breastfed while in the case of those with apparently healthy children, 96 of them were reported to be exclusively breastfed. Exclusive breastfeeding was found to be significantly associated with being healthy (p<0.05).

Of the children that presented with diarrhea, 49.5% were the first child in their family while the presentation of diarrhea at the health facility decreased with the number of children in the home **(Figures1 and 2)**.

Treatment seeking behavior

On questioning caregivers regarding treatment procedures followed during the onset of diarrhea, it was revealed that sixty (56.1%) of them administered drugs to the subjects before seeking medical attention at the health facilities where the study was carried out. Of these 60 caregivers, 31 (51.7%) gave their children self-prescribed drugs while the prescription of others varied between both licensed and unlicensed prescribers as shown in **(Figure 3)**. Of these 31 caregivers that prescribed and administered drugs to their children, 28(90.3%) administered antibiotics as follows:

13 mothers/guardians administered Metronidazole; 6 (Ampicillin/cloxacillin); 2 (Co-trimoxazole); and 1 (Amoxicillin) administered one antibiotic only. 5 caregivers administered two antibiotics (a combination of any of the aforementioned antibiotics and/or chloramphenicol or tetracycline) and one caregiver co-administered three different antibiotics.

In every combined case, Metronidazole and/or Co-trimoxazole was/were administered. The result of this study showed that metronidazole (48.6%)

TABLE 1
Age and sex distribution of diarrhea subjects

Age (months)	No. (%) of female	No. (%) of male	Total
0-6	9 (21.4)	18 (27.7)	27 (25.2)
12	10 (23.8)	14 (21.5)	24 (22.4)
13-18	12 (28.6)	21 (32.3)	33 (30.8)
19-24	11 (26.2)	12 (18.5)	23 (21.5)
Total	42 (39.3)	65 (60.7)	107
There is a significant difference in the sex of the participants (p=0.026)			

TABLE 2
Water sources consumed by subjects

Water Source	Case (%)	Control (%)	p-value
Well water	43(40.2)	30 (26.1)	0.0319*
Bore-hole	21(19.6)	52 (45.2)	< 0.0001*
Sachet water	28(26.2)	26 (22.6)	0.6389
Rainwater	6(5.6)	2 (1.7)	0.1588
Bottled water	1(0.9)	2 (1.7)	1
Multiple water sources	8(7.5)	3 (2.6)	0.1248
Total	107(100)	115 (100)	
significant p-value			

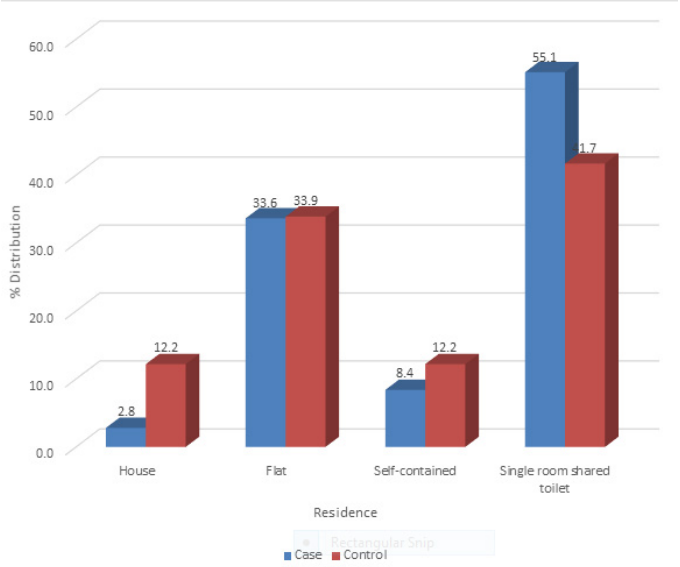

Figure 1) *Categorization of subjects by types of residence*

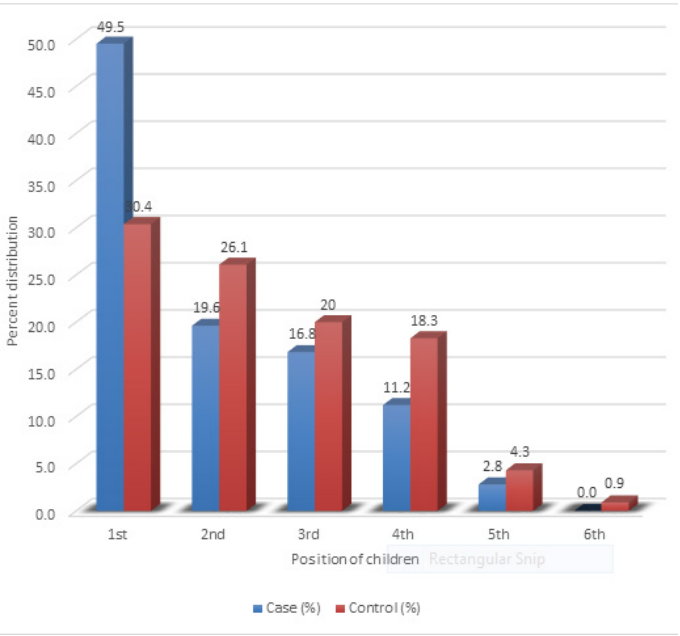

Figure 2) *Percentage distribution of subjects by their birth positions*

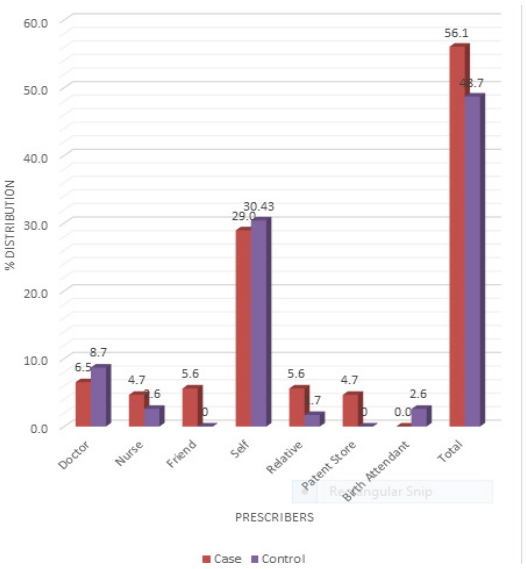

Figure 3) *Percentage distribution of drug prescribers*

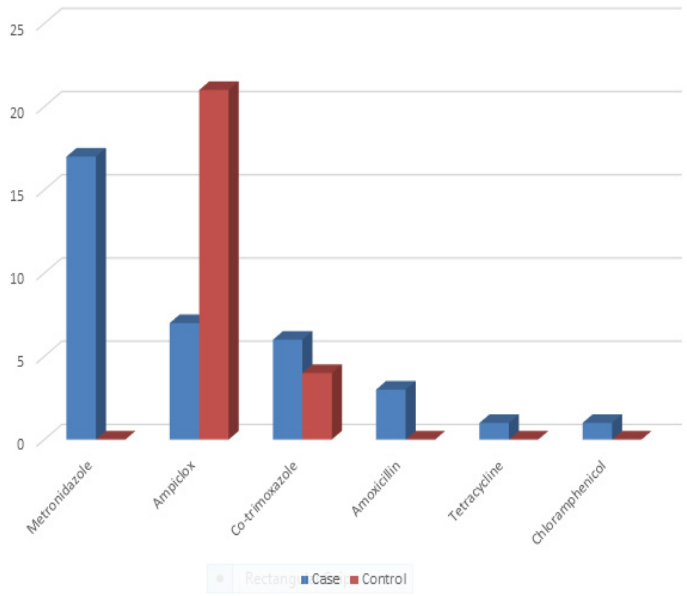

Figure 4) *Frequency distribution of antimicrobials administered to subjects*

was the most commonly administered anti-infective in the self-management of childhood diarrhea in the study environment as shown in **(Figure 4)**.

Results from the questionnaires also showed that not only guardians of infected children administered antibiotics. Caregivers of apparently healthy subjects also administered antibiotics for several reasons.

DISCUSSION

Diarrhea is a leading cause of pediatric morbidity and mortality in low-income nations and is linked to some geographically distinct socio-demographic factors [17]. Education remains an important pathway for the dissemination of vital information. There was no significant difference in the educational levels of caregivers in both the study and control groups. A majority of the caregivers in the study (49) and control (70) groups had secondary-level education. However, there was a significant difference between them but not associated with diarrhea. The lack of association between the level of education of caregivers and the presentation of childhood diarrhea is in agreement with the results obtained by Oloruntoba et al. who reported that there was no relationship between how well-educated a caregiver was, with the frequency of presentation of diarrhea cases in children [18]. This observation could be attributed to the fact that all subjects who participated in this study had some form of formal education irrespective of any level.

According to The World Health Organization, water intended for human consumption should be pleasant to drink, be cool, and have no turbidity, color, or any disagreeable taste or smell. In addition, such water must be free of chemical impurities as well as microorganisms, especially coliforms which are associated with diarrhoeal diseases [19-21].

Water is undoubtedly the most important means of spreading diarrheal infections, and feces have been shown to contaminate water supplies, especially in developing and underdeveloped nations [22-25]. The majority of the study's diarrhoeal participants (40.2%) drank water supplied from wells, while the vast majority (45.2%) of the control participants drank water from boreholes. No subject had access to tap water that had undergone municipal treatment. The majority of residents in the research area have wells in their homes, which are used as their primary water sources [26,27]. A growing number of people in semi-urban and metropolitan parts of Nigeria rely on dug wells and water sellers for their water supply because purified pipe-borne water is scarce and insufficient for the teeming population in many developing countries, including Nigeria [26]. The grade of the water obtained from wells is determined by the organic and physicochemical characteristics of the water, which are largely influenced by the concentration of biological, chemical, and physical contaminants as well as the intensity of human activity taking place in any given environment [28-34]. In Nigeria, numerous research on the security of well water has been conducted. Water samples taken from various wells in Ago-Iwoye town were used to isolate *Escherichia coli, Klebsiella spp., Enterobacter spp.,* and *Citrobacter spp. Salmonella spp*. and *Vibrio cholera* were also discovered by Oguntoke et al. in various wells in different areas of Ibadan, Nigeria [35-40]. Adeyemo et al., Akinyemi et al., and Aboh et al. all isolated *Klebsiella spp., Proteus spp.,* and *E. coli* from wells in Ibadan, Lagos, and Zaria, respectively [27,41,42]. Well, water was found to be significantly ($p=0.0319$) associated with diarrhea in this study. The isolation of pathogens responsible for water-borne diseases such as diarrhea suggests that well water, if not adequately treated would be unfit for human consumption. In many houses, the well is located close to septic tanks which in such circumstances could serve as a source of bacterial contamination. Additionally, the use of a single well by many households as is frequently the case in this environment, is another source of contamination as containers that are dipped into the well from different households are likely to be contaminated with various disease-causing organisms.

In this study, there is a significant association between the type of residences associated with the subject facilities ($p<0.0001$) but living in single rooms with shared toilet facilities is most significantly associated with diarrhea. This observation is in agreement with the report of Ethiopia where children living in households without adequate toilet facilities were found to be 92% more likely to develop diarrhea than those living in households equipped with such facilities [43].

Small domestic ruminants make up about 40% of Nigeria's total meat supply and have significantly helped the nation address its protein shortage issue [44,45]. In many countries' diets, frozen meats including turkey, chicken, and fish are important sources of nutrition [46-48]. They are Africa's most affordable sources of animal protein [49-51]. Hence, in emerging nations, there is a rising appreciation for small-scale, integrated animal farming where the majority of developing nations raise fish, poultry, cattle, sheep, goats, and other animals with subpar veterinary care and sanitation [45,52-55]. These animals are raised using the common African method of husbandry approach that puts them close to people as well as other household animals like dogs and cats [56]. Pathogenic bacteria have been isolated from both diseased and healthy animals and as such close contact with animals may lead to infections in humans [57-59].

In this study, 52 parents of diarrhoeal children and 53 parents of the control subjects revealed that they reared animals in their homes. There was therefore no significant association of animal rearing with diarrhea in this study ($p>0.05$). This could be because in the study environment, the free-range system of rearing animals is often practiced, where the animals only come home to sleep. So, there is usually minimum contact with the animals being reared.

Results of this study show that more (60.7%) male children were observed to present with diarrhea than their female (39.3%) counterparts. A similar result was reported in northern Nigeria in which the researchers observed that 22.3% of male and 18.3% of female children presented with diarrhea at the time of their study [60]. However, the results from this study are in contrast with a study in Kogi state, Nigeria where it was reported that of the children in their study group, 21.7% were male and 31.7% were female children were found to have diarrhea [61]. In this study, however, a significant difference ($p<0.05$) was observed in the number of male children (60.7%) affected by diarrhea compared to the female children (39.3%). It is therefore apparent that being male could be associated with a risk of diarrhea as has indeed been reported in Bangladesh [62].

Another variable studied was the ordinal position of the children within their respective families and it was observed here that 49.5% of children diagnosed with diarrhea were the first-born children in their family whilst only 30.4% of the healthy children fell into this category. There is therefore a significant association between firstborn children and the presentation of diarrhea at health facilities. This observation could be attributed to the inexperience of first-time mothers who could become overly concerned when they observe the symptoms of diarrhea in their children for the first time. This forces them to seek competent medical attention in the nearest hospital or healthcare center. Mothers who have acquired some experience from minding older children are however able to cope competently on their own with this emergency and are less likely to rush off to the hospital.

Exclusive breastfeeding in infancy is known to protect against diarrhea with maternally acquired antibodies helping to fight infective agents responsible for the disease [63,64]. In addition to the presence of antibodies in breast milk, the very process of breastfeeding is of significant hygienic advantage over any other method of feeding young children. In this study, the majority,74 of the children in the study group were not exclusively breastfed within the first six months as they had been introduced to the

family diet early on while 96 of the children in the control group were exclusively breastfed within the same period. The difference between the two groups was found to be significant ($p<0.05$).

In this study, 60 (56.1%) caregivers of diarrhoeal subjects administered drugs to their children before they sought medical attention at the health facilities where the study was carried out. Of these 60 caregivers, 31 (51.7%) administered self-prescribed drugs to their children while others were distributed among other prescribers both licensed and unlicensed. This result is comparable with the results in Nepal where 57.4% of mothers were reported to practice self-medication [65]. It is however higher than the figures obtained in Karachi where 30% of mothers practiced self-medication [66]. Of these 31 caregivers that treated their children, 28 (90.3%) administered an antibiotic; 13 (46.4%), 6 (21.4%), 2 (7.1%), and 1 (3.6%) of them administered Metronidazole, Ampicillin/cloxacillin, Co-trimoxazole and Amoxicillin only, respectively while 5 (17.9%) administered two antibiotics (combination of two of any of the aforementioned antibiotics, chloramphenicol or tetracycline) and one (3.6%) caregiver administered three antibiotics, combined. In every combined case, Metronidazole and/or Co-trimoxazole was/were administered. The result of this study showed that metronidazole (48.6%) was the most commonly administered anti-infective in the self-management of diarrhea in the study environment. This is similar to the 48.9% use of metronidazole obtained in Tanzania [67]. Some researchers who studied the use of non-prescribed antibiotics in pediatrics in Mongolia have reported that amoxicillin (58%) was the most commonly used antibiotic to manage diarrhea by mothers/caregivers [68].

Twenty-five caregivers of healthy subjects in this study administered antibiotics to their children/wards. This is because the belief that antibiotics should be administered to neonates and infants to aid their proper development is prevalent in the study environment. Most (56.1%) mothers/caregivers empirically treat their children with first aid medicines such as Oral Rehydration Salts (ORS), Paracetamol, and antimalarials before seeking further medical attention. This could be due to some factors, including the scarcity and high expense of medical services, which force many moms to treat their children with easily available, affordable medications. It is when such treatments fail that they seek hospital intervention so that a significant number of children are brought into the hospital in serious conditions. These mothers could indulge in self-medication if the symptoms of diarrhea presented by their children are similar to previous ones. They may also self-medicate their children for convenience and to save time that would be spent waiting to see a doctor at the hospital.

LIMITATIONS

This study focused on a small population of a town. The results of this study only reflect the opinions of the participants who were polled. These results cannot be generalized to other geographical locations.

CONCLUSION

The study has shown that childhood deaths caused by diarrhea diseases can be prevented if parents/caregivers and the government can take precautionary measures such as exclusive breastfeeding for the first 6 months of life, environmental sanitation, provision of treated water, and continued education of caregivers on the management of diarrhea.

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