

STUDIES ON PARASITIC INFECTIONS AND INFESTATIONS IN CHILDREN

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Key words: *intestinal parasites, parasitic infections and infestations in children, seasonal variability*

INTRODUCTION

There are over 100 types of parasites and worms which can live inside the human body. Some are microscopic, while others are so large that they can easily be observed with the naked eye. These organisms may be encountered anywhere in our living environment, in the air that we breathe, in the water that we drink, in our food.

MATERIAL AND METHODS

In order to identify intestinal parasites, both a macroscopic examination of fecal matter and a routine stool test were conducted. From the stool sample, the following prepares were made available for microscopic examination:

- direct prepare in saline solution and Lugol solution;
- thick prepare (Kato-Miura Method);
- prepare after concentrating parasitic elements, the method of sedimentation in formalin-ether (Ritchie).

The investigation was conducted in 2015 on 547 children, in the summer and autumn seasons, at "Saint Pantelimon" Hospital from Focsani.

RESULTS AND DISCUSSIONS

In June-November 2015, at "Saint Pantelimon" Hospital from Focsani, in the Parasitology Laboratory, were investigated parasitologically 548 children and identified the following species of parasites located in the intestinal tract: *Giardia intestinalis*, *Hymenolepis nana*, *Ascaris lumbricoides*, *Enterobius vermicularis*. These species were identified during the entire experimental period (Table 1).

In the summer of 2015, in "Saint Pantelimon" Hospital from Focsani were investigated parasitologically 245 children, of whom 57 children were infected (23.2 %).

In June, for the children investigated were identified three species of intestinal parasites (*Giardia intestinalis*, *Hymenolepis nana* and *Enterobius vermicularis*). In the remaining two

months of the season, there were identified four species (in addition to the ones identified in June, there was *Ascaris lumbricoides*).

Table 1. Intestinal parasite species registered at "Saint Pantelimon" Hospital, Focsani in June-November 2015

Crt. No.	Month	Parasite species identified			
		G.i.	H.n.	A.l.	E.v.
1	June	+	+	-	+
2	July	+	+	+	+
3	August	+	+	+	+
4	September	+	+	+	+
5	October	+	+	+	+
6	November	+	+	-	+

Legend:
G.i. - *Giardia intestinalis*
H.n. - *Hymenolepis nana*
A.l. - *Ascaris lumbricoides*
E.v. - *Enterobius vermicularis*

The total percentages of infestation had an increase from the first month of the summer season until the last month. The highest percentage of infestation was recorded in August, when 27.6 % of the investigated children were found positive, followed by June (22 %) and July (21.2 %).

Distributed on parasite species, most children were found positive in tests for *Giardia intestinalis* (10.7 % of the children investigated in August were infected with *Giardia intestinalis*, 10 % in June, 7.5 % in July), followed by *Hymenolepis nana* (6.5 % of those investigated in August were infected with *Hymenolepis nana*, 5.7 % in July, 4.3 % in June), followed by *Ascaris lumbricoides* (6.5 % of those investigated in August were infected with *Ascaris lumbricoides*, 2.3 % in July, 0 % in June), and *Enterobius vermicularis* species (10.9 % of those investigated in August was infected with *Enterobius vermicularis*, 4.6 % in July 3% in June); (Table 2, Fig. 1).

In autumn 2015, at Saint Pantelimon Hospital of Focsani were submitted to parasitological investigation 302 children, of which 108 children were infected (35.9 %).

In November, the children investigated were positive for three species of intestinal parasites (*Giardia intestinalis*, *Hymenolepis nana* and *Enterobius vermicularis*). In the remaining two months of the season four species were identified (in addition to November, *Ascaris lumbricoides*). The total percentages of infestation had an oscillatory increase since October and decreased in the other months. The highest percentage of infestation was recorded in October, when 45.7 % of investigated children were found positive, followed by September (35.5 %) and November (20.5 %).

Distributed on parasite species, most children were found positive in tests for *Giardia intestinalis* (21.2% of the children investigated in October were infested with *Giardia intestinalis*, 14.5% in September, 6.8% in November), followed by *Hymenolepis nana* (9.9% of the children investigated in September were infested with *Hymenolepis nana*,

8.3% in October, 8.2% in November), followed by *Ascaris lumbricoides* (8.3% of the children investigated in October were infested with *Ascaris lumbricoides*, 5.5% in September, 0% in November) and *Enterobius vermicularis* (8.3% of the children investigated in October were infested with *Enterobius vermicularis*, 5.5% in September, 5.5% in November); (Table 3, Fig. 2)

In summer, the highest percentage of children investigated originated from rural areas in July (27.2% of the children investigated were from rural areas) and August (46.6%); (Table 4, Fig. 3).

In the autumn season, in October, the differences between the two living environments were significant (44.8% of the persons infested were from rural). In the other two months of this season were registred significant differences (Table 5, Fig.4).

Table 2. Degree of infestation with intestinal parasites in children investigated at "St Pantelimon" Hospital from Focsani, in the summer season of 2015

No. crt.	Month	Children investigated	Infested children					
			Total		Of whom ... (%) infested with:			
			no.	%	G.i.	H.n.	A.l.	E.v.
1	June	100	22	22	10	7	-	5
2	July	80	17	21.2	7.5	6.3	2.5	4.9
3	August	65	18	27.6	10.7	4.6	4.6	7.6

Legend: see Table 1.

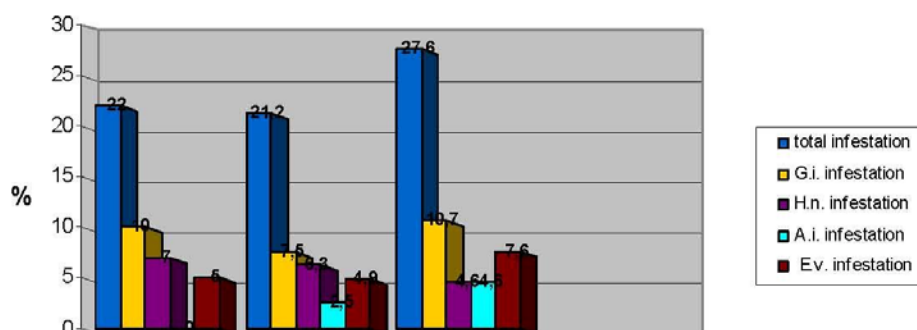


Figure 1. Degree of infestation with intestinal parasites in children investigated in the summer season of 2015

Table 3. Degree of infestation with intestinal parasites in children investigated in the autumn season of 2015

No. crt.	Month	Children investigated	Infested children					
			Total		Of whom ... (%) infested with			
			no.	%	G.i.	H.n.	A.l.	E.v.
1	September	110	39	35.5	14.5	9.9	5.5	5.5
2	October	120	55	45.7	21.2	8.3	8.3	8.3
3	November	73	15	20.5	6.8	8.2	-	5.5

Legend: see Table 1.

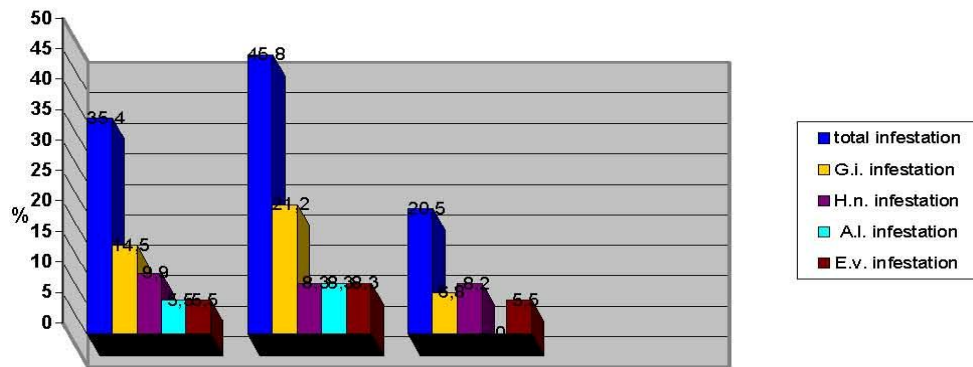


Figure 2. Degree of infestation with intestinal parasites in children investigated in the autumn season of 2015

Table 4. Degree of intestinal parasite infestation in the human population investigated in summer, according to their environment

Crt. No.	Month	Environment	Children investigated	Infested children					
				Total		Of whom ... (%) infested with			
				nr.	%	G.i.	H.n.	A.I.	E.v.
1	June	rural	56	12	21.4	10	7	-	5
		urban	44	10	22.7				
2	July	rural	55	15	27.2	7.5	6.3	2.5	4.9
		urban	25	2	8				
3	August	rural	30	14	46.6	10.7	4.6	4.6	7.6
		urban	35	4	11.4				
	Total	rural	141						
		urban	104						

Legend: see Table 1.

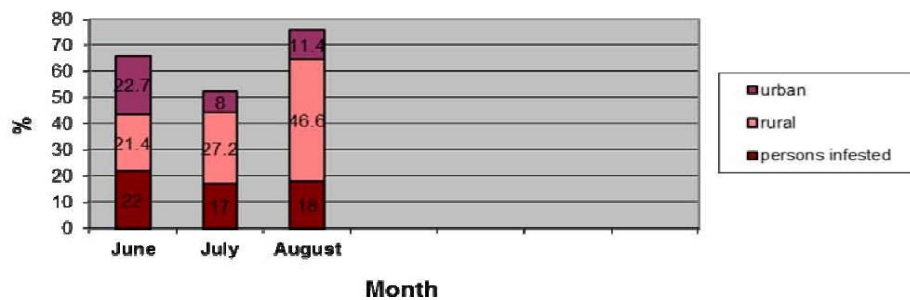


Figure 3. Degree of intestinal parasite infestation in the human population investigated in summer, according to their environment

Table 5. The degree of intestinal parasite infestation in the human population investigated in autumn, according to their environment

No. crt.	Month	Environment	Children investigated	Infested children					
				Total		Of whom ... (%) infested with			
				no.	%	G.i.	H.n.	A.I.	E.v.
1	September	rural	61	26	42.6	10	7	-	5
		urban	39	11	28.2				
2	October	rural	78	35	44.8	7.5	6.3	2.5	4.9
		urban	42	16	38				
3	November	rural	41	8	19.5	10.7	4.6	4.6	7.6
		urban	32	7	21.8				
	Total	rural	180						
		urban	113						

Legend: see Table 1.

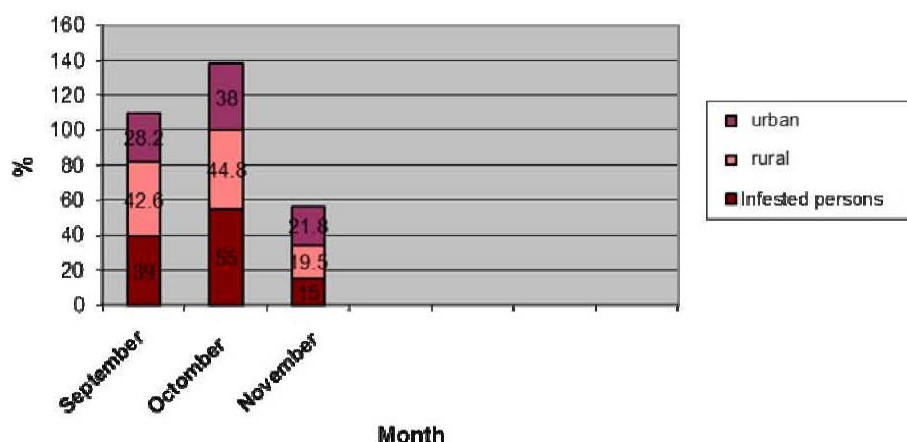


Figura 4. The degree of infestation in children investigated in autumn, according to living their environment

The data collected indicate that, on the whole, the children from rural area are more infested with intestinal parasites than children from towns (38.3% of the infested children were from rural areas, while the rest of 30% were from urban areas).

During the summer season, the highest percentage was registered in June for female patients (59.1% of the infested persons were female, 40.9% were male), in July (58.8% of the infested persons were female and 41.2% male) and August (59.1% of the infested persons were female and 40.9% male); (Table 6, Fig. 5).

In the autumn season, in August, the percentages are significantly higher than in the other two months (30% of the infested children were female and 45% were male). In the other two months, there were registered significant differences as follows: in June (17.3% of the infested children were female and 36% were male) and July (20% of the infested children were female and 22.2% were male) (Table 7, Fig. 6). In the autumn season, in October, the difference were higher than in the other two

months (44.6% of the infested persons were female and 47.2% were male).

In the other two months of this season, the differences registered were in September (36.6% of the children investigated were female and 42.2% were male) and November (41.6% of the children investigated were female and 2% were male). The data indicate that female children were more infested with parasites than male children.

In the summer season, the highest percentage was registered in June (60.1% of the infested persons were children) și July (21% of the infested persons were children) (Table 8., Fig. 7).

In the summer season, in August, the differences among the three age group are significant (48% of the infested children are children aged between 0 - 7 years, 12.5% are aged between 7 - 14 years and 23% of the infested children are teenagers whose age varies between 14-18 years).

During the two months of this season, the differences recorded are significant (Tab. 9, Fig. 8).

Table 6. Figura 4. The degree of infestation in children investigated in summer, depending on gender

Crt. No.	Month	Gender	Children investigated	Infested children					
				Total		Of whom ... (%) infested with			
				nr.	%	G.i.	H.n.	A.I.	E.v.
1	June	M	50	9	18	10	7	-	5
		F	75	13	17.3				
2	July	M	45	10	22.2	7.5	6.3	2.5	4.9
		F	35	7	20				
3	August	M	30	9	30	10.7	4.6	4.6	7.6
		F	45	9	20				
	Total	M	90						
		F	155						

Legend: see Table 1.

M- male

F- female

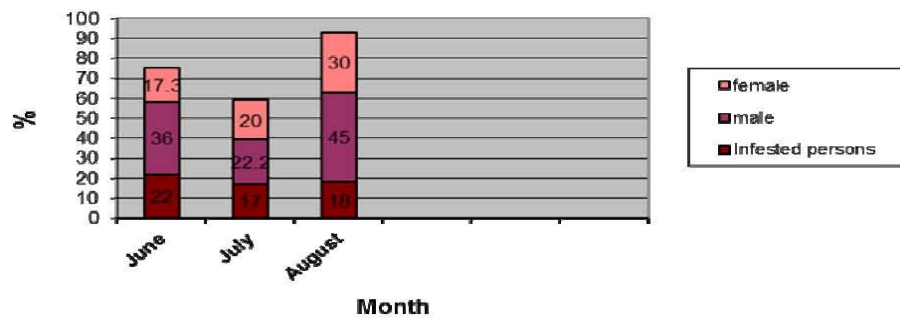


Figure 5. The degree of infestation of children investigated in summer, depending on gender

Table 7. The degree of infestation of children investigated in autumn, depending on gender

No. crt.	Month	Gender	Children investigated	Infested children					
				Total		Of whom ... (%) infested with			
				nr.	%	G.i.	H.n.	A.l.	E.v.
1	September	M	45	19	42.2	10	7	-	5
		F	55	20	36.3				
2	October	M	55	26	47.2	7.5	6.3	2.5	4.9
		F	65	29	44.6				
3	November	M	29	5	17.2	10.7	4.6	4.6	7.6
		F	24	10	41.6				
	Total	M	129						
		F	144						

Legend: see Table 1.; M- male; F- female

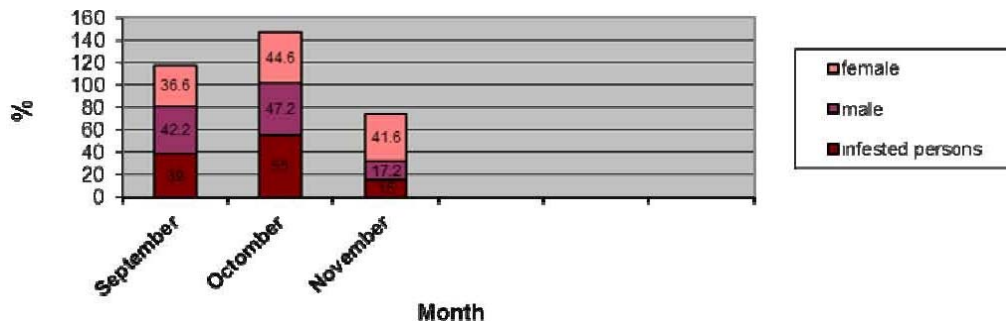


Figure 6. The degree of intestinal parasite infestation of children investigated in summer, depending on gender

Table 8. The degree of intestinal parasite infestation in the human population investigated in summer, according to their age

No. crt.	Month	Age	Children investigated	Infested children					
				Total		Of whom ... (%) infested with			
					nr.	%	G.i.	H.n.	A.l.
1	June	0-7 years	80	11	13.7	10	7	-	5
		7-14 years	35	4	11.4				
		14-18 years	10	2	20				
2	July	0-7 years	28	9	32.1	7.5	6.3	2.5	4.9
		7-14 years	19	2	10.5				
		14-18 years	9	1	11.1				
3	August	0-7 years	25	12	48	10.7	4.6	4.6	7.6
		7-14 years	8	1	12.5				
		14-18 years	13	3	23				
	Total	0-7 years	133						
		7-14 years	62						
		14-18 years	103						

Legend: see Table 1.

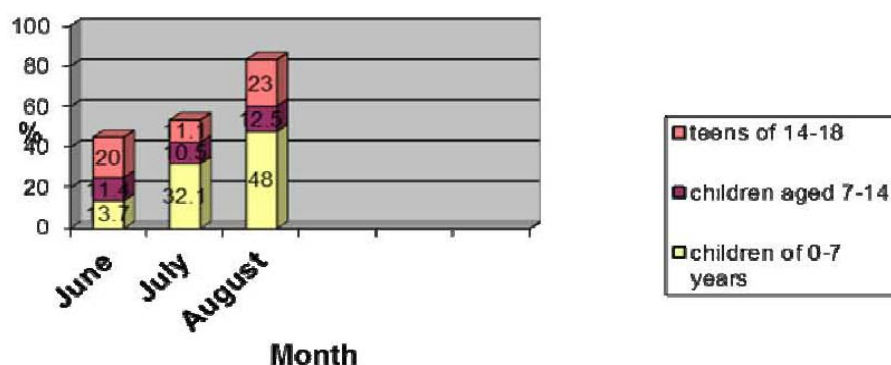


Figura 7. The degree of infestation in children investigated in summer, according to their age

Table 9. The degree of intestinal parasite infestation in children investigated in summer, according to their age

No crt	Month	Age	Children investigated	Infested children					
				Total		Of whom ... (%) infested with			
				nr	%	G.i.	H.n.	A.l.	E.v.
1	June	0-7 years	50	6	12	10	7	-	5
		7-14 years	14	3	21.4				
		14-18 years	70	1	1.4				
2	July	0-7 years	60	10	16.6	7.5	6.3	2.5	4.9
		7-14 years	21	5	23.8				
		14-18 years	31	7	22.5				
3	August	0-7 years	30	20	66.6	10.7	4.6	4.6	7.6
		7-14 years	13	6	7.6				
		14-18 years	25	4	16				
	Total	0-7 years	140						
		7-14 years	48						
		1-18 years	126						

Legend: see Table 1.

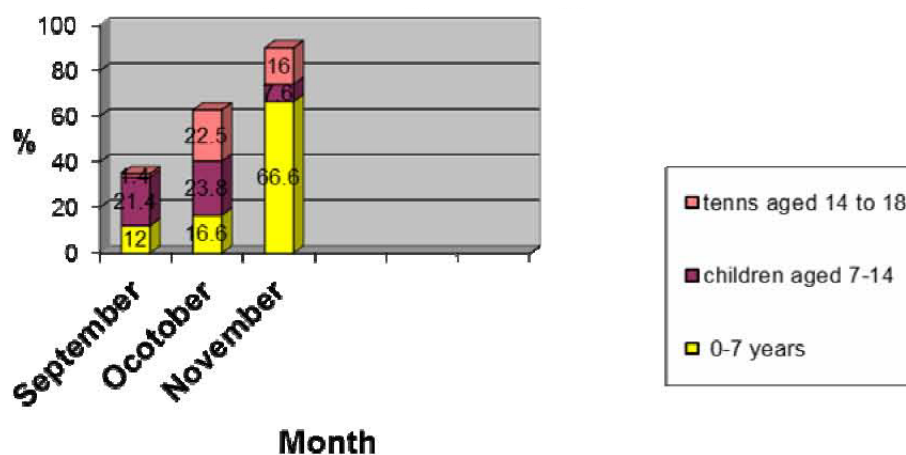


Fig. 8. The degree of intestinal parasite infestation in children investigated in autumn, according to their age

CONCLUSIONS

The studies on parasites located in the intestinal tract of children were conducted at "St Pantelimon" Hospital from Focsani in the summer

and autumn of 2015. 545 children were investigated and 4 parasite species were identified as follows: *Giardia intestinalis*, *Hymenolepis nana*, *Ascaris lumbricoides* and *Enterobius vermicularis*.

In the summer season were submitted to parasitological investigation 245 children and the following species were identified: *Giardia intestinalis*, *Hymenolepis nana*, *Ascaris lumbricoides*, *Enterobius vermicularis*. The total percentage of infestation with intestinal parasites ranged from 21.2%, in July, 22% in June and 27.6% August. Most persons were infested with *Giardia intestinalis*.

In the summer season, 303 children were investigated parasitologically and the following species were identified: *Giardia intestinalis*, *Hymenolepis nana*, *Ascaris lumbricoides* și *Enterobius vermicularis*. The total percentage of infestation with intestinal parasites registered an oscillating growth similar to the opne in summer, the highest percntag being registered in October (45.8%), in September (35.4%) and November (20.5%).

Depending on the living environment, most children found positive belonged to rural areas. Some hygiene rules may have not been respected.

In terms of gender, the total percentages were higher in female versus male patients. Although there is this difference, we do not consider that female children are more vulnerable to parasitic diseases compared to male children.

As far as age is concerned, the total percentages were higher in children aged 0-7 years compared to children represented by teens of 14 -18 years. The total percentage of infestation of children aged 7-14 years is higher than that of children aged 14-18 years. These differences explain the way of playing with and observance of personal hygiene criteria.

ABSTRACT

This paper presents a study on localized intestinal parasites in children. Parasitological investigation was conducted at the Hospital "Saint Pantelimon" Focsani in summer and autumn of 2015. Were investigated 545 children (245 in summer and 303 in autumn). The total percentage of infection with intestinal parasites in summer ranged from 21.2% in July, 22% in June and 27.6% in August.

In autumn, the total percentage of infection with intestinal parasites had increased oscillating, the highest percentage was registered in October (45.8%) in September 35.4% and in November 20.5%.

These parasitic species were identified: *Giardia intestinalis*, *Hymenolepis nana*, *Ascaris lumbricoides* and *Enterobius vermicularis*.

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