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A review on the prevalence of Human Giardiasis in some selected States in Nigeria

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Abstract *Giardiasis is caused by Giardia doudenalis and is a protozoan parasitic infection associated with poor socioeconomic conditions and therefore most commonly found in highly impoverished countries. This disease is associated with public clusters such as correctional and day care centers as well as public recreational centers such as swimming pools, especially in absence of good personal and environmental hygiene. It is often transmitted through infected fomites, contaminated water and food. Because sexual transmission has been documented, coinfection with HIV/AIDS have been reported and the disease has been declared a member of venereal diseases, hence, an opportunistic infection in immunocompromised hosts. It has been seen in various ages, but prevalence is mostly higher among children, which has been associated with transmission through the fecal-oral route due to such behaviors as encopresis, finger sucking, sand eating and nail biting among others. This review assesses the prevalence of Giardiasis in some states in Nigeria through convenient sampling of available literature.*

Key Words: *Human giardiasis, prevalence, Nigeria, implication*

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1.0 Introduction

Giardiasis, otherwise known as flagellate diarrhea or traveler's disease, is a gastrointestinal parasitic disease associated with acute or chronic diarrhea and malabsorption, which has been implicated for reduced growth in children and lower productivity in livestock. The etiology of this disease are members of the protozoan genus Giardia (family *Giardiidae* ;order *Giardiida*), which constitutes at least six human and animal-pathogenic species, with *Giardia doudenalis* implicated in most human cases. *G. doudenalis* and *G. intestinalis* are used synonymously, whereas the older names (*G. lamblia* and *Lamblia intestinalis*), though occasionally found in human clinical literature, are no longer considered taxonomically valid. People have been shown to be the major reservoir hosts (CFSPH, 2012).

The pathogen is the most common protozoan intestinal parasite, particularly in warm climates (Ellis *et al*., 1993). Risk factors include exposure to parasite-contaminated water or food (Bean *et al.*, 1996), direct contact with infected people especially in densely populated areas like correctional and day care centers (Polis *et al.*, 1986) as well as through public recreational service centers such as swimming pools (Porter *et al.*, 1988). Sexual transmission

has been reported largely among homosexuals and a few instances of heterosexual transmission (Meyers *et al*. 1977; Stuart *et al.,* 2003; Schmerin *et al*. 1978; Birkhead and Vogt 1989; Esfaridiari 1997) and therefore has been designated a sexually-transmitted disease by the US centers for disease control and prevention (Haggerty, 2006). Instances of coinfection with HIV makes it a potential opportunistic pathogen in immunocompromised hosts (Esfaridiari *et al.,* 1997; Gundel and Hermann, 2002).

It is largely considered to be a disease of highly impoverished countries where poor sanitary conditions and lack of control for insect and animal populations are very common (Gilman *et al*., 1988). Global epidemiological surveys revealed that social and economic factors such as poverty, poor personal and environmental hygiene, ineffective healthcare system and lack of safe drinking water (Tellez, 1997; Kasprazak, 1989; Walsh and Kenneth, 1979; Ekundayo *et al*., 2007; Wagbastoma, *et al*., 2005) predispose people to intestinal parasitic infections. Pica, encopresis, nail biting and finger sucking are behavioral irregularities observed in children and have been implicated in fecal-oral transmission of parasitic infections from one person to another (Thomas *et al*., 2014; Usip and Nwosu, 2013, Gimba and Dawan, 2015).

Giardiasis can be symptomatic or asymptomatic. Most carriers have been shown to be asymptomatic, yet shedding the parasite in feces (Danciger and Lopez, 1975) and therefore lead to prolonged transmission of the disease. Symptomatic Giardiasis is also associated with abdominal pain and cramps, reduced hemoglobin (Hb) level and hypoalbuminemia (Monajemzadeh, 2008; Neva, 1994; Solomons, 1982). Prevalence stands at 2 to 5% and 20 to 30% in industrialized and developing countries respectively (Farthing, 1993).

Giardia spp exist in two stages, cysts and trophozoites with cysts being the infective stages. The cysts are excreted in feces and though considered to be promptly infectious, they have been shown to undergo a maturation period of up to 7 days before they can cause disease. 10-25 and 1-10 cysts are sufficient to cause infection in humans and animals respectively, with an incubation period of 1-45 days in majority of cases, whereas symptoms manifest after 1-2 weeks. Resistance to stress prompts integrated water treatment approach involving filtration, chemical and physical sterilization using chlorine dioxide and UV radiation (CFSPH, 2012). The relative resistance of cysts to stressful conditions is evident in water outbreaks that occur despite routine filtration and chlorination procedures (Wallis *et al.,* 1998).

Poor environmental sanitation coupled with lack of proper hygiene contribute immensely to spread of Giardiasis, especially among children that are yet to be able to take care of themselves at home or day care centers. This review intends to explore the scale of this problem in some selected states in Nigeria through convenient sampling of available literature, hence, rather offers a brief account of pervasiveness than reflect true national scale of prevalence.

2.0 Materials and Method

For the purpose of this review, some states in Northern and Southern Nigeria were selected through convenience sampling of available literature. These included Kaduna, Benue, Niger, Borno and Jigawa States in the north and Edo, Ogun, Cross-river and Osun States in the south. An extensive search and review of literature was carried out using search engines including Google scholar, science direct and research gate databases for studies on the prevalence and risk factors associated with prevalence of human giardiasis in Nigeria. All relevant works were considered for this review.

3.0 Results and discussion

The results of various prevalence studies on human Giardiasis across the selected states is presented in Tables 1 to 6. These include overall prevalence and prevalence according to age groups and gender. In each of the Tables,

references are presented to reflect the source of the data. Table 1 captures, rate of prevalence in selected Northern states. Table 2 present rate of prevalence in selected Southern states. Tables 3 and 4 present highest prevalence according to age groups in selected states in the Northern and Southern parts of Nigeria respectively. Tables 5 and 6 show information on sex distribution in selected Northern and Southern states in Nigeria respectively.

Table 1: Rates of prevalence in selected states in Northern Nigeria

S/N	Study area	Method	NE	Positive	Prevalence (%)	Reference
1.	Jigawa	FECM	120	44	36.7	Yahaya and Dogara (2018)
2.	Niger	FECM	250	46	18.4	Mohammed *et al.* (*2015*)
3.	Borno	FECM	256	85	33.2	Biu *et al.* (2009)
4.	Kaduna	ELISA	374	150	41.45	Helen *et al.* (2011)
5.	Benue	ELISA	128	37	28.9	Atu *et al.* (2016)
6.	Benue	SFT	292	118	40.41	Kolawole *et al.* (2009)

***NE= Number examined; FECM= Formol-ether concentration Method; ELISA= Enzyme linked immunosorbent assay; SFT= Sedimentation and floatation technique.**

Table 2: Rates of prevalence in selected Southern states

S/N	Study area	Method	NE	Positive	Prevalence (%)	Reference
1.	Osun	QICM	733	97	13.2	Atu *et al.* (2014)
2.	Cross-river	FECM	1055	281	26.63	Usip *et al.* (2017)
3.	Ogun	FECM	394	47	11.9	Ogbolu *et al.* (2009)
4.	Edo	FECM	80	0	0.00	Okpala *et al.* (2014)

****NE= Number examined; QICM= Quick immunochromatographic method; FECM= Formol-ether concentration Method.**

Table 3: Highest prevalence according to age groups in selected states in Northern Nigeria

S/N	Age group	NE	Positive	Prevalence (%)	Reference
1.	0 – 10	32	18	56.3	Yahaya and Dogara (2018)
2.	9 – 10	83	14	16.9	Mohammed *et al.* (2015)
3.	2 – 25	189	42	22.2	Biu *et al.* (2009)
4.	3 – 5	107	51	32.9	Helen *et al.* (2011)

****NE= Number examined**

Table 4: Highest prevalence according to age groups in selected states in Southern Nigeria

S/N	Age group	NE	Positive	Prevalence (%)	Reference
1.	0 – 2	37	20	54.1	Atu *et al.* (2016)
2.	10 – 11	335	82	24.48	Usip *et al.* (2017)
3.	11 – 13	9	14	15.56	Ogbolu *et al.* (2009)

***NE= Number examined**

Table 5: Sex distribution of prevalence in selected states in Northern Nigeria

S/N	Sample size	Prevalence (%)				Reference
		Males		Females		
		NE	+ve (%)	NE	+ve (%)	
1.	120	46	15(32.6%)	74	29(39.2%)	Yahaya and Dogara (2018)
2.	250	135	84(62.4%)	115	52(45.2%)	Mohammed *et al.* (2015)
3.	256	128	39(30.5%)	128	46(35.9%)	Biu *et al.* (2009)
4.	374	191	78(50.3%)	183	77(49.7%)	Helen *et al.* (2011)

***NE= Number examined; +ve= Number of positive samples for giardiasis**

Table 6: Sex distribution of prevalence in selected states in Southern Nigeria

S/N	Sample size	Prevalence (%)				Reference
		Males		Females		
		NE	+ve (%)	NE	+ve (%)	
1.	128	80	19(23.8%)	48	18(37.5%)	Atu *et al.* (2016)
2.	1055	495	157(31.7%)	560	124(22.1%)	Usip *et al.* (2017)
3.	292	165	70(42.42%)	127	48(37.79%)	Ogbolu *et al.* (2009)

***NE= Number examined; +ve= Number of positive samples for giardiasis**

Varying rates of prevalence were reported in some states in Nigeria; 36.7% in Jigawa (Yahaya and Dogara, 2018), 18.4% in Niger (Mohammed *et al.*, 2015), 33.2% in Borno (Biu *et al.*, 2009), 41.45% in Kaduna (Helen *et al.*, 2011), 40.41% and 28.9% in Benue (Kolawole *et al.*, 2009; Atu *et al.*, 2016), 13.2% in Osun (Atu *et al.*, 2014), 26.63% in Cross-river (Usip *et al.*, 2017), 11.9% in Ogun (Ogbolu *et al.*, 2009) and a negative result in Edo state (Okpala *et al.*, 2014). The highest (26.63%) and least (11.9%) prevalence rates in the south were reported in Cross-river and Ogun States respectively (Table 2), whereas 41.45% and 18.4% were the highest and least rates reported in northern Nigeria, in Kaduna and Niger States respectively (Table 1).

Majority of the results fall within the 20 to 60% prevalence defined for developing countries (Reitmeyer and Robertson, 1997). Among the authors, the most commonly used diagnostic technique is Formol-ether concentration method (FECM), whereas Enzyme linked immunosorbent assay (ELISA), Quick immunochromatographic method (QICM) and sedimentation and floatation technique (SFT) were not very popular. Differences in diagnostic techniques and inclusion of asymptomatic patients may form the basis for variations in reported rates of prevalence.

Rate of prevalence of Giardiasis is more common in children than in adults, which is probably due to behavioral irregularities and lack of self-protection. Age distribution of the disease revealed 56.3% in children between 0 and 10 years of age (Yahaya and Dogara, 2018), 16.9% between 9 to 10 years (Mohammed *et al.*, 2015), 22.2% among individuals between 2 to 25 years (Biu *et al.*, 2009), 32.9% in children aged between 3 and 5 (Helen *et al.*, 2011) (Table 3), 54.1% among children aged 0 to 2 (Atu *et al.*, 2016), 24.48% between 10 and 11 (Usip *et al.*, 2017) and 15.56% among children aged 11 to 13 (Ogbolu *et al.*, 2009) (Table 4), demonstrating the vulnerability of children, especially between the ages of 3 and 5.

Despite varying rates of prevalence across the sexes (Tables 5 and 6), gender is not significant

in the distribution of human Giardiasis. Differences in prevalence of giardiasis among sexes could be due to socio-economic disposition of the population, particularly the culinary role of women and the disease pattern which is mostly facilitated by poor handling of drinking water, food or sewage (WHO, 1996).

Despite the relatively lower prevalence of giardiasis reported in some states in Nigeria, the disease is significantly prevalent in highly impoverished areas, especially the rural areas. This can be attributed to exposure to contaminated soils, water and food, lack of personal and environmental hygiene as well as lack of access to effective healthcare facilities. Sex and age are not significant in its distribution, though higher cases have been reported in children. This is attributed to the close person-person contact on playgrounds and in day care centers.

4.0 Conclusion

The occurrence and wide spread of giardiasis among human populations demands attention. It is imperative to design and implement effective preventive and control strategies through creation of awareness on the disease as well as potential sources of infection, provision of adequately equipped healthcare facilities, monitoring activities of children at daycare centers as well as ensuring food safety and provision of potable drinking water. However, avoiding indiscriminate sexual behavior and proper handling of sewage should be adopted by the general public.

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