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Research Article

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Burden of gastrointestinal parasitic infections: A 5-year retrospective study at a tertiary hospital in Ghana.

Eric Konadu-[1,2], Stephen Yao Gbedema-[1], Yaw Duah Boakye-[1], Bright Osei-Mensah-[1] and Ernest Badu-Boateng-[2]

[1]Department of Pharmaceutics, Faculty of Pharmacy and Pharmaceutical Sciences, College of Health Sciences, KNUST, Ghana.

[2]Department of Microbiology, Parasitology Laboratory unit, Komfo Anokye Teaching Hospital, Kumasi, Ghana

Correspondence should be addressed to Eric Konadu: *erickonadu12@gmail.com*

Abstract

Gastrointestinal parasitic infections (GPIs) have been recognized as a global health challenge with debilitating effects in low-and-middle-income countries. One of the major drawbacks preventing its elimination and proper control strategies is lack of sufficient data. In Ghana, routine surveillance of GPIs are not readily conducted leaving a huge gab to determine the dynamics and trends of GPIs. The study was therefore aimed at determining the burden and distribution of GPIs among patients who reported at the Komfo Anokye Teaching Hospital (KATH) for routine stool examination between2015 and2019.Stool examination records at the KATH Parasitology laboratory from March 2015 to December 2019 were manually reviewed and analyzed with Statistical Package for Social Science (SPSS) version 26.0.Four thousand one hundred and seventeen (4,117) patients reported at the Parasitology laboratory of the Komfo Anokye Teaching Hospital from March, 2015 to December, 2019 to be screened for GPIs. Out of the 4,117, 194 were infected with at least one of the gastrointestinal parasites. The overall prevalence of GPIs for the 5-year period was 4.7%. The predominant gastrointestinal parasite recorded was *Intestinal flagellates* representing 94.8% whereas the least prevalent intestinal parasite was *Balantidium coli* 0.5%. Cumulatively, for the 5-year period, most of the positive cases for GPIs were reported in ApriCR20/l and lowest infestation rate was recorded in August. Highest number of the infected patients had moderate infection intensity representing 55.1% whereas mild and severe infection intensity represented 25.7 and 19.0% respectively. The overall infestation rate was relatively low which can be attributed to ineffective diagnostic approach and insensitivity of the wet mount technique that was used throughout the 5-year period.

Keywords: Prevalence, Infestation, Gastrointestinal parasites

1. Introduction

GPIs are caused by numerous protozoa and helminths. Globally, about 3.5 billion people are affected with GPIs causing 200,000 deaths annually [1]. The most affected population is in developing countries [2].

In Africa, Walana *et al.* and Alemu *et al*. [3, 4] reported that, the prevalence of GPIs ranges between 2.0 and 89.0%. Some of the common gastrointestinal parasites that are usually reported in Africa include; *Cryptosporidium parvum, Isospora belli, Microsporidia species, Entamoeba coli, Cyclospora species, Blastocystis hominis* and *Dientamoeba fragilis, Entamoeba histolytica, Giardia lamblia, Trichuris trichiura, Ascaris lumbricoides, Strongyloides stercoralis* and *Ancylostoma species* [8,9, 12].

The burden and intensity of GPIs are mostly influence by nutritional and immunological status of the study population, socio-economic factors as well as climatic factors in the study area[5,6]. The increasing population in Africa predisposes the people to poor sanitary conditions, crowded settlements, inadequate toilet facilities which leads to rapid contamination of food and water, malnutrition and low host resistance as a result of low immunity [7]. All these are risk factors facilitates the spread of GPIs in Africa.

In Ghana, the GPIs prevalence ranges between 2.0 and 78.0 % and the top three GPIs infestations are Giardiasis, Amoebiasis and Cryptosporidiosis [10, 11].

GPIs infestations can result in complications such as cognitive retardation, loss of appetite, weight loss, chronic diarrhoea and anaemia [13,14]. Irrespective of detrimental consequences of GPIs, Ghana is still faced with paucity of scientific data on GPIs. These make the work of stakeholders that are involve in policy making and provision of eradication strategies on GPIs difficult to execute their task effectively due to unavailability of data. This retrospective study sought to determine the burden of GPIs from 2015-2019 at Komfo Anokye Teaching Hospital in Ghana.

2. Materials and Methods

2.1 Ethical clearance

The study protocol was approved by the Committee on Human Research, Publications and Ethics of the School of Medicine and Dentistry (SMD), Kwame Nkrumah University of Science and Technology (KNUST) and the Ethical Review Committee of Komfo Anokye Teaching Hospital, Kumasi with Registration number RD/CR20/158. Participants confidentiality was paramount and was maintained throughout the study.

2.2 Study design

This was a retrospective study conducted at the Komfo Anokye Teaching Hospital (KATH) in Kumasi, Ghana from January, 2020 to August, 2020.

2.3 Study area

The Komfo Anokye Teaching Hospital (KATH) in Kumasi, Ashanti Region, is a tertiary hospital and the second largest health facility in Ghana. It is a suitable referral Centre for 11 out of the 16 administrative regions in Ghana; which include Ashanti, Bono East, Ahafo, Western North, Savannah, Northern, North East, Upper West, Upper East and some part of Central and Eastern regions. It also serves patients from our neighbouring countries such as Cote d'Ivoire and Burkina Faso. The Hospital also serves as a clinical training center for Pharmacy, Medical and Biomedical science students of the Kwame Nkrumah University of Science Technology. The Hospital's geographical location also makes it accessible for people.

2.4 Data collection and study population

Data was collected from KATH Parasitology laboratory records. The folders of all patients who reported at the laboratory for routine stool examination from March, 2015 to December, 2019 were assessed for the following parameters: age, gender, specimen consistency, laboratory

results (presence or absence of the intestinal parasites) and parasite load for the positive cases. Direct wet mount technique as described by Cheesbrough [15] was the only method used for the gastrointestinal parasite identification.

2.5 Data analysis

The data was analysed using Microsoft Excel 2019 and Statistical Package for Social Sciences (SPSS) version 29.0.

3. Results

3.1. Annual distribution of gastrointestinal parasitic infections

A total of 4,117 patients were tested for GPIs at the KATH Parasitology laboratory between March 2015 and December 2019. The highest number of tests were conducted in 2015 (n=979; 23.8%) whereas the lowest was recorded in 2017 (n=490; 11.9%). Majority of the patients tested were females (3,163; 76.8%) compared to males (n=954; 23.2%). In 2015, 2018 and 2019, it was observed that, the prevalence of GPIs amongst the males and females were relatively the same within the 5 years period of study except in 2016 where the females showed a prevalence higher than their male counterparts. The overall prevalence for the five-year period was4.7% (n=194) **(Table 1).**

Table 1: Yearly burden of gastrointestinal parasitic infections reported at KATH from 2015-2019

Year	Number of patients tested			Number of infected patients		
	Females	Males	Total (%)	Females (%)	Males (%)	Total (%)
2015	754	225	979 (23.8)	50 (6.6)	15 (6.7)	65 (6.6)
2016	607	235	842 (20.5)	27 (4.4)	8 (3.4)	35 (4.1)
2017	344	146	490 (11.9)	19 (5.5)	10 (6.8)	29 (5.9)
2018	692	154	846 (20.5)	32 (4.6)	7 (4.5)	39 (4.6)
2019	766	194	960 (23.3)	21 (2.7)	5 (2.6)	26 (2.7)
Total	**3163 (76.8)**	**954 (23.2)**	**4117 (100.0)**	**149 (4.7)**	**45 (4.7)**	**194 (4.7)**

3.2 Monthly distribution of gastrointestinal parasitic infections from 2015-2019 In 2015, the highest infestation rate of GPIs were reported in April. It was followed by May and June then to March, December, November, September, October and August. No positive case was recorded in July.For 2016, most of the positive cases of GPIs were recorded in the month of January which was followed by May and June. Then to February, July and August. The lowest was recorded in March, April, October, November and December. In 2017, highest number of GPlswere reported in December then to March. It was followed by July, April, September, October and November. No intestinal parasitic infection was recorded in the rest of the months. For 2018, most cases of GPIs were recorded in November and it was followed by April, January, August, February, March, May and July. The lowest infestation rate was seen in June, October and December. In 2019, most positive cases of GPIs were recorded in October. It was then followed by March and June then to January, May and July. No case of intestinal parasitic infection was recorded in September, November and December (Figure1).

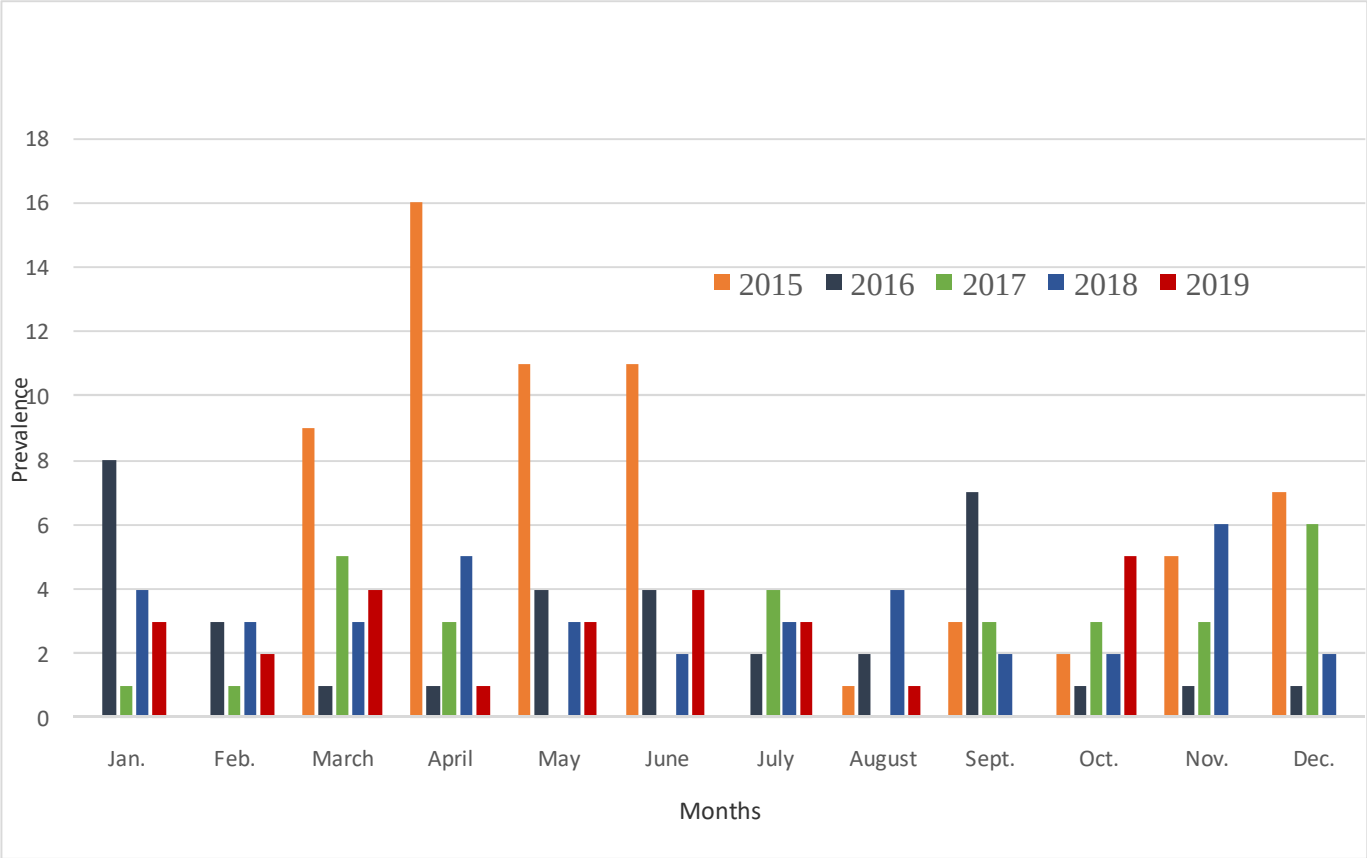

Figure 1: Monthly prevalence of GPIs from 2015-2019

3.2 Distribution of the various intestinal parasite isolated between2015 and 2019

The predominant gastrointestinal parasite isolated for the five-year period (2015-2019) was *Intestinal flagellates* (n=184; 94.8%) and it was followed by *Dicroelium dentriticum*(n=3; 1.5%). The prevalence of *hookworm ova, Schistosoma mansoni and Strongloides stercoralis* was 1.0% each and *Balantidium coli* represented0.5% **(Table 2).**

Table 2: Distribution of intestinal parasites identified at KATH between 2015 and 2019.

Intestinal parasite isolated	Number infected	Percentages
Intestinal flagellates	184	94.8%
Dicrocoelium dendriticum	3	1.5%
Hookworm ova	2	1.0%
Balantidium coli	1	0.5%
Schistosoma mansoni	2	1.0%
Strongyloides stercoralis	2	1.0%
Total	194	100%

3.3 Yearly assessment of the intensity of the intestinal parasitic infection among the infected patients.

The parasite load was determined to ascertain the intensity or severity of the gastrointestinal parasitic infections among the infected patients from 2015 to 2019. The intensity of GPIs were classified based on the number of intestinal parasites found in high power field (hpf). Thus, when between 1-10 parasites / hpf are constantly found on the various field observed microscopically it was classified as mild infection. When 11-100 parasites / hpf are found it was reported as moderate infection and >100 parasite / hpf as severe infection [15].

In 2015, 24 representing 36.9% were identified to have mild infection, 26 (40.0%) had moderate infection and 5 (23.0%) reported with severe infection. In 2016, 11(31.4%) of the infected patients presented with mild infection, 16 (45.7%) with moderate infection and 8 severe infection representing 22.9%. In the year 2017, 5 (17.2%) patients were identified to have mild infection, 20 (69.0%) with moderate infection and 4 (13.8%) with severe infection. In 2018in all, 5 (12.8% patients were having mild infection, 27 (69.2%) with moderate infection and 7 (17.9%) with severe cases of intestinal parasitic infection. For 2019, a total of 5 (19.2%) patients were having mild infection, 18(69.2%) were diagnosed to have moderate infection and 3 (11.5%) with severe infection. For the mild infection, out of the 5 patients, 4 (15.4%) were females and 1 (3.8%) was male. Over the 5-year period, the prevalence of mild, moderate and severe infections was 25.7, 55.1 and 19.0% respectively **(Table 3).**

Table 3: Yearly comparison of intestinal parasite load among patients with intestinal parasitic infection

		Infection intensities		
Years	Total infected with IPIs / year	n (%) Mild	n (%) Moderate	n (%) Severe
2015	65	24 (36.9)	26 (40.0)	15 (23.1)
2016	35	11 (31.4)	16 (45.7)	8 (22.9)
2017	29	5 (17.2)	20 (69.0)	4 (13.8)
2018	39	5 (12.8)	27 (69.2)	7 (17.9)
2019	26	5 (19.2)	18 (69.2)	3 (11.5)
n(Total) %	194	50 (25.7)	107 (55.1)	37 (19.0)

4. Discussion

GPIs continue to be a global health problem with significant impact in developing countries [16]. Routine surveillance and efficient monitoring in the trend of distribution of GPIs plays a crucial role in the fight against these infections. In view of this, the present study analysed data on gastrointestinal parasites isolated at the Komfo Anokye Teaching Hospital, Kumasi, Ghana from 2015-2019 to determine the prevalence, the infection intensity and distribution of the various gastrointestinal parasites.

The overall prevalence of GPIs over the five-year period (2015-2019) was 4.7%. This current retrospective study records a lower prevalence compared to similar study conducted at Gondar in Northwest Ethiopia by Ayelgn *et al.* who reported a prevalence of 41.3% [17] and in Ghana by Appiah *et al.* at the Ho Teaching Hospital who recorded overall prevalence of 10.0% [18].

The difference in prevalence between the current and the previous studies could be attributed to the method used in the isolation of the gastrointestinal parasites. In this present study, only wet mount technique was used in the identification of the gastrointestinal parasites which is less sensitive compared to formol-ether concentration and molecular techniques. The study also revealed that, there was slight variations in the prevalence of GPIs during the five-year period. Increased infestation rate was recorded in 2015 (6.6%) and 2017 (5.9%) with gradual reduction in 2018 (4.6%), 2016 (4.1%) and 2019 (2.7%). Similar finding was reported in Turkey by Parazitler *et al.* [19] where fluctuations in prevalence was recorded in a 5-year retrospective study. The annual changes in prevalence for the 5-year period could be attributed to poor infection control strategies in Ghana [20].This is because, aside treating the suspected and diagnosed cases of GPIs, there is no long-term preventive measures to curb the spread. The predominant intestinal parasite identified was *Intestinal flagellates* 94.8% and *Balantidium coli* 0.5% was the least encountered gastrointestinal parasite. This finding is in contrast to a study by Ayelgn *et al.* [17] in Ethiopia and Parazitler *et al.* in Turkey [19]. In that study, *Entamoeba histolytica* and *Blastocystis hominis* was the most common gastrointestinal parasites isolated. However, the finding agrees with Appiah *et al.* in Ghana [18] who also reported *Intestinal flagellates* as the most prevalent gastrointestinal parasites encountered in that study. The high incidence of intestinal protozoan parasites reported in the present and previous studies in Ghana confirms poor sanitary conditions in the country facilitating easy contamination of food and water with intestinal protozoa [21,22]. The study also revealed that, highest infestation rate of GPIs was recorded in the month of April over 5-year period (2015-2019) and the lowest in August **(Figure 1**). This is because in Ghana, there is minimal rainfall from January, February and August and increased rainfall from April [23]. When there is minimal or no rainfall (in January, February and August) the sanitation situation in Ghana is slightly controlled and GPIs reduces [24]. However, when the rainy season starts sanitation becomes very poor and water and food become easily contaminated with gastrointestinal parasites due to rampancy of open defecation and inappropriate disposal of faecal waste [25]. The study also established that,50 (25.7%) presented with mild GPIs. One hundred and seven (55.1%) had moderate GPIs and 37 (19.0%) reported with severe GPIs**(Table 3)**.This indicates that, majority of the patients were moderately infected with GPIs and could be as a result of the endemic nature of the GPIs in Ghana [26].

5. Conclusion

The infestation rate was relatively low compared to similar studies and there were fluctuations in prevalence over the 5-year period. Intestinal protozoa infections were higher compared to helminthic infections. GPIs was highest in the month of April and the lowest in August.

The study recommends that, there should be review of clinical laboratories testing method for gastrointestinal parasites in Ghana and include more sensitive methods for diagnosis of GPIs aside saline wet mount technique.

6. Limitation of the study

Data for the first two months (January and February) in 2015 was not available in the record books for analysis. Due to the nature of the study, risk factors that predisposes the populace to GPIs in the study area was not captured hence we were unable to correlate the infestation rate to the risk factors for GPIs. Saline wet mount technique was the only method used in the identification of the gastrointestinal parasites. Due to difficulty in morphological differentiation and identification with saline wet mount technique most intestinal protozoans isolated were reported as *Intestinal flagellates*.

Conflicts of interest

The authors declare that they have no competing interest or preference.

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