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Intestinal parasitic infections among pregnant woman at Bafang district hospital, west region of Cameroon: Prevalence and associated factors

Cherry Suzanne Kengne [1], Christian Ngounouh Taheu [1, 2, 5, *], Julienne Louise Ngo Likeng [1, 2, 3, 5], Lucien Koumdji Kouakam [1], Martinobrie Hermione Weladji Cheubou [1], Edouard Francky Nganti Mebenga [1] and Philippe Salomon Nguwoh [2, 4, 5]

[1] *Department of Microbiology, Higher Institute of Sciences and Techniques Applied to Health, University of Douala, Yaounde-Cameroon.*
[2] *Department of Health Sciences, Distant Production House University, Delaware, United State of America (USA).*
[3] *Department of Public Health, School of Health Sciences, Catholic University of Central Africa, Yaounde-Cameroon.*
[4] *Department of Biochemistry, Immunology and Molecular Biology, National Public Health Laboratory, Yaounde, Cameroon.*
[5] *Department of Health Sciences, University of Lisala, Democratic Republic of Congo (DRC).*

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Abstract

Background: Intestinal parasitic infections (IPIs) remains a serious public health problem in sub-Saharan Africa (SSA). IPIs caused by helminths and protozoan parasites are common among pregnant women. Data on the national pooled prevalence of IPIs and associated factors during pregnancy is not well documented in Cameroon. This study was conducted to investigate the prevalence of IPIs and associated factors among pregnant women at the Bafang district hospital (BDH) in the West region of Cameroon.

Methods: We carried out a cross-sectional study from May, 30th to Jun, 24th 2022 among pregnant women aged between 14 to 48 years old (mean age: 27.41 ± 6.67 years old) at BDH in the West region of Cameroon. Stool samples were freshly collected from each pregnant woman in a clean container and examined fresh, then concentrated with 10% formalin-ether to increase the yield of the eggs and larvae. Statistical analyses were performed using Epi Info v. 7 and IBM SPSS version 20 software with any value of $p<0.05$ considered statistically significant.

Results: Of the 156 pregnant women examined, 13.46% (n=21) were infected and among them, 90.48% were mono-infected and 9.52% were double-infected. The species mainly found were *Entamoeba histolytica* (5.77%) for protozoa and *Strongyloides stercoralis* (1.28%) for helminths. The prevalence of IPIs was high in pregnant women aged <30 years (66.67%), in those with a secondary education (90.48%) and in single (42.86%). In addition, the prevalence of IPIs was more in the second trimester (42.86%) as compared to the first (28.57%) and the third trimester (28.57%) of pregnancy ($p<0.05$). No association was found between the prevalence of IPIs and associated factors.

Conclusion: The results of this study show a high prevalence of IPIs among pregnant women at the BDH with *Entamoeba histolytica* and *Strongyloides stercoralis* as the majority species in circulation.

Keywords: Prevalence; Associated factors; Intestinal parasitic infections; Pregnant women

* Corresponding author: Christian Ngounouh Taheu
Department of Microbiology, Higher Institute of Sciences and Techniques Applied to Health, University of Douala, Yaounde-Cameroon.

1. Introduction

Intestinal parasitic infections (IPIs) are the most common parasitic diseases worldwide. The annual death has been attributed to IPIs in developing countries [1]. IPIs constitute a global serious health burden causing clinical morbidity in 450 million persons, many of these are school children and women of reproductive age in low- and middle-income countries (LMIC) [2,3]. Soil transmitted helminths (STH) such as *Ascaris lumbricoides (A. lumbricoides)*, *Trichuris trichiura (T. trichiura)* and the hookworms such as *Necator americanus (N. americanus) and Ancylostoma duodenale (A. duodenale)* are the most common and important in terms of child health [4]. Generally, more than 2 billion people are infected with STH and out of that 1 billion infected with *A. lumbricoides*, 740 million with hookworm and 795 million with whipworm [5]. The global disease burden attributed to intestinal helminths is 39 million disability adjusted life years [6]. Pregnant women often experience more severe infections than their non-pregnant counterparts. The natural immune response to pregnancy causes women to be more susceptible to IPIs when pregnant than in non-pregnant state. Moreover, IPIs disturb pregnancy at the maternal and foetal level [7,8,9]. In addition, IPIs could occur at any stage of the three trimesters during pregnancy, but infection during the first trimester is associated with more severe foetal and placental consequences than those occurring later in pregnancy. These IPIs could cause anaemia: induce a characteristic deficiency of iron, total energy, proteins, folate and zinc, all of which leads to low weight gain during pregnancy and intrauterine growth retardation, increased risk of infection and low birth weight (LBW) [10]. Furthermore, IPIs during pregnancy are associated with serious adverse effects for both mother and unborn child [9, 10, 11].

Elevated IPIs have been recorded in LMIC because of poverty, low literacy rate, lack of safe drinking water, poor hygiene, malnutrition and hot and humid tropical climate [12, 13, 14]. IPIs are a major concern, mostly in developing countries, particularly in sub-Saharan Africa (SSA) [15]. In Ethiopia, Animaw et al reported a high prevalence of IPIs (27.32%) including 11.2% hookworms and 10.3% *A. lumbricoides* [16]. Meanwhile, currently, data on intestinal parasites and their impact on pregnancy are not well established in endemic countries [17]. In Cameroon, several studies have been conducted on the harmful effects of IPIs in preschool and school children and in the general population, but few studies have focused on prevalence and the disastrous effects of IPIs in pregnant women. The objective of this study was to determine the prevalence of IPIs and associated factors among pregnant women at the BDH in the West region of Cameroon.

2. Material and methods

2.1. Study area and population

Between May, 30th to June, 24th (one-month period), we carried out a cross-sectional study in pregnant women at BDH, West region of Cameroon. The western region is one of the ten regions of Cameroon. BDH is located in the town of Bafang, capital of haut Nkam division, west Cameroon. Bafang is a cosmopolitan city with 62. 800 inhabitants with agriculture and trade as activities [18].

2.2. Stool analysis

2.2.1. Direct wet preparation

Stools were collected fresh in the morning in sterile, labelled transparent plastic container. Stool specimens were first observed macroscopically for the presence of mucus, blood, and adult helminth worms. We placed a drop of saline water in the middle of the left half of the slide and a drop of lugol in the middle of the right half of the slide. Using a wooden applicator, a small amount of stool was removed and mixed with the drop of saline water and lugol. We covered each drop with a coverslip and read the slides under a binocular optical microscope with ×10 objectives then at ×40 [19]

2.2.2. Ritchie's Concentration Technique

This technique allowed us to increase the sensitivity of the search for cystic forms or parasite eggs. So in a large container, approximately one volume of stool was mixed by gradual dilution with a 10% formalin solution until a homogeneous mixture was obtained. After decantation for one minute, the mixture obtained was filtered using a sieve and collected in a conical centrifuge tube graduated at least 15 ml using a funnel. A 1/3 solution of flammable ether was added to the conical centrifuge tube. The conical tube containing the solution was closed and mixed by successive inversions by hand for 30 seconds. The solution was then taken to a centrifuge at 1500 rpm for 5 minutes to remove the top three layers by abruptly inverting the conical tube and reconstituting the pellet. The pellet obtained was read drop by drop between slide and coverslip under a binocular optical microscope with ×10 then ×40 objectives [19].

2.3. Statistical analysis

The data were collected using a standard questionnaire as well as those obtained in the laboratory were summarized in a Microsoft Excel 2016 spreadsheet, then concluded and analysed with Epi info version 7 software for bivariate analyses and IBM SPSS version 20 for multivariate analyses. Statistics were performed using Yates-corrected khi-square. Any value of $p<0.05$ was considered statistically significant.

3. Results

3.1. Sociodemographic characteristics of the study population

A total of 156 pregnant women in prenatal consultation at the BDH was included in this study. The age of the participants ranged from 14 to 48 years, a mean age of 27.41 years (Standard Deviation ± 6.67), and a median age of 28 years (IQR: 23-32). From 156 pregnant women, the majority were salaried (76.92%; n=120), had a secondary level (82.05%; n=128), were single (40.38%; n=63), were in the second trimester of pregnancy (41.03%; n=64) and 76.28% (n=119) had secondary education as their sector of activity (Table 1).

Table 1 Sociodemographic characteristics of the study population

Variables	Category	Total (N=156)	Percentage (%)
Age (years)			
	< 30	100	64.10
	≥ 30	56	35.90
Economic conditions			
	Salaried	120	76.92
	Non salaried	36	23.08
Education			
	illiterate	2	1.28
	Primary	4	2.56
	Secondary	128	82.05
	Higher	22	14.10
Status			
	Single	63	40.38
	Cohabiting	44	28.21
	Divorced	2	1.28
	Married	47	30.13
Age of pregnancy			
	1st trimester	54	34.62
	2nd trimester	64	41.03
	3rd trimester	38	24.36
Activity sector			
	Primary	13	8.33
	Secondary	119	76.28
	Tertiary	24	15.38

3.2. Distribution of the prevalence of intestinal parasites in the study population

Table 2 Distribution of the prevalence of intestinal parasites in the study population

Variables	Category	Total (N=156)	Percentage (%)
Protozoa			
Endolimax nana			
	Non infected	154	98.72
	Infected	2	1.28
Entamoeba coli			
	Non infected	148	94.87
	Infected	8	5.13
Giardia intestinalis			
	Non infected	155	99.36
	Infected	1	0.64
Entamoeba histolytica			
	Non infected	147	94.23
	Infected	9	5.77
Iodamoaba butchilii			
	Non infected	155	99.36
	Infected	1	0.64
Helminths			
Necator americanus			
	Non infected	155	99.36
	Infected	1	0.64
Strongyloides stercoralis			
	Non infected	154	98.72
	Infected	2	1.28
Trichuris trichiura			
	Non infected	155	99.36
	Infected	1	0.64

This distribution shows that protozoa were more represented with 5.77% for *Entamoeba histolytica*, 5.13% for *Entamoeba coli*, 1.28% for *Endolimax nana*, 0.64% for *Giardia intestinalis* and 0.64% for *Iodamoeba butschlii*. Regarding the helminths, the frequencies were low unlike protozoa with 0.64% for *Necator americanus*, 1.28% for *Strongyloides stercoralis* and 0.64% for *Trichuris trichiura* (Table 2).

3.3. Distribution of the prevalence of IPIs according to sociodemographic characteristics

Table 3 Distribution of the prevalence of IPIs according to sociodemographic characteristics

Variables	Total number		Infected		Non infected		Khi-square	p-value
	n=156	%	n= 21	%	n=135	%		
Age (years)								
< 30	100	64.10	14	66.67	86	63.70	0.20	0.90
≥ 30	56	35.90	7	33.33	49	36.30		
Economic conditions								
Salaried	120	76.92	1	4.76	35	25.93	3.47	0.06
Non salaried	36	23.08	20	95.24	100	74.07		
Education								
Illiterate	2	1.28	0	0	2	1.48	2.48	0.48
Primary	4	2.56	1	4.76	3	2.22		
Secondary	128	82.05	19	90.48	109	80.74		
Higher	22	14.10	1	4.76	21	15.56		
Status								
Single	63	40.38	9	42.86	54	40.00	0.3	0.9
Cohabiting	44	28.21	6	28.57	38	28.15		
Divorced	2	1.28	0	0	2	1.48		
Married	47	30.13	6	28.57	41	30.37		
Age of pregnancy								
1st trimester	54	34.62	6	28.57	48	35.56	0.45	0.79
2nd trimester	64	41.03	9	42.86	55	40.74		
3rd trimester	38	24.36	6	28.57	32	23.70		
Activity Sector								
Primary	13	8.33	1	4.76	12	8.89	5.24	0.07
Secondary	119	76.28	20	95.24	99	73.33		
Tertiary	24	15.38	0	0	24	17.78		

Table 3 shows that no statistically significant difference was found between IPIs and sociodemographic characteristics. However, the prevalence of IPIs was high in participants aged under 30 years (66.67%), in non-salaried pregnant women (95.24%), in those with a secondary level of education (90.48%), in single pregnant women (42.86%) and in pregnant women of secondary activity sector (95.24%). In addition, the prevalence of IPIs was more in the second trimester (42.86%) as compared to the first (28.57%) and the third trimester (28.57%) of pregnancy.

3.4. Distribution of the prevalence of IPIs according to risk factors

Table 4 Distribution of the prevalence of IPIs according to associated factors

Variables	Total number		Infected		Non infected		Khi-square	p-value
	N=156	%	n= 21	%	n=135	%		
Source of drinking water								
Tap water	52	33.33	11	52.38	41	30.37	4.41	0.35
Forage	51	32.69	6	28.57	45	33.33		
Mineral water	13	8.33	1	4.76	12	8.89		
River	1	0.64	0	0	1	0.74		
Source	39	25	3	14.29	36	26.67		
Good meat cooking								
Yes	155	99.36	21	100	134	99.26	1.15	0.28
No	1	0.64	0	0	1	0.74		
Hand washing before meals								
Yes	155	99.36	20	95.24	135	100	1.15	0.28
No	**1**	**0.64**	**1**	**4.76**	**0**	**0**		

Table 4 shows that no statistically significant difference was found between the associated factors and the IPIs. However, the high prevalence was observed among those who drank tap water (52.38%), those who had declared yes for a good cooking of the meat (100%) and those who washed their hands before the meal (95.24%).

4. Discussion

The overall prevalence of IPIs in this study was 13.46% (95%CI: 8.53%-19.84%). This prevalence is close to those obtained by Wekesa et al. (13.8%) [20] in Kenya and Abaka et al. (14.3%) [21] in Ghana. Relatively higher prevalence rate was reported by Animaw et al. (27.3%) [16] in Ethiopia. In contrast, Balarak et al. [22] in Iran reported a lower infection rate of 3.73%. These differences could be attributed on the one hand to sample size and on the other hand to socio-economic conditions, lack of hygiene and sanitation facilities, climate and environmental factors. Despite these observed differences, the fact remains that the prevalence of IPIs remains high in Cameroon.

In the current study, the prevalence of protozoa predominated (13.46%) followed by helminths (2.56%). Several studies conducted in pregnant women have also found higher prevalence of protozoan infections than helminth infections [14,23,24,25]. The high prevalence of protozoa could be due to lack of food hygiene and the low prevalence of helminths can be explained by systematic deworming of pregnant women during pregnancy. We identified a total of eight species and the main species found was *Entamoeba histolytica* (5.77%). This observed prevalence is close to that obtained by Abaka et al. [21] in Ghana, who obtained a prevalence of 5.0%. This high prevalence of *Entamoeba histolytica* in our study can be explained by the fact that there are favourable climatic conditions for the survival of cysts outside the human host and also for its transmission, the type of drinking water used and the hygienic conditions.

In this study, 90.48% and 9.52% were mono-infected and double-infected respectively. Studies have found lower prevalence of double infections among pregnant women in Ethiopia [14, 26]. The difference observed between the results could be explained by socioeconomic conditions because the majority of women enrolled in this study were non-salaried (95.24%). In addition, this difference could be justified by the sample size, unsanitary conditions.

In the present study, no sociodemographic variable was significantly associated with the prevalence of IPIs in pregnant women. However, the prevalence of IPIs was high in pregnant women under the age of 30, from high school and in pregnant women in the second trimester of pregnancy. Our results are consistent with findings from studies conducted in Kenya by Njeru et al. [27], in Nigeria by Ojurongbe et al. [28], in Ethiopia by Derso et al. [14]. However, our results

are contrary to the study conducted in Ethiopia by Edosa et al. [29], who found that gestational age was significantly associated with the prevalence of IPIs.

Regarding the factors associated with the IPIs, not all the variables studied in this study were associated with IPIs in pregnant women. Although the results agree with those of [14, 21]. These results are contrary to those of [16,30] which showed that hand washing practices after leaving the toilet, the absence of toilets and washing food before consumption were associated with IPIs during pregnancy.

Study limitation

For each pregnant woman, a single stool sample examination was performed. It would be interesting to follow pregnant women by taking a second sample to ensure diagnostic sensitivity.

5. Conclusion

The objective of this study was to determine the prevalence of IPIs and associated factors among pregnant women at the BDH, West Region of Cameroon. The results of this study showed a high prevalence of IPIs among pregnant women in this locality of the country. In this study, the species mainly found were *Entamoeba histolytica* for protozoa and *Strongyloides stercoralis* for helminths. The prevalence of IPIs was high in participants aged under 30 years, in non-salaried pregnant women, in those with a secondary level of education, in single pregnant women in pregnant women of secondary activity sector and in the second trimester.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors declare that there are no competing interests.

Statement of ethical approval

Ethical clearance was obtained from the Ethics Committee of the Regional Delegation of Public Health for the Centre Region, Yaounde-Cameroon (Ref: CEN°451CRERSHC/2022). Both official's language (French and English) were used to explain the aim of the study.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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