Journal of American Science

Websites:
http://www.jofamericanscience.org
http://www.sciencepub.net

Emails:
editor@sciencepub.net
sciencepub@gmail.com

MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Prevalence of parasitic infestation in school aged Children in El Arish city

Prof. Hosny Mohammed Ahmed El-Masry, Dr. Mohammed Ahmed Ali Taha, Eslam Abdallah Farag Qourah.

Pediatric Department, Faculty of Medicine. AL-Azhar University (Assiut), Egypt
eslamqouarh@gmail.com

Abstract: Intestinal parasitic infections (IPI) constitute a global health burden. They have been linked with poorer nutritional outcomes, including an increased risk for nutritional anemia, protein-energy malnutrition (PEM), and growth deficits in children. Prevalence of these parasites varies from one country to another. Preschool age children are one of the groups at high-risk for intestinal parasitic infections. So, the aim of this work was to determine the prevelance of parasitic infestations in school aged children in El Arish city and also to asses the risk factors and etiologies of parasitic infestations. This study was carried out on 1000 school aged children (primary and preparatory) in El-Arich City; their ages between 6-15 years during the period from 1st April to 30th September 2017. Data were collected via personal interview with the students after taking permission from the headmasters of the selected schools and consents from their parents or guardians. In the current study, we found that the highest percentage infested children was among age group 9 < 12 years. So age is an important risk factor for intestinal parasitic infestations and school children have been reported to be at highest risk for intestinal parasitic infestations. In this study, it was found an increasing association between age and intestinal parasitic infestations within the age group of 9- < 12 years (34.62%), then in age 6- < 9 years (30.94%), the percentage of non-infected students was higher among older ages from 12 to 15yrs. Regards to Enterobius vermicularis infection among the young children (6 -9 years old), the study revealed that these children were more exposed to infection due to their ignorance with the hygienic habits which protect them from autoinfection and external infection such as eating contaminated food outside their homes, playing with dust or contaminated materials as doors of W.C's, no mass treatment for all infected children and no regular stool analysis after treatmentas. Finally we found that the commonest symptom is abdominal colic among the studied school children which represented (54.5%) while pallor of conjunctiva and oral mucous membrane were the commonest signs (55%) and all cases of Enter obiusvermicularis had pruritis ani.
[Hosny Mohammed Ahmed El-Masry, Mohammed Ahmed Ali Taha, Eslam Abdallah Farag Qourah. **Prevalence of parasitic infestation in school aged Children in El Arish city.** *J Am Sci* 2020;16(3):71-80]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). http://www.jofamericanscience.org. 9. doi:10.7537/marsjas160320.09.

Keywords: Prevalence; parasitic; infestation; school; age; Children; El Arish city

1. Introduction

Intestinal parasitic infections (IPI) constitute a global health burden. They have been linked with poorer nutritional outcomes, including an increased risk for nutritional anemia, protein-energy malnutrition (PEM), and growth deficits in children. Prevalence of these parasites varies from one country to another. Preschool age children are one of the groups at high-risk for intestinal parasitic infections. The adverse effects of intestinal parasites among children are diverse and alarming. Intestinal parasitic infections have detrimental effects on the survival, appetite, growth and physical fitness and cognitive performance of children **(Ibrahium, 2011).**

Several studies have reported the association of intestinal parasitic infections with other sets of risk factors. In particular, risk factors for soil transmitted helminthes infections related to host specific and environmental factors, were reviewed. Many risk factors associated with heavy intestinal parasitic infections were found–genetics, behavior, household clustering and occupation, poverty, poor sanitation and lack of clean water, climate and season and health education and sanitation in the control of helminthes infections. **(Prasert, 2008)**

The problems to be overcome in achieving adequate control of helminthiasis are formidable and it probably must be accepted that eradication of infection is an unrealistic goal in most parts of the tropical world in the future., However, it has been clearly demonstrated that partial control is currently practicable within non-industrialized communities resulting in a reduction both in prevalence and in individual worm burden. Such partial control is likely to have very important beneficial implications in terms of the children's growth, and of the overall physical, mental, and economic health of the community **(Stephenson, 2000).**

Aim of the work

To determine the prevelance of parasitic infestations in school aged children in El Arish city and also to asses the risk factors and etiologies of parasitic infestations.

2. Patients and methods

This study was carried out on 1000 school aged children (primary and preparatory) in El-Arich City; their ages between 6-15 years during the period from 1st April to 30th September 2017.

Data were collected via personal interview with the students after taking permission from the headmasters of the selected schools and consents from their parents or guardians, and the cases were subjected to:

a- Some clinical examination:

The children were examined in a good light in the health unit of the selected schools to elicit some important clinical finding which may reveal specific signs suggesting aneamia as: pallor of the Skin, lips and eyelids or dry, brittle, flat and spoon shape nails.

b- Some anthropometric measurements as:

1- Weight (in kg).

Weight was measured by portable beam scale. The scale was set on a hard, flat and uncarpeted surface. The scale was calibrated at the beginning of each working day and after each weight. The child was in light clothes without shoes, stood straight, calm on the scale, hands close to the trunk. The reading of the weight was obtained in kilogram unit to the nearest 0.1 kg and written down in a previously prepared list **(Gibson, 2005).**

2- Height (in cm.):

Height was measured by stadiometer. The stadiometer was set on a hard, flat and uncarpeted surface. The child stood without shoes, straight, calm, with his back against the scaled board of the stadiometer, the buttocks, the back, the occiput should be touching the stadiometer with the childs eyes facing forward, knees kept unbent, arms close to the trunk and heels together. A special piece of stadiometer was desended on the highest point of the head without pressure. The reading of the height was obtained in centimeter unit, to the nearest 0.1 cm and written down in a previously prepared list **(Cameron and Hovander, 1983).**

3- Body mass index (BMI):

BMI = weight in kg/ (height in meters)²

BMI cut off point among the studied children was classified according to **(Theodore and Elena, 2000):**

Under weight:	<15.88kg/m²
Average weight:	15.88kg/ m²-17.9kg/m²
Over weight:	18-21kg/m²
Obesity:	> 21kg/m²

c- Investigations:

An informational document about the study, and how to supply a stool specimen in special labeled container and a cellulose tape slide, was given to each participant student.

Stool analysis:

Mothers were asked to perform one cellulose tape test on her young child who was participating in the study. Laboratory slides were provided with cellulose tape attached to them. Older student was asked to collect material for examination by himself in the early morning prior to bathing or defecation.

The stool specimens (0.5–1.5 gr) were collected in labeled plastic vials without preservatives and transported to the laboratory within four hours after collection. They were examined for the presence of parasites by direct wet mount, Lugol's iodine solution and modified formaline - ethyl acetate sedimentation techniques **(Pinar et al 2004)**.

The presence of parasites was confirmed when proved by any of the above methods.

Statistical analysis

Data were entered checked and analyzed using Epi-Info version 6 and SPP for Windows version 8 **(Dean, 2006)**.

Data were summarized using:

3. Results

The table 1 shows that frequent age group is 12-14 yrs (34.8%). About two thirds of the studied school children are within the Middle SES (65.2%). However more than one half of them are underweight (55.8%).

Table (1): Socio-demographic characteristics of the studied school children at El-Arish City (no = 1000).

Variable	Frequency	Percent %
1) Age (years):		
- Mean ± SD		
(10.9 yrs ± 2.9(		
- Range (6-15years)		
- Age groups:		
• 6 -	236	23.6
• 9 -	293	29.3
• 12 -	348	34.8

Variable	Frequency	Percent %
• 15 -	123	12.3
2) Sex:		
Boys	513	51.3
Girls	487	48.7
3) Child education		
- Primary	648	64.8
- Preparatory	352	35.2
4) Socioeconomic status (SES):		
- Low	33	3.3
- Middle	652	65.2
- High	315	31.5
5) Order in family:		
- 1st	143	14.3
- 2nd	502	50.2
- 3rd	313	31.3
- ≥4th	42	4.2
6) BMI:		
- Under weight	558	55.8
- Average weight	196	19.6
-Over weight	163	16.3
-Obesity	83	8.3

N.B: 75 students refused to Participate in the study so they were excluded from the analysis.

Table (2): Prevalence of parasitic infestations among the studied school children at El-Arish City (no = 1000).

Parasitic infestations	frequency	Percent %
Non infected	457	45.7
Infected	543	54.3
Total	1000	100.0

This table demonstrates that, the prevalence of parasitic infestations among the studied school children constitutes 54.3%.

Table (3): Frequency distribution according to the number of parasitic infestations among the studied school children at El-Arish City (no = 1000).

Number of parasitic infestation	Frequency	Percent %
No parasite	457	45.7
One parasite	497	49.7
Two parasite	46	4.6
Total	1000	100

The above table shows that about half of the studied school children have one parasite infestation (49.7%).

Table (4): Frequency distribution of parasitic infestations among the studied school children at El-Arish City (no = 1000).

Identified Parasites	Frequency	Percent %
Entrobius vermicularis	199	19.9
Giardia lamblia	47	4.7
Entameoba histolytica	117	11.7
Ascaris lumbriciods	57	5.7
Ankylostoma duodenal	34	3.4
H. nana	89	8.9
Total	543	54.3

N.B: 47 of total cases had mixed infections.

This table shows that Entrobius v., Entameoba Hist., and H nana are the commonest parasitic infestation among the studied school children (20.8%, 12.6%, and 9.8% respectively).

Table (5): Frequency distribution of parasitic infestation among the studied school children at El-Arish City according to age group (no = 1000).

Age group In years	Parasitic infestation		Test of significance and p-value
	Non-infected No %	Infected No %	
6-(no=237)	69 15.1	168 30.94	Z test=21.1, P=0.0000
9- (no=293)	105 22.98	188 34.62	Z test=9.2, P=0.001
12-(no=350)	192 42.01	158 29.1	Z test=10.2, P=0.0014
15-(no=120)	91 19.91	29 5.34	Z test=32.3, P= 0.0000
Total	457 100	543 100	

This table shows that there is high statistical significant differences between infested and non infested school children at all age groups. It also reveals that the highest percentage of infested children is among age group 9- < 12 years (34.62%), followed by age 6- < 9 years (30.94%), respectively.

Table (6): Distribution of parasitic infestations among the studied school children at El-Arish City according to sex (no = 1000).

Sex	Parasitic infestation				Total
	Non infested No	%	Infested No	%	
Boys	205	44.86	308	56.72	513
Girls	252	55.14	235	43.28	487
Total	457	100	543	100	1000

$X^2 = 8.37$ P= 0.004

This table shows that the highest percentage of infestation is among boys (56.72%) with high statistical significant difference.

Table (7): Frequency distribution of parasitic infestations among the studied school children at El-Arish City according to child's education grade (n = 1000).

Child's education	Non infested No	%	Infested No	%	Total	X^2 & p value
primary	203	44.42	445	81.95	648	$X^2 = 91.2$
preparatory	254	55.58	98	18.05	352	p = 0.000
Total	457	100	543	100	1000	

This table shows that primary school children are more infected than preparatory ones (81.95% vs 18.05% respectively) with high statistical significant difference.

Table (8): Frequency distribution of socio-economic status and parasitic infestation among the studied school children at El-Arish City (n = 1000).

SES	Parasitic infestation				Test of significance X^2	p-value
	Non infested No	%	Infested No	%		
High	57	12.5	258	47.5	94.3	0.000
Middle	392	85.78	260	47.88		
Low	8	1.75	25	4.6		
Total	457	100	543	100		

This table shows that children with high SES are least infested (4.6%) than others.

Table (9): Frequency distribution of parasitic infestations among the studied school children at El-Arish City according to Environmental factors (n = 1000).

Environmental factors	Non infested No	%	Infested No	%	Test of significance and p value
Type of bath room:					
- modern	262	57.33	505	93	X^2=105.7
- ordinary	195	42.67	38	7	P=0.000
Water source:					
-pipe	162	35.45	406	74.77	X^2=94.4
-under ground	295	64.55	137	25.23	P=0.000
Shared bed:					
Yes	145	31.73	302	55.62	X^2=8.3
No	312	68.27	241	44.38	P=0.003
Type of floor:					
-dusty	90	19.69	100	18.42	X=0.16
-not dusty	367	80.31	443	81.58	P=0.686
Total	**457**	**100**	**543**	**100**	

The table reveals that, there are statistical significance association between house environmental factors regarding the type of bath room, water source and shared bed and parasitic infestation among the studied school children (p <0.05).

Table (10): Relation between some habits and parasitic infestation among the studied school children at El-Arish City (n = 1000)

Habits	Non infested No	%	infested no	%	Test of significance and p value
Eating outdoor:					
- yes	111	24.29	502	92.45	X^2=289.2
- no	346	75.71	41	7.55	P=0.000
Washing vegetable and fruits before use:					
- yes	405	88.62	63	11.6	X^2=248.7
-no	52	11.38	480	88.4	P=0.000
Washing anus after defecation:					
- yes	328	71.77	40	7.37	X^2=266.5
-no	129	28.23	503	92.63	P= 0.000
Washing hands before eating:					
- yes	282	61.71	26	4.79	X^2=228
-no	175	38.29	517	95.21	P=0.000
Washing hands by water and soap:					
- yes	378	82.71	92	16.94	X^2=260
-no	79	17.29	451	83.06	P=0.000
Biting nails:					
- yes	25	5.47	162	29.83	X^2=61
-no	432	94.53	381	70.17	P=0.000
Playing in dust:					
- yes	10	2.19	368	67.77	X^2=108.8
-no	447	97.81	175	32.23	P=0.000
Walking bare foot:					
- yes	130	28.45	461	84.9	X^2=206
-no	327	71.55	82	15.1	P=0.000
Total	**457**	**100**	**543**	**100**	

This table shows that there are statistical association between parasitic infestation and some habits, and the frequent habits are not washing hands with water and soap, eating outdoor, walking bared foot and playing in dust.

Table (11): Frequency distribution of parasitic infestations among the studied school children at El-Arish City according to past history

Past history	Yes Freq	%	No Freq	%	Total
• Previous stool analysis	147	14.7	853	85.3	1000
• Previously diagnosed parasitic infestation	118	11.8	882	88.2	1000
• Knowing the type of infested parasite	53	5.3	947	94.7	1000
• Previous anti-helminthes ttt	118	11.8	882	88.2	1000
• Complete the course of ttt	137	13.7	863	86.3	1000
• All the family took anti-helminthes drugs	108	10.8	892	89.2	1000
• If repeated stool analysis after completing the course of ttt	35	3.5	965	96.5	1000

The above table shows that only 14.7% of the studied school children had done previous stool analysis with 11.8% previously diagnosed positive parasitic infestations and previous history of anti-helminthic treatment. On the other hand, there is only 3.5% of them had done repeated stool analysis.

Table (13): Distribution of parasitic infestations among the studied school children at El-Arish City according to Body mass index (n = 1000).

BMI	Parasitic infestations				Test of significance and p value
	Non- infested		Infested		
	No	%	No	%	
Under weight (<15.88kg/m^2)	115	25.16	443	81.58	Z test=148.6 P=0.000
Average weight (15.88-17.9 kg/m^2)	131	28.67	65	11.98	Z test=10.7 P=0.001
Over weight (18-21 kg/m^2)	141	30.85	22	4.05	Z test=78 P=0.000
Obesity (>21 kg/m^2)	70	15.32	13	2.39	Z test=31.1 P=0.000
Total	**457**	**100**	**543**	**100**	

This table shows that 81.58% of infested children are under weight.

Table (13): Frequency distribution of knowledge among the studied school children at El-Arish City about mode of transmission of parasitic infestation (n = 1000).

Variables	frequency	Percent
Contaminated hands:		
-yes	915	91.5
-no	85	8.5
Feco oral:		
-yes	853	85.3
-no	147	14.7
By flies:		
-yes	702	70.2
-no	298	29.8
Stool contamination:		
-yes	657	65.7
-no	343	34.3
Contaminated clothes:		
-yes	170	17.0
-no	830	83.0
Touching:		
-yes	150	15.0
-no	850	85.0

This table shows that the highest percent of knowledge among the studied school children about mode of transmission of parasitic infestation are about contaminated hands, feco-oral, by flies and stool contamination respectively.

Table (14): Frequency distribution of symptoms and signs of parasitic infestation among the studied school children at El-Arish City (n = 1000).

Symptoms and signs	Frequency	Percent
I-Symptoms:		
1-Abdominal colic	545	54.5
2- loss of appetite	543	54.3
3- Weight loss	538	53.8
4- Vomiting and nausea	512	51.2
5- Dysentries	467	46.7
6-Sleep disturbance	312	31.2
7-Salivation during sleep	245	24.5
8- Pruritis ani	232	23.2
II-Signs:		
1- Pallor symptom	550	55.0
2- Inner lips	533	53.3
3- Nail symptoms	472	47.2
4-White patches	373	37.3
5- Angular stomatitis	112	11.2
6- Angular blepheritis	10	1.0

The previous table shows that loss of appetite and abdominal colic are the highest frequent symptoms among children, however brittle nail is the highest frequent sign among them.

4. Discussion

The prevalence of intestinal parasitic infestations among primary and preparatory schoolchildren at El-Arish City has been estimated in the current study. The numbers of parasitologically infected cases were found to be (543) cases which constitute (54.3%) of the total cases **(table 2)**.

Such findings were higher than that presented by **El-Masry et al. (2007)** who found parasitic infestation among school children at Sohag Governorate were (38.5%). **Tadros (1997)** agreed with the study results as he found that the parasitic infestations among school children at Giza were 50.4%. His study was also attributed to similar environmental and habitual factors as these areas in Lower Egypt. These findings are in accordance with the studies done in other parts of the world as well as in rural area of Eshawar in the Islamic Republic of Pakistan as Out of 200 children examined, 132 (66%) were found positive for various intestinal helminthes infestation**. (Ikram et al., 2009)**

Another study of intestinal helminthiasis among school pupils was taken in three primary schools in Ilie in Olorunda Local Government Area of Osun state in order to determine the prevalence of helminthic infections where the prevalence rate was (52.0%). (**Adefioye et al., 2011)**

The present study revealed that the intestinal parasites namely Giardia lamblia, Ascaris lumbricoides, Hymenolepis nana, Enterobius vermicularis, Ankylostoma duodenale, Entameoba histolytica were the commonest parasites identified from the examined stool samples.

Coinfection with two parasites were seen in our study which represents about (4.6%) and about half of the studied school children has one intestinal parasite infestation (49.7%) as in **table (3)**.

The present study identified the commonest parasites infestation among the studied school children were Enterobius vermicularis (20.8%), Entameoba histolytica (12.6%), Hymenolepis nana (9.8%), Ascaris lumbricoides (6.6%), Giardia lamblia (5.6%) and Ankylostoma duodenale (4.5%) **table (4)**.

In Egypt, the incidence of parasitic infections among school children was studied by many investigators. **El-Masry et al., 2007** reported that Entameoba histolytica (20.4%), Enterobius vermicularis (16.6%) and Giardia lamblia (15.2%). **Awwad et al., (1984)** reported that the prevalence of intestinal parasites in Bani- Shebl village, near Zagazig were Giardia intestinalis (18.2 percent), Entamoeba histolytica (14.5 percent), Schistosoma mansoni (1.1 per cent), Ascaris (27 percent) and Enterobius vermicularis (15.7 per cent) Hymenolepis nana (6 percent). These variations in the incidences of infection with different parasites may be possibly due to the different methods used for laboratory investigations of the examined cases, variation in the examined samples and the different personal hygienic standards of the examined cases and different time of studies.

High prevalence of Enterobius vermicularisin the current study might be due to improper hygiene including not washing hands with soap after defecation, before eating, autoinfection and the

highly infectious nature of this parasite. And about 55.6% of infested children using shared bed during sleeping as shown in **table (9)**.

In the current study we found that the highest percentage infested children was among age group 9 < 12 years. So age is an important risk factor for intestinal parasitic infestations and school children have been reported to be at highest risk for intestinal parasitic infestations. In this study, it was found an increasing association between age and Intestinal Parasitic infestations within the age group of 9- < 12 years (34.62%), then in age 6- < 9 years (30.94%), the percentage of non-infected students was higher among older ages from 12 to 15yrs **table (5)**. A similar findings were obtained by **Hafez et al. (1979) and El-Masry et al. (2007)**.

Regards to Enterobius vermicularis infection among the young children (6 -9 years old), the study revealed that these children were more exposed to infection due to their ignorance with the hygienic habits which protect them from autoinfection and external infection such as eating contaminated food outside their homes, playing with dust or contaminated materials as doors of water cycles, no mass treatment for all infected children and no regular stool analysis after treatment as proved in **tables (9 and 10)**.

Regarding to the parasitic infection in relation with the sex, the current study revealed that males were more susceptible to infection than females as in **table (12)**. The difference of prevalence between males and females could be attributed to increasing the activities of males outside doors more than females. These findings coincides also with the findings reported by **Riffat and Nagaty (1958); El-Mahroky (1979) and El-Masry et al. (2007)**.

In this study, we found that primary school children were more infected than preparatory which was proved by increasing infections in age 9 < 12 years (34.62%) as in **table (7).**

Middle and lower socioeconomic status was factor for intestinal parasitic infestations. The effect of low and middle socioeconomic status on risk of infectious diseases in general, and parasitic infections in particular is complex in nature and could be attributed to several other factors such as lack of access to clean water, poor hygienic environment in houses, lack of access to education due to financial constraints and overcrowded conditions. So we found that children with high SES are the least infected (4.6%) than others **table (8).**

It was found also that there are statistical association between parasitic infestation & some habits especially eating outdoor (92.45%), walking bared foot (84.9%) and not washing hands with water & soap (83.06%) **table (16)**. There was improper cleaning practices after defecation which may be the probable causes behind autoinfection. Toilet paper usage was not commonly used possibly due to low income.

The above findings show that some bad hygienic habits play a significant role in the spread of intestinal helminthes among school children and those findings were similar to that obtained by **(El-Masry et al., 2007)**. Only (14.7%) of the studied school children had done previous stool analysis and (11.8%) previously diagnosed as positive for parasitic infestations and previous history of anti-helminthic treatment. On the other hand, there is only (3.5%) of them had done repeated stool analysis **table (11)**. So, there is significant association between Intestinal Parasitic infestations and regular stool analysis which play an important role in early diagnosis. And this is a role of family physician by making health education about stool analysis for children and repeat stool analysis after treatment.

It was revealed that 81.58% of infected children are under weight **(table12).** So there was an association between the anthropometric indices and intestinal parasitic infestations. Malnutrition contributes to a low IQ level, stunted physical and mental wellbeing of these children as has been demonstrated by a survey by (**Huong et al., 2007**) which showed considerable difference in IQ level of infected and non-infected children. It is an established fact that intestinal parasitic infestations contribute significantly to poor growth and malnutrition in children.

The rate of weight gain in children treated from worm infestation was 8% greater than untreated children. Studies using height, weight or haemoglobin concentrations as indices to assess the nutritional status of infected children before and after treatment showed significant improvement in the nutritional status of the treated children **(Huong et al., 2007**). Ankylostoma duodenale infestation in children causes growth retardation and anemia while heavy infestation with both Ankylostoma duodenale and whipworm causes protein energy malnutrition **(Ikram et al., 2009).** The connection between worm burden and malnutrition is further supported by studies indicating that deworming programs lead to sharp increases in growth; the presence of this result even in older children has led some scholars to conclude that “it may be easier to reverse stunting in older children than was previously believed Other", less clearly causal studies also show a strong correlation between worm burden and malnourishment among school-age children **(Walson et al., 2009).**

Helminthes affect nutrition by inducing iron-deficiency anemia. This is most severe in heavy hookworm infections, as Ankylostoma Duodenale which feed directly on the blood of their host.

A similar result was found in the central region of Turkey where the prevalence of intestinal parasites was higher in the rural area **(Ulukanligil and Seyrek 2004)** and another study conducted by **(Huong et al., 2007**) showed that higher relation between intestinal parasite infection and Anemia in school children in rural Vietnam.

From the presents study we found that the highest percent of knowledge among the studied school children about mode of transmission of parasitic infestation are: by contaminated hands (91.5 %), by feco-oral (85.3%), by flies (70.2%) & and by stool contamination (65.7%) **(table 14).** But prevalence of parasitic infections between them due to their ignorance about important of regular stool analysis and change in their attitudes and use of improper water. This calls for the institution of control measures including treatment of infected individuals, improvement of sanitation and provision of clean water. The impact of each measure would be maximized through a health education program directed to schoolchildren in particular, and to communities in general as reported by **Mengistu and Berhanu (2004)**.

Finally we found that the commonest symptom is abdominal colic among the studied school children which represented (54.5%) while pallor of conjunctiva and oral mucous membrane were the commonest signs (55%) (table 21) and all cases of Enter obiusvermicularis had pruritisani. The previous symptoms and sings may be attributed to manifestations of aneamia that induced by parasitic infestations. In more serious infections, skin-itching, fever, nausea, vomiting, or bloody stools may occur. And some parasites travel from the lungs to the intestine or from the intestine to the lungs and other parts of the body. Many other conditions can result in these symptoms, so laboratory tests are necessary to determine their cause. In children, irritability and restlessness are commonly reported by parents as reported by **(Loukopoulos et al., 2007).**

Conclusion

The present study revealed that the prevalence of intestinal parasitic infestations among the studied primary and preparatory school children during the academic year 2017 at El-Arish City was more than 54%.

It was found that Enterobius vermicularis, Entameoba histolytica, Hymenolepis nana, Ascaris lumbricoides, Giardia lamblia, Ankylostoma duodenale were the commonest intestinal parasitic infestations among the studied school children. Parasitic infestations were statistically significantly higher among boys, primary school students, middle and low SES students.

Children who do not wash hands before meals, eating out doors, not washing anus after defecation, walking bare foot and bitting nails were the most frequent and statistically significant associated habits among the studied school children.

The highest percent of knowledge among the studied school children about mode of transmission of parasitic infestations were by contaminated hands, feco-oral, by flies contamination respectively.

Loss of appetite and abdominal colic were the most frequent symptoms, however brittle nails was the frequent sign among the studied school children.

Recommendations

From the present study the researcher recommends health education programs of prevention and control of intestinal parasitic infestations among school children which must be provided to school children and their parent's. This is achieved by:

A- Family physician role:

1. Health education of school children and their parents about problems associated with intestinal parasitic infestations and how to prevent it.
2. Health education providing the following messages will reduce the number of infected school children:
   i. avoid contact with soil that may be contaminated with human faeces.
   ii. wash hands with soap and water before handling food.
   iii. wash, peel or cook all raw vegetables and fruits.
   iv. protect food from soil and wash or reheat any food that falls on the floor.
3. Early diagnosis of parasitic infections among school children.
4. Free Comprehensive treatment of cases.
5. Regular screening and treatment of cases.
6. Make sure that treatment is given regularly and sustained.

B- Teacher role:

1. Education of children in schools about nutrition.
2. Increase the school children awareness of health problems associated with intestinal parasitic infestations, sound health about eating habits & hygienic practices.

3. Provide information and individual solutions that can help motivate changes in attitudes and behavior of school children.

C- Parents role:

1- Improving personal and environmental hygiene for their children.

2- Encourage their children to frequent hand washing, use of clean utensils, and measures to prevent cross - contamination during food processing.

3- Encourage their children to get good health by making changes in their eating habits & hygienic practices.

4- Separation between their children during sleeping during infection by intestinal parasites.

D- The government role through family health units and health insurance of schools:

1- Make deworming an integral component of a school health program.

2- Combine deworming with iron and other micronutrient supplements.

3- Ensure that teachers and health agencies work in co operation.

4- Help teachers understand the benefits of deworming, so that they are supportive.

5- Protect children throughout their development by starting treatment early and continuing treatment throughout primary school.

6- Reach out health services to non - enrolled school aged children.

7- Serve healthy food to children at schools.

8- Ensure sanitation facilities in all schools and use of safe and adequate water supply.

9- follow up & maintain a healthy behavior.

E- Further studies:

Finally, we recommend further studies for evaluation of magnitude of intestinal parasitic infestations among school children in different places especially in rural areas in Egypt and interventional studies to prevent these parasitic infestations.

References

1. Cameron M and Hovander. Manual on feeding infants and young children 3rd ed. p.3, Oxford University Press, New York. And manual of anthropometric measures, 1983.
2. Dean F (2006): Statistical methods in scientific researches. European Journal of Scientific Research; 14(3).
3. El-Masry FA, El-Hawary ZM and Salem NA. Competing anemia among school children using a highly available on preparation. Egypt J Comm Med. 2007; 7 (2): 81–94.
4. El-Masry H. M, Y. A. Ahmed, A. A. Hassan, S. Zaky, E. S. Abd-Allah, E. A. El-Moselhy, Y. A. Baraka And M. A. Abdel-Rahem. Prevalence, Risk Factors and Impacts of Schistosomal and Intestinal Parasitic Infections Among Rural School Children in Sohag Governorate. The Egyptian Journal of Hospital Medicine (2007) Vol., 29: 616– 630.
5. Gibson R. Principles of nutrition assessment. Second edition ed. Oxford: Oxford University Press, 2005.
6. Ibrahium AA. Prevalence and predisposing factors regarding intestinal parasitic infections among rural primary school pupils at Minia Governorate, Egypt. Journal of Public Health in Africa. 2011; 2: e29.
7. Loukopoulos, P., Komnenous, A., Papadopoulos, E. And Psychas, V. Lethal Ozolaimus megatyphlon infection in a green iguana. J. Zoo. Wildlife Med. 2007; 38:131-134.
8. Pinar O, Sema E, Berna G, Ozlem O, Erdal B. Intestinal parasites prevalence and related factors in school children, a western city sample-Turkey. BMC Public Health. 2004; 4: 64.
9. Prasert R, Pitak W, Nipon T, Supalarp P, Natefa R. Factors Associated with Intestinal Parasites among Households. J Trop Med Parasitol. 2008; 31:85-94.
10. Stephenson LS, Latham MC, Ottesen EA. Global malnutrition. Parasitology. 2000; 121: S5–22.
11. Stephenson LS, Latham MC, Ottesen EA. Malnutrition and parasitic helminth infections. Parasitology. 2000; 121: S23–38.
12. Theodore H. and Elena A. Text book New Public Health 2000; 436-442.

3/3/2020