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Prevalence of enteroparasitosis in residents of Bonito de Santa Fé, Paraíba, Brazill

Prevalência de enteroparasitoses em residentes de Bonito de Santa Fé, Paraíba, Brasil

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ABSTRACT

Introduction: Enteroparasitosis are caused by helminths and protozoa that inhabit the human intestine, often occurring in places where living conditions and basic sanitation are unsatisfactory. **Objective:** To investigate the prevalence of intestinal parasites in users of a clinical analysis laboratory in the city of Bonito de Santa Fé, Paraíba. **Methodology:** This was an epidemiological, descriptive and retrospective study, in which the results of the Fecal Parasitological Examinations (EPF) were analyzed from January to June 2022. **Results:** Of the 50 samples analyzed, 50% were positive for enteroparasites and/or enterocommensals, with the most prevalent species being *Giardia lamblia* (45.5%) and *Entamoeba coli* (39.4%). No helminths were found. Among the 25 positive tests, 76% were monoparasited and 24% bi/polyparasited. The pathogenic species *Giardia lamblia* was the most prevalent among the monoparasites (52.6%). The prevalent parasitic association was *G. lamblia* and *Entamoeba coli*, with 100%. There was no statistically significant association between the variables sex, age group and zone with the presence of infection (p>0.05). **Conclusion:** It should be considered that the municipality needs to reduce the prevalence rates through strategies of diagnosis and treatment of the infected, educational programs on parasite prevention and improvements in basic sanitation conditions, public policies for urban and housing.

Keywords: Parasites. Prevalence. Epidemiology. Laboratory Diagnosis.

RESUMO

Introdução: As enteroparasitoses são causadas por helmintos e protozoários que habitam o intestino humano, ocorrendo frequentemente em locais nos quais as condições de vida e de saneamento básico são insatisfatórias. **Objetivo:** Investigar a prevalência de enteroparasitoses em usuários de um laboratório de análises clínicas do município de Bonito de Santa Fé, Paraíba. **Metodologia:** Tratou-se de um estudo epidemiológico, descritivo e retrospectivo, no qual, foram analisados os resultados dos Exames Parasitológicos de Fezes no período de janeiro a junho de 2022. **Resultados:** Das 50 amostras analisadas, 50% estavam positivas para enteroparasitos e/ou enterocomensais, sendo as espécies de maior prevalência *Giardia lamblia* (45,5%) e *Entamoeba coli* (39,4%). Nenhum helminto foi encontrado. Dentre os 25 positivos, 76% estavam monoparasitados e 24% bi/poliparasitados. *Giardia lamblia* foi a espécie mais prevalente entre os monoparasitados (52,6%). A associação parasitária mais prevalente foi *Giardia lamblia* e *Entamoeba coli* (100%). Não foi observada associação estatisticamente significativa entre as variáveis sexo, faixa etária e zona com a presença de infecção (p>0,05). **Conclusão:** Deve-se considerar que o município precisa reduzir os índices de prevalência por meio de diagnóstico e tratamento dos infectados, programas educativos sobre prevenção e melhorias nas condições de saneamento básico, planejamento urbano e habitacional.

Palavras-chave: Parasitas. Prevalência. Epidemiologia. Diagnóstico Laboratorial.

1. INTRODUCTION

Enteroparasites or intestinal parasites represent one of the major public health problems, both in Brazil and in other underdeveloped and developing countries[1,2,3]. Depending on basic sanitation conditions, socioeconomic level, educational background, age, and personal hygiene habits, the prevalence of diseases caused by these parasites may vary[4,5].

The main enteroparasitic infections are caused by helminths and protozoa that inhabit the human intestine, occurring frequently through the ingestion of cysts and eggs present in food, water, objects contaminated with feces, and through the fecal-oral route, as well as by transcutaneous penetration of larvae[6,7]. Depending on the parasite load, symptoms can vary from mild to severe, in some cases presenting no symptoms at all, or being nonspecific, such as anorexia, irritability, sleep disorders, vomiting, nausea, diarrhea, and even, in some cases, progressing to death[8].

In routine healthcare services, clinical analysis laboratories use parasitological techniques on fecal samples to diagnose intestinal parasitosis due to their low cost and broad spectrum for identifying parasitic species. Clinical diagnosis, which is based on nonspecific clinical manifestations or the presence of asymptomatic cases, becomes imprecise, making laboratory diagnosis essential for appropriate therapeutic management[9].

Although structured treatment protocols exist in both public and private healthcare systems, with the administration of oral medications, the implementation of preventive and educational measures, in all social contexts, aims to raise awareness in society about the risk of parasite transmission. These measures are essential for reducing exposure and prevalence in the population, being the most effective way to combat infections[3,9].

Analyzing the prevalence of intestinal parasitosis in locations where living conditions and basic sanitation are inadequate, such as those found in much of northeastern Brazil, becomes fundamental to providing subsidies for the creation of action strategies against these infections[10].

In this sense, as concerns grow regarding health and the transmission of parasitic infections, conducting an epidemiological investigation and providing accurate information on the prevalence variables of intestinal parasite infections becomes relevant, considering that this information can contribute to the development of action strategies against these infections. Given these considerations, this study aimed to determine the prevalence of enteroparasitosis among users of the Municipal Clinical Analysis Laboratory of Bonito de Santa Fé, Paraíba.

2. MATERIALS AND METHODS

Type of Research

This is an epidemiological, descriptive, analytical, and retrospective study, in which the results of Stool Parasitological Examinations (SPE) were analyzed, including the presence or absence of parasites and the species found, as well as variables such as sex, age group, area, and neighborhood of residence of the users recorded in the data files of the Clinical Analysis Laboratory of the Honorina Tavares de Albuquerque Municipal Hospital, Bonito de Santa Fé, Paraíba.

Study Location

The municipality of Bonito de Santa Fé (07°18'46"S and 38°30'54"W) is located in the mesoregion of Sertão Paraibano and the microregion of Cajazeiras, with an estimated population of 12,126 inhabitants in 2021, according to the Brazilian Institute of Geography and Statistics (IBGE). Its territorial area is 226.798 km², with a density of 47.32 inhabitants/km², and it is located 493 km from the state capital, João Pessoa, and 65 km from the city of Cajazeiras. Its neighboring municipalities include Monte Horebe (north); Serra Grande and São José de Caiana (east); Conceição (Paraíba) (south); and the state of Ceará (Barro and Mauriti) (west)[11].

According to the National Register of Health Establishments (CNES)[12], the municipality has a healthcare network composed of primary and medium-complexity care services distributed among the following health establishments: the Municipal Hospital and its internal specialty and laboratory services, Basic Health Units (UBS), Family Health Support Center (NASF), Basic Pharmacy, Physiotherapy Clinic, Home Care Service (SAD), Health Department, Mobile Emergency Care Service (SAMU), Health Academy, Melhor em Casa program, and Health Surveillance, which includes sanitary, epidemiological, and environmental surveillance.

Sampling

The study included 50 SPE reports contained in the database, performed between January and June 2022. The Clinical Analysis Laboratory of the Honorina Tavares de Albuquerque Municipal Hospital serves the entire population of Bonito de Santa Fé/PB, conducting approximately two SPEs per week.

Inclusion and Exclusion Criteria

According to the study's perspective, medical records that were properly completed and belonged to users of both sexes and all age groups who underwent SPEs were included. Medical records of patients who were not residents of the municipality and districts were excluded from the research.

Data Collection Procedure

Data collection was carried out by accessing printed and digitally stored examination reports in the laboratory's computer system, which records user data such as the individual's name, examination date, age, and address.

The epidemiological variables and categories were employed according to the methodology of Lima et al.[3], based on the available data in the medical records: age (all age groups), sex (male or female), place of residence (rural or urban area), neighborhood, parasitic associations (monoparasitism, biparasitism, polyparasitism, absence of association), and species, according to the examination results.

Data Analysis

The data were organized in spreadsheets for calculation and result generation. Variables were presented in absolute numbers and percentages. Graphs were created using Excel® version 2016, and statistical analyses were performed using the Statistical Package for Social Sciences (SPSS), version 20.0. The Chi-Square test (χ^2) or Fisher's Exact Test was applied, with $p<0.05$ considered statistically significant for null hypotheses.

Ethical Aspects

The research was submitted to the Research Ethics Committee of the Center for Education and Health at the Federal University of Campina Grande (CEP-CES-UFCG) and approved under opinion number 5.515.716, with the Certificate of Presentation for Ethical Consideration (CAAE) 58400122.1.0000.0154, on July 7, 2022.

3. RESULTS

Of the 50 stool parasitology reports (EPF), 50% tested positive for enteroparasites and/or enterocommensals. The methodology used in all tests was spontaneous sedimentation by Lutz or Hoffman, Pons, and Janer (HPJ).

Among the tests with positive results (n = 25), 76% were monoparasitic, 20% were biparasitic, and only 4% were infected with three parasitic species.

Among the 19 monoparasitic individuals, *Giardia lamblia* had the highest prevalence (52.6%), followed by *Entamoeba coli*, with 31.6% of cases. The other prevalence percentages for mono, bi, and triparasitic individuals are shown in Table 1.

Table 1. Prevalence of enteroparasite/enterocommensal species in mono-, bi-, and triparasitic individuals among users of the Clinical Analysis Laboratory of HHTA, Bonito de Santa Fé, from January to June 2022.

Monoparasitic		
Species	**N**	**%**
Giardia lamblia	10	52.6
Entamoeba coli	6	31.6
Entamoeba histolytica/E. dispar	3	15.8
Total	19	100
Biparasitic		
	N	**%**
Giardia lamblia + Entamoeba coli	5	100
Total	5	100
Triparasitic		
	N	**%**
Entamoeba coli + Entamoeba histolytica/E. dispar + Iodamoeba butschlii	1	100
Total	1	100

Source: Research data, 2022.

Regarding the sex variable of the individuals, of the positive cases (n=25), 64% were female. No statistically significant association was observed (p=0.999) (Table 2).

Table 1. Distribution of the prevalence of enteroparasites/enterocommensals by sex among users of the Clinical Analysis Laboratory of HHTA, Bonito de Santa Fé, from January to June 2022.

Category	**Resultado**						***P***
	Positive		**Negative**		**Total**		
Sex	**n**	**%**	**N**	**%**	**N**	**%**	
Female	16	64	16	64	32	64	0.999
Male	9	36	9	36	18	36	
Total	25	100	25	100	50	100	

Source: Research data, 2022.
p = Chi-square test.

The age group that constituted the majority of the tests performed was between 20 and 59 years (40%), which also had the highest percentage of positive cases (48%), followed by the 0 to 9 years group with 24%. No statistically significant association was observed between the variables (p=0.603), as shown in Table 3.

Table 3. Distribution of the prevalence of enteroparasites/enterocommensals by age groups among users of the Clinical Analysis Laboratory of HHTA, Bonito de Santa Fé, from January to June 2022.

Category	Result						
	Positive		Negative		Total		*P*
Age group	**n**	**%**	**N**	**%**	**N**	**%**	
0 to 9 years	6	24	10	40	16	32	0,603
10 to 19 years	4	16	4	16	8	16	
20 to 59 years	12	48	8	32	20	40	
60 years or older	3	12	3	12	6	12	
Total	25	25	25	100	50	100	

Source: Research data, 2022.
p = Chi-square test.

The species *Giardia lamblia* and *Entamoeba coli* had the highest prevalence among the parasitized individuals, 45.5% and 39.4%, respectively. Regarding the distribution of the prevalence of enteroparasite/enterocommensal species by age group, the highest prevalence of *Giardia lamblia* was observed in the 20 to 59 years group, representing 46.7% of the cases. For *Entamoeba coli*, the highest prevalence was also in adults (20 to 59 years), with 50%. There was only one case of *Iodamoeba butschlii* in this same age group.

Among the tests that showed associations between enteroparasite/enterocommensal species (n=6), the highest percentage of biparasitic/poliparasitic cases occurred in the 20 to 59 years age group, with 66.6% (Table 4).

Table 4. Association between mono-, bi-/poliparasitic individuals according to age group among users of the Clinical Analysis Laboratory of HHTA, Bonito de Santa Fé, from January to June 2022.

Category	Result					
	Monoparasitic		Bi/Poliparasitic		Total	
Age group	**n**	**%**	**n**	**%**	**N**	**%**
0 to 9 years	5	26,3	1	16,7	6	24
10 to 19 years	4	21,1	0	0,0	4	16
20 to 59 years	8	42,1	4	66,6	12	48
60 years or older	2	10,5	1	16,7	3	12

Total	19	100	6	100	25	100

Source: Research data, 2022.

Regarding the distribution of the prevalence of enteroparasites/enterocommensals by the users' place of residence who had positive results, 68% were residents of the urban area of the municipality. Statistically, no significant difference was observed between the variables (p=0.185), as shown in Table 5.

Table 5. Distribution of the prevalence of enteroparasites/enterocommensals by place of residence among users of the Clinical Analysis Laboratory of HHTA, Bonito de Santa Fé, from January to June 2022.

Category	**Result**						
	Positive		**Negative**		**Total**		***P***
Place of Residence	**n**	**%**	**N**	**%**	**N**	**%**	
Urban area	17	68	21	84	38	76	0.185
Rural area	8	32	4	16	12	24	
Total	25	100	25	100	50	100	

Source: Research data, 2022.
p = Chi-square test.

The majority of the tests were performed by individuals residing in the city center (62%). Table 6 shows the percentage of positive cases for enteroparasites/enterocommensals by neighborhood of residence, with Conjunto Barrosão having 100% of infected individuals.

Table 6. Prevalence of enteroparasites/enterocommensals by neighborhood of residence among users of the Clinical Analysis Laboratory of HHTA, Bonito de Santa Fé, from January to June 2022.

Category	**Result**					
	Positive		**Negative**		**Total**	
Neighborhood	**n**	**%**	**n**	**%**	**N**	**%**
Centro	16	51.6	15	48.4	31	62
Jardim das Neves	2	50	2	50	4	8
Distrito Viana	0	0	2	100	2	4
Conjunto CEHAP	0	0	1	100	1	2
Conjunto Barrosão	1	100	0	0	1	2
Alto Belo Horizonte	1	33.3	2	66.7	3	6

Antolândia	0	0	2	100	2	4
Rural area sites	5	83.3	1	16.7	6	12
Total	25	50	25	50	50	100

Source: Research data, 2022.

4. DISCUSSION

The prevalence results of enteroparasites/enteric commensals in studies that address different methodologies and specific population groups, such as various age groups, ethnic groups, distinct regions, disease carriers, among others, have shown variable data, both quantitatively and in the species diagnosed, which may hinder the comparative and more comprehensive analysis of the results found in different geopolitical regions of Brazil[13].

However, the current study used epidemiological variables and categories available in patient records, such as age, sex, area and neighborhood of residence, association of parasites, and diagnosed species. In the 50 stool exams analyzed, half were positive for at least one species of enteroparasite and/or enteric commensal. This prevalence rate is considered high, showing similarity to the results of another epidemiological study conducted in a laboratory at a hospital in Juru, a municipality also located in the backcountry of Paraíba, where 48.4% of the 2,326 exams performed were positive[14].

Similar prevalences were found in a district of Feira de Santana, Bahia, where 48.3% of the 2,304 samples analyzed were positive for at least one species[15]; in Aracaju, Sergipe, where 49.4% of 153,912 stool exam records were positive[13]; and in João Pessoa, Paraíba, where 50% of 40 results from the clinical analysis laboratory of the University Hospital were positive[16]. According to Busato et al.[17], variations in the prevalence of parasitic infections near or above 50% have been reported in the North and Northeast regions of Brazil. However, lower prevalence data were found in Cajazeiras, Paraíba (30% of 514 samples)[18]; and Araruna, Paraíba, where 35% of 100 samples analyzed were positive[19].

Higher prevalence rates were observed in Cáceres, Mato Grosso, one of the 100 poorest municipalities in the country, where 74.9% (n=137) of the 183 stool samples were positive for some type of parasite[20]; and in Pilar, Alagoas, which presented a positivity rate of 87.8% from the 181 coproparasitological samples[21].

According to Cardoso et al.[22], the high prevalence of enteroparasites and/or enteric commensals in the population may be related to several factors, such as the lack of basic sanitation, insufficient hygiene and housing conditions, which are generally present in

communities with low social and economic status. According to the latest census by the Brazilian Institute of Geography and Statistics (2010), the municipality of the study, Bonito de Santa Fé/PB, had more than half of its households with inadequate sewage systems (56.4%), and only 0.5% of urban households in public streets had the presence of gutters, sidewalks, pavement, and curbs. The Municipal Human Development Index (IDHM), the geometric mean of the three dimensions of income, longevity, and education, was 0.574 in 2010, classified in the low human development range, between 0.5 and 0.599[11].

Among the 25 positive samples analyzed, 76% were infected by a single parasite and 24% had infections with two or more species of protozoa, which is consistent with data from the municipality of Buriti dos Lopes, Piauí, which also showed 76% single-parasite infections (n=158) and 24% (n=51) mixed infections[23], as well as from the municipality of Santa Cruz, Rio Grande do Norte, where 24.5% of the 1,129 positive samples showed bi/polyparasitism. This association occurs because several species of enteroparasites and/or enteric commensals share similar transmission mechanisms, as well as due to greater exposure to poor sanitary conditions[3].

In the distribution of enteroparasites and/or enteric commensals observed in single-parasite individuals, *Giardia lamblia* had the highest prevalence, followed by *Entamoeba coli*. Regarding the mixed infections, all co-infections were by *Giardia lamblia* and *Entamoeba coli*. This association was also observed in a laboratory in Piau, where 7.6% (n=52) of samples were co-infected with these species[23].

Among the species found, *Giardia lamblia* was the most frequent in the general population (45.5%), which is consistent with the results observed in Jericó/PB, where this parasite was diagnosed in 45.6% of 283 positive cases[24]. The commensal species *Entamoeba coli* was the most frequent with 39.4% of the positive cases. Although it does not represent a direct health risk to the affected individual, it is one of the main markers of fecal-oral contamination, indicating failures in personal hygiene behavior, basic sanitation, and water and food treatment, since enteric commensals share similar transmission and infection mechanisms with some pathogenic species for humans[25].

Regarding the distribution of intestinal parasitism by sex, no statistical association with the positivity of the test results was observed. This result is consistent with the data from the municipality of Maria Helena, Paraná[26] and Pilar, Alagoas[21], where no statistical association was found between the positive cases and the sex of the individuals ($p>0.05$).

In this study, no helminths were found during the analyzed period. This predominance of protozoa was also observed in Cajazeiras/PB, where only one case of *Enterobius*

vermicularis was diagnosed among all the positive samples (n=154)[18]; in Patos/PB, where 94.7% (n=303) of the positive samples were protozoa and 5.3% (n=17) were helminths[27]; and in Pombal/PB, where the number of protozoan cases was 99%[28].

The high frequency of protozoa could be linked to low socioeconomic, environmental, and sanitary conditions in which the population lives, particularly due to the provision of poor-quality water, fecal contamination of water and food, and inadequate hygiene practices[18]. The growing process of urbanization, with the loss of natural land features, being replaced by extensive paved areas that hinder the survival of geohelminth larvae, reduced contact between unprotected body parts and contaminated soil, and easy access to effective and low-cost anthelmintics, are also factors that influence the number of helminth infections, significantly reducing their frequency compared to protozoa[29].

According to the National System of Information on Sanitation (SNIS)[30] and the Water and Sanitation Institute (IAS)[31], the municipality of Bonito de Santa Fé/PB in 2020 had 3,644 inhabitants without access to drinking water services (30.3%) and about 37.6% of the population had access to sanitation services, compared to the state average of 56.2% and the national average of 66%. According to the Sewage Atlas of the National Water Agency (ANA)[32], in 2013, the municipality had only 0.41% of its sewage properly managed through centralized collection and treatment systems or individual solutions. Of the rest, 63.3% was collected but not treated, and 36.3% was neither collected nor treated. As for urban solid waste management, 75.7% of the total population had access to household waste collection, with a difference between the urban (100%) and rural populations (22.8%)[30,31]. These data indicate poor sanitation conditions that could be the main causes of the high prevalence of parasitized individuals observed in this study.

Regarding the number of cases of enteroparasites and/or enteric commensals by age group, although individuals aged 20 to 59 years showed the highest frequency with 48% of positive cases, no statistically significant association was found (p=0.603). Analyses conducted in Santa Cruz/RN, where 43.9% of infected individuals were aged 20 to 59 years (p=0.066)[3], and in Maria Helena, Paraná, with 17.9% (n=69) of cases in individuals aged 0 to 9 years (p=0.529)[26], also showed no association between age group and coproparasitological test results.

In this study, the highest prevalence of *Giardia lamblia* and *Entamoeba coli* infections occurred in the 20 to 59-year age group. Children had 20% of the infections from *Giardia lamblia*, which is concerning from a clinical perspective, as it is associated with severe acute diarrhea and dehydration, which are leading causes of child mortality in children under 5

years of age, in addition to abdominal pain, nausea, vomiting, loss of appetite, and malnutrition, a characteristic not observed in adults[33].

There was only one case of *Iodamoeba butschlii* in the 20 to 59-year age group, similar to a reported case of this same parasite in the microregion of João Pessoa/PB, in the 18 to 59-year range (5%)[16]. It was not possible to statistically evaluate the association between age group and infecting species.
In the present study, it was not possible to evaluate statistically the association between cases of bi/polyparasitism and age group. Research in Santa Cruz, Rio Grande do Norte, evaluated this association and found no statistical relationship with age group ($p>0.05$)[3].

According to the users' place of residence, the majority of the tests were conducted by people living in the city center (62%). The neighborhood with the highest prevalence of infected individuals was Conjunto Barrosão, with 100% of the exams for this locality. No statistically significant difference was observed between the residential areas ($p=0.185$). Other studies conducted in municipalities in Paraíba showed that the majority of parasitized individuals lived in the urban area: in Araruna, the percentage was 53%[19]; in Jericó, it was 66.4%[34]; and in Marizópolis, it was 88.9%[35].

Although the majority of the infected individuals lived in urban areas, parasitic infections can be found in both urban and rural zones, and their proportion can vary depending on the environment and parasitic species. It is possible that individuals living in urban areas, with better sanitation and water supply services, are less affected compared to residents in rural areas where environmental conditions are more favorable for the proliferation of parasites[36].

Regarding the coproparasitological technique used at the Clinical Analysis Laboratory of HHTA, all stool samples were analyzed using the spontaneous sedimentation method, which is effective for heavy helminth eggs but can also identify protozoan cysts. This method, when used alone, can make it difficult to diagnose infection by species that can only be detected by techniques specific for light cysts and eggs, such as flotation or centrifugation, and for the diagnosis of larvae based on thermohydrotropism[37].

The simultaneous use of methodologies with different sensitivities can increase the efficiency and quality of the diagnosis and reduce false-negative results. It is recommended to use one general method, one specific for helminth larvae, and another for protozoa. However, in most cases, the use of more than one coproparasitological method becomes unfeasible due to the amount of stool that may be insufficient and the lack of adherence from governmental agencies due to the high cost of some techniques[38,39].

5. FINAL CONSIDERATIONS

The findings of this study showed that the prevalence of individuals infected with intestinal parasites among users of the Clinical Analysis Laboratory of HHTA was 50%. Among all recorded cases, the pathogenic species *Giardia lamblia*, the causative agent of giardiasis, and the commensal *Entamoeba coli*, a marker of fecal-oral contamination, demonstrated higher prevalence. The highest percentages were observed in females, in the age group of 20 to 59 years, and among residents of urban areas. Bi- and triparasitized individuals were found, and no helminth infections were detected.

The high prevalence of people infected with protozoa may be mainly related to the availability of poor-quality water, poor personal hygiene habits, contamination of food without proper sanitation, and inadequate basic sanitation conditions.

The use of only one coproparasitological technique for analyzing all fecal samples may have hindered the diagnosis of infection by some species that can only be detected by more selective techniques. Therefore, it would be important to perform more than one diagnostic method capable of detecting helminth species, complementing the technique used and thus increasing its sensitivity.

Given these results, it should be considered that the municipality needs to reduce the prevalence rates of these parasites through strategies that expand the diagnosis and treatment of infected individuals. This can be achieved by offering educational programs that raise awareness about the need for parasite prevention and sanitary education among the population, improvements in basic sanitation conditions, and public policies for urban and housing planning.

There is also a need for further studies that highlight the prevalence of enteroparasitosis and/or enteric commensals in the municipality of Bonito de Santa Fé. This would help establish parameters that can more accurately indicate the factors that contributed to the high prevalence found in this study, as well as guidelines for implementing measures that reduce exposure to these infections.

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