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Parasitic Causes Associated with Diarrhea and Dysentery in Children in Wukari, North East, Nigeria

[1] Anyiam Vivian Ifeoma, [2] Imarenezor Edobor Peter Kenneth

[1, 2] Department of Microbiology, Faculty of Science, Federal University Otuoke, Bayelsa State, Nigeria

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Corresponding Author: **Imarenezor Edobor Peter Kenneth**

Abstract

Parasitic agents associated with diarrhea and dysentery in children constitutes a serious public health challenge globally, especially as the leading cause of death in children (after respiratory diseases). Childhood diarrhea and dysentery affecting children under the ages of between 0-5 accounts for approximately 100% of the global burden. Accurate and timely detection of the aetiology of these diseases is very crucial; but conventional methods, apart from being laborious and time-consuming, often fail to identify difficult-to-culture pathogens. The aetiological agent of an average of up to 40% of cases of diarrhea cannot be identified. Standard bacteriological and parasitological isolation and identification techniques was implored in this study. Parasites identified in this study comprises of *Entamoeba histolytica* [12], *Schistosoma mansoni* [10], *Ascaris lumbricoides* [11] and *Gardia lamblia* [8]. Entamoeba histolytica 12 (1.9%) is more prevalence when compare to other parasitic agents identified. The percentage of the children with diarrhea and dysentery as a result of the parasitic infection between the ages of (0-1) years old in higher rate (1.8%). The children having the lowest risk are those whose water was filtered (1.4%). Bacteria isolated were *Escherichia coli*, *Salmonella* species, *and Shigella* species with *Escherichia coli* been the most prevalence. In conclusion, adequate care from parents is highly recommended in other to prevent most of this agent from getting to children. Therefore, proper hygiene from parents through washing of feeding materials, washing of hands and drinking of proper treated water is recommended.

Keywords: Children, Diarrhea, Dysentery, North East, Parasitic, Wukari, Nigeria

Introduction

Diarrhea in endemic areas includes a wide variety of bacteria, viruses, and parasites. Intestinal parasites are associated with serious clinical diseases and mortality and are known to cause malnutrition and impairment of the physical development in children and affect their growth and learning. Bacterial organisms, such as *campylobacter spp*, *Salmonella spp*, *Shigella spp*, and different groups of enteropathogenic *Escherichia coli* are well-known as causes of gastrointestinal diseases all over the all over the world. These organisms have been demonstrated in water and stools from the vender region [1]. Infections by most of these organisms can be asymptomatic, or can be treated with dehydration solution particularly in cases of viruses and some bacteria. As defined by World Health Organization, dysentery is bloody diarrhea, i.e. any diarrheal episode in which the loose or watery stools contain visible red blood [2] Dysentery is most often caused by Shigella species (bacillary dysentery) or *Entamoeba hystolytica* (amoebic dysentery). Dysentery starts with the sudden onset of repeated stooling. However, unlike acute watery diarrhea, stools are often smaller in quantity and are characterized by blood and pus. Thus, it is also referred to as acute bloody diarrhea. Dysentery usually presents with fever, tenesmus, abdominal pain, and cramps; vomiting occurs less often [1]. Inflammation of the colon (the part of the large intestine that extends from the cecum to the rectum) due to infection by one of a number of enteric pathogens leads to dysentery. The main cause of dysentery in children is the Shigellae [2]. *Campylobacter jejuni* and entero-invasive *E. coli* or salmonellae of many serotypes are relatively less frequent causes of diarrhea. *Entamoeba histolytica* seldom causes dysentery in young children [3, 4]. Dysentery usually requires antimicrobial therapy [5]. World health organization defines diarrhea as the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual [2]. Worldwide, diarrheal diseases are reported as the leading cause of mortality among children aged five years and below [6]. In some parts of the world, they account for higher mortality rates than all other causes combined [7]. Childhood diarrhea affecting children, five years old and below accounts for approximately

63% of the global diarrhea burden [8], and is the second significant cause of infant mortality in developing nations [9, 10] where poor sanitation and insufficient potable water supply are key factors [11, 12]. In Africa, Asia, and South America, diarrhea accounts for one in eight deaths among children younger than 5 years per annum [13, 10] and an estimated 16% of child deaths in Nigeria annually [14]. In Ogun State, South-West Nigeria, diarrhea is one of the three diseases (the others being typhoid fever and cholera) which together are the second most prevalent water-related disease [15]. Acute diarrheal cases are the most prevalent of all diarrheal cases around the globe [16]. Commonly reported enteric bacterial diarrheal diseases and the causative agents are botulism (*Clostridium botulinum*), Campylobacter gastroenteritis (*Campylobacter jejuni*), cholera (*Vibrio cholerae*), *Escherichia coli* gastroenteritis, Salmonellosis (various Salmonella serovars), Shigellosis *(Shigella spp*.), and Staphylococcal food poisoning (*Staphylococcus aureus* enterotoxins) [17, 18]. Children below five years of age have the most at risk from foodborne pathogens, including Shiga toxin-producing Escherichia coli O157, *Campylobacter, Shigella, Yersinia, Salmonella, and Cryptosporidium* [19, 10]. In the past few decades, the awareness in hand washing has tremendously reduced the burden of diarrhea caused by enteric bacteria and protozoans, yet, it has less impact on diarrhea caused by viruses [20]. The mouth is the typical portal of entry for gastrointestinal pathogens, which are ingested alongside contaminated food and water [21]. Also, they are acquired via contact with diarrheic animals and their contaminated environments or with the fecal matter of a diarrheic person [17, 12]. While in their gastrointestinal habitat, these pathogens, through a variety of pathological mechanisms by which they could be typed, trigger the over secretion of fluid in the lumen of the small intestine associated with electrolyte imbalance, and eventual diarrhea [17, 22]. Accurate diagnosis of diarrheal pathogens is necessary for surveillance, prevention, and control of diarrhea [23, 18]. Traditional, phenotypic tests such as Gram staining, bacteriological culture and recording of colonial characteristics, and biochemical tests form the mainstay of laboratory diagnosis in less developed countries [19]. However, such tests take longer turnaround time to identify slow-growing bacteria, resulting in delayed treatment of patients [3]. In many other cases, the results of these tests, even when considered in concert, are false negatives [1]. To this end, this research tends to evaluate the prevalence rate of Childhood diarrhea and dysentery in Wukari community which will broaden the existing epidemiological picture of this disease in this part of the globe and has a direct consequence on planning adequate control programme.

Materials and Methods

The study area

This study was carried out in the Department of Microbiology, Federal University Wukari, Taraba State, Nigeria. Wukari metropolis is a large town which is the Headquarter of Wukari Local Government Area of Taraba State. Geographically, Wukari lies between latitude 7°55'42" North and longitude 9°47'59" East. It has an area of 4,308 km2. Wukari is home to Federal University Wukari, Kwararafa University and National open university. The major languages spoken are Jukun, Kutep, Tiv, Hausa and Fulani [24].

Sample collection

Total of 100 stool samples of children age 0-5 years attending different health facilities in Wukari L.G.A. was collected and was not biased as to the person is an indigene or non- indigene of the country or having varying social or religion.

Parasitological analysis

Microscopic Examination

Each stool sample was examined by direct microscopy in other to detect parasites. The method used was wet mount preparation and viewed using x10 and x40 objectives of the light microscope.

Macroscopic Examination

Stool samples were observed visually and the following were recorded in addition to personal information required for the study, the color, the consistency, presence of blood and mucus and any other abnormalities were observed macroscopically and recorded.

Bacteriological analysis

Collected samples were cultured on MacConkey agar and Salmonella-Shigella Agar (SSA). using the streak plate method. The plates were incubated at 37°C for 24 hours. Discrete colonies were identified and characterized by morphological characteristics, Gram staining, biochemical tests and sugar fermentation analysis using standard microbiological methods [8].

Results

The result of one hundred (100) clinical isolates collected from patients are as shown on Table 1 and 2 which shows the percentage distribution of the isolates. According to the graphs on figures 1- 4, children within the range of 0-1, males had a higher frequency than females. In the graph for range 2-3 females had a higher frequency than males same for age range 4-5.

Table 1: Isolation and identification of bacteria isolate from stool samples and biochemical test

Bacterial Isolates	Gram staining reaction	Indole	Citrate	Catalase
Escherichia coli	Gram variable (gram- rod, gram+ rods in chain and gram + coccobaccili)	+	-	+
Salmonella spp.	Gram + diploccoci in clusters	+	+	+
Shigella spp.	Gram - rods	-	+	+

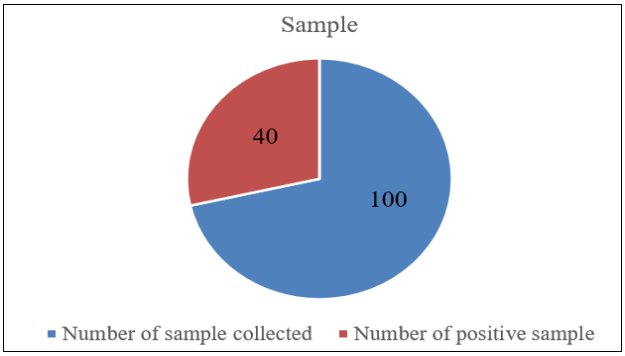

Fig 1: chart showing percentage of sample collected and positive sample

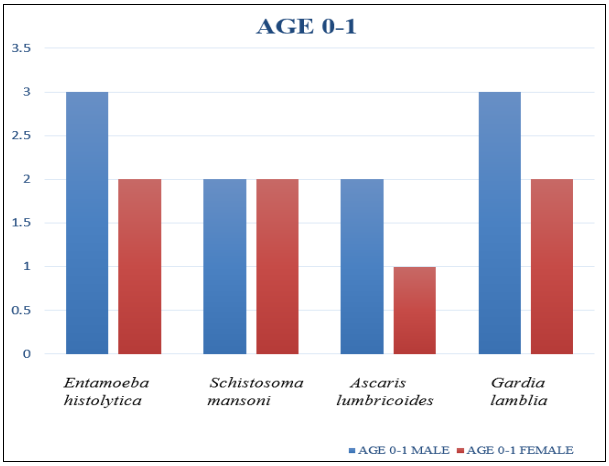

Fig 2: Patients: sex age grade distribution between 0-1 years old

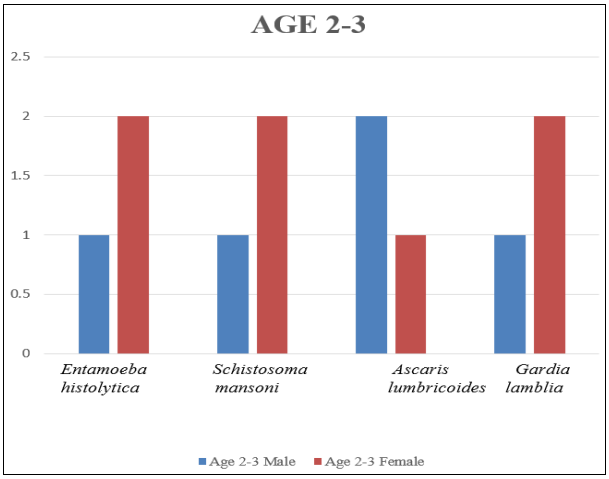

Fig 3: Patients sex age grade distribution between 2-3 years old

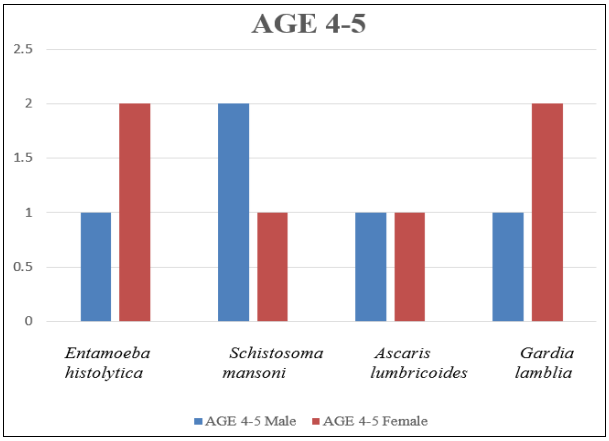

Fig 4: Patient: sex age grade distribution between 4-5 years old

Table 2: Patients sex age grade distribution showing total percentage and mean of parasites

Parasites	0-1year old		2-3years old		4-5years old		TOTAL	Percentage (%)	Mean(SEM)
	Male	Female	Male	Female	Male	Female			
Entamoeba histolytica	3	2	1	2	1	3	12		1.9
Schistosoma mansoni	2	2	1	2	2	1	10		1.8
Ascaris lumbricoides	2	1	2	1	1	1	8		1.4
Gardia lamblia	3	1	1	2	1	2	11		1.8
Total	10	7	5	7	5	6	40		

Discussion

Prevalence of 1.4% observed in this study is however lower than expected in view of the present sanitary condition of most areas in wukari. Contributory factors to the observed prevalence in the study maybe the government and non-governmental agencies sponsored "mass deworming programmed" of children which may have had the effect of reducing parasitism and dysentery in children [1]. Also, measures have been taken by local and state governments at improving environmental sanitation in most areas in wukari local government area of Taraba state which includes taking charge of packing of refuse in wukari metropolis [25, 18]. However, reports have specified the percentage of the children with diarrhea and dysentery as a result of the parasitic infection between the age of (0-1) years old in higher rate (1.8%) [26]. Another contributory factor to the relative prevalence suggested by this study may be the number of samples examined per patient, studies have shown that examination of multiple stool samples maximizes parasites detection rate [27] Nevertheless, for reason of compliance and logistics, all data in this study were based on stool sample examination. Parasites identified in this study included *Entamoeba histolytica*, *Schistosoma haematobium*, *Ascaris lumbricoides* and *Gardia lamblia* have been reported by studies, as major index of community level of environmental contamination and unsanitary lifestyle [27]. Therefore, low prevalence of protozoans observed in this study may be a reflection of minimal level of environmental contamination obtainable in wukari. However, this parasite was identified in unformed stool of children with diarrhea and dysentery reports have suggested that these parasites are associated with childhood diarrhea. Helminthes identified in this study are the usual diarrhea genic parasitic pathogens, Ascaris lumbricoides was the most risk of giardiasis. These observations were however attributed to the "poor quality of the piped water" in these regions [18]. The children having the lowest risk are those whose water was filtered (1.4%). These findings agree with previous study and not unexpected, in that those who did not treat their water had the highest risk as any parasite in the water may be expressly ingested since no attempt was made at eliminating the parasites before consumption [27].

Conclusion

Parasitic agents associated with diarrheal and dysentery diseases remain an existential threat to global public health, especially to the children of ages 0-5, in low- and middle-income nations of the world, where access and the cost of quality healthcare remain below par and beyond affordable respectively. Treatment of childhood diarrheal diseases should be done within shorter turnaround times than ever before, given the need to reduce mortality due to them, especially during epidemic outbreaks. Conventional culture techniques, time-tested as they are, remain limited in offering rapid diagnosis, especially as a fair proportion of diarrheal pathogens are difficult to culture and yet to be identified. Metagenomics and bioinformatics, in particular, offer great potentials in achieving a rapid diagnosis and epidemiological surveillance of diarrheal diseases, which in turn will lead to the outcome of rapid management, treatment, prevention, and control of diarrheal diseases. Based on the finding and conclusion of this study, the following recommendations were drawn: Potable water should be provided regularly to all areas in Wukari especially the outskirt where piped water has not been extended to. Every household should be encouraged to treat their water by filtration method before consumption. Faecal matter should be properly disposed off by water closet system in every household. Cases of diarrhea diseases in children should be adequately investigated before treatment. Minimum of stool microscopy should be done. Routine broad –spectrum anti-helminthic and anti-protozoan's agents should be encouraged in children.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of informed consent

All participants were adequately prepared for the study; were given health education, all necessary information provided and voluntarily signed consent form.

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