IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 12 Ver. II (Dec. 2015), PP 98-105
www.iosrjournals.org

Ascaris lumbricoides and other Gastrointestinal Helminthic Parasites among Qena Inhabitants with special concern to its Relation to Anemia and Eosinophilia

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Abstract:
Objective: *Aim of this study is to define ascariasis and other gastrointestinal helminthes, its relation to anemia and eosinophilia at Qena Governorate, Egypt.*
Methods: *We performed a prospective evaluation of 798 patients their age from 2 -65 years old from January 2014 to January 2015.Fecal samples were collected from all patients and examined by direct smears, Kato Katz technique and Formol ether concentration technique according Examination was done under X10 objective, higher magnification was used for further confirmation. Blood samples were collected for complete blood count (CBC). Hemoglobin level less than11.5 mg/dL was used to define anemia. Eosinophilia was defined as an eosinophils count of greater than or equal to 500 cells/µL. The present study was previously approved by the Ethical Health Committee by the Egyptian Ministry of Health and Population.*
Results:*359 (44.98 %) out of 798 were had gastrointestinal helminthes infection, 53(6.64%) of them were with Ascaris lumbricoides. Commonest parasitic infection was E. vermicularis 238(29.83%) while S. mansoni and Fasciola spp. were (0.37%) for each. Parasitic infection were higher in children 54.84% while in adults 29.71%, no great gender difference, male 49.5 % and female 40.25% while it higher in rural than urban it was 50.95% and 38.35% respectively. Anemia in (39.62%) of patients with ascariasis, colic in (73.58%) and eosinophilia in(45.28%) with a highly significant difference in comparison to peoples free from ascariasis (P value 0.001).*
Conclusion: *Qena governorate in need for early diagnosis, treatment ,preventive and control measures for gastrointestinal helminthiasis and more studies especially on children*
Keywords: *Ascaris lumbricoides, Helminthes, parasite, rural and urban.*

I. Introduction:

Intestinal parasites are responsible for morbidity and mortality worldwide, especially in low-income countries and in people with other diseases[1]**.** Infections with gastrointestinal nematode parasites are widespread and contribute significantly to both morbidity and mortality among humans **[2].** They are the most common infections among school age children and they tend to occur in high intensity in this age group **[3]**.The global prevalence and number of cases of intestinal helminths infection in school age children have been estimated to be Roundworm 35% (320 millions); Whipworm 25% (233 millions); Hookworm 26% (239 millions), others 14% (128 millions). **[4]**

The most prevalent parasitic helminth in humans, *Ascaris lumbricoides* , is estimated to infect 1.5 billion people globally**[5].** Soil-transmitted helminth (STH) infections are among the most common infections, primarily affecting the poorest sectors of the population. In 2010, an estimated 819 million people worldwide were infected with *Ascaris lumbricoides*, 464 million with *Trichuris trichura* , and 438 million with hookworm STH infections are rarely fatal but cause chronic morbidity. The global burden of STHs is estimated at nearly 5 million years lived with disability **[6].**

Children are at highest risk of infection and carry the highest disease burden **[7].** Malnutrition and anemia are associated with infection and arise from a combination of mechanisms that involve chronic inflammation, malabsorption, and blood loss **[8].**

Ascariasis is the most frequent soil-transmitted helminthiasis **[6].** *Ascaris lumbricoides* may contribute to nutritional deficiencies and even produce intestinal occlusion, whereas other soil-transmitted helminthes (STHs) cause chronic intestinal blood loss that results in anemia, and impairing physical growth, cognition, learning and working capacities **[9].** Anemia has complex etiological factors, including micronutrient deficiencies (iron, folate, riboflavin, vitamin A and B12), haemoglobinopathies and parasitic infections **[10].**

II. Aim Of The Work:

The aim of the study is to identify the prevalence of ascariasis and other gastro-intestinal helminthic parasitic infection among Qena residents and its relation to anemia and eosinophilia.

III. Subjects And Methods:

This study was done on 798 patients their age from 2 -65 years old attending to out patient's clinics of Pediatric, Internal Medicine and Tropical Medicine Departments in the period from January 2014 to January 2015. 485 of the studied cases were children and 313 were adults, 420 rural and 378 from urban areas and 408 were males and 390 were females. All the studied patients were complaining of colic, fever, diarrhea and/or pallor.

Fecal samples were collected from all patients in clean , sterile plastic containers, all samples were provided freshly and from which direct smears according to **(Cheesbrough, 1998) [11]** and smears were then examined microscopically under the X10 objective and for further confirmation under X40.Kato Katz technique was performed according to **Marshall , 1995**. Examination was done under X10 objective, higher magnification was used for further confirmation. Formol ether concentration technique according to **Cheesbrough**, **2004 [12]** was performed by emulsifying 2 gm of stool in 15 mL of 10% formal-saline, the suspension was allowed to stand for 30 min, then strained through two layers of gauze into a 15 mL conical centrifuge tube and centrifuged at 2000 rpm for 5 min. Washing step was repeated until supernatant becomes clear. The sediment was re-suspended with 10 mL of 10% formal-saline and then 3 mL of diethyl ether was added. The tube was shaken vigorously for 30 sec and centrifuged at 2000 rpm for 5 minutes. Fecal debris layer was removed by wooden applicator stick and the tube rapidly inverted to discard the top three layers while the sediment remained at the bottom. A drop of iodine was mixed with the sediment, then transferred to a microscope slide, covered with a cover glass, and was examined microscopically.

Blood samples were collected for complete blood count (CBC), hemoglobin, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), leukocyte count with differential (including eosinophils count), and platelet count were measured using an automated analyzer (BC-5300 Auto Hematology Analyzer, Mind Ray, Shenzhen, China). WHO age and sex adjusted hemoglobin level cut- off points were used to define anemia. Eosinophilia was defined as an eosinophils count of greater than or equal to 500 cells/µL. Anemia was defined by values less than11.5 mg/dL **[13]**.

The present study was previously approved by the Ethical Health Committee by the Egyptian Ministry of Health and Population. Informed consent was obtained from adults and patients' parents for children.

IV. Statistical Analysis:

Data were tabulated and analyzed through computer facilities using the Statistical Package for Social Science (SPSS) version 20. Chi-square [X2 at degrees of freedom (df) tests were used, where appropriate. Alpha error (α) to tolerable type-I error is 0.05, and p-value less than alpha was considered significant.

V. Results:

The study was done on 798 patients attended to Qena University Hospital at the period from June 2014 to June 2015, all of those patients were complaining from different gastrointestinal symptoms with or without anemia.

359 (44.98 %) out of 798 patients involved were positive for gastrointestinal helminthic infection 53(6.64%) of them were with *Ascaris lumbricoides*. In the present study the commonest parasitic infection was *E. vermicularis* infection 238(29.83%) while *S. mansoni* and *Fasciola spp*. were less common and were diagnosed in 3 peoples (0.37%) for each as shown in table (1).

Prevalence of helminthic parasitic infection were higher in children than adults it was 54.84% (266 out of 485) and in adults 29.71% (93 out of 313), and about gender its prevalence was slightly higher among male in comparison to female it was 49.5 % (202 out of 408) and 40.25% (157 out of 390) while in relation to residence helminthic parasitic infection were higher in rural areas in comparison urban areas it was 50.95% (21 out of 420) and 38.35%(145 out of 378) as shown in table (2).

Polyparasitism were found in 18 patients most of them 16 were children and they were as following: Three cases with *Enterobius vermicularis +Ascaris lumbricoides, one case with Hymenolepis nana + Ascaris lumbricoides* , nine cases with *Enterobius vermicularis + Hymenolepis nana* , two cases with *Ancylostoma dudenale + Enterobius vermicularis, one case Enterobius vermicularis +Schistosoma mansoni*, one case *Enterobius vermicularis + Trichuris trichura* and one case *Enterobius vermicularis + Tania saginata.*

Ascaris lumbricoides infection was diagnosed in 53(6.64%) patients, 29 from them were children while it was found in 24 adults with a significant ratio (P value 0.003), also there is a highly significant difference among residence of the studied peoples where it was diagnosed in 41 rural peoples and 12 urban peoples (P value 0.002), while there was no difference in its prevalence in relation to gender as shown in table (3).

Anemia was detected in 21(39.62%) of patients with ascariasis, colic was found in 39(73.58%) and eosinophilia was in 24(45.28%) with a highly significant difference in comparison to peoples negative to *Ascaris lumbricoides* infection (P value 0.001) as shown in table (4).

The following tables and diagrams will show results of the present study:

Table 1: showed the prevalence of different helminthic parasites.

Parasite	Frequency	Percent
Negative cases	439	55.01%
Ascaris lumbricoides	53	6.64%
A. duodenale	14	1.75%
E. vermicularis	238	29.83%
Fasciola spp.	3	0.37%
H. nana	45	5.63%
T. saginata	5	0.62%
T. trichura	6	0.75%
S.mansoni	3	0.37%
Total	798	

Table 2: Show socio-demographic risk factors and different clinical presentation of parasitic infection.

Characteristics	Infected		P value
	No	%	
Age <= 21 years >21	221 241	47.9 52.1	.000
Sex Female Male	187 275	40.4 59.6	.295
Residence: Urban Rural	194 268	41.9 49.1	.000
Diarrhea: Yes No	46 416	34.9 65.1	.003
Colic: Yes No	217 245	46.9 43.1	.008
Anemia : Yes No	49 413	10.7 89.3	.001
Eosinophilia : Yes No	89 373	19.3 80.7	.000

Table 3: Show socio-demographic risk factors associated with ascariasis.

Characteristics.	Infected by Ascariasis		Non Infected		P value
	No				

	53 / 798	**% 6.64**	**No 439 / 798**	% 55.01**%**	
Children Adults	29 24	54.7 45.3	228 211	51.9 48.1	0.003
Female Male	26 27	49 51	240 199	54.7 45.3	0.419
Urban Rural	12 41	22.6 77.4	271 168	61.7 38.3	0.002

Table 4: Showed socio-demographic risk factors and some medical problems associated with ascariasis.

Characteristics.	Infected by Ascaris		Non Infected(free)		P value
	No 53/798	%6.64	**No 439/798**	% 55.01	
Anemia : Yes No	21 32	39.6 60.4	40 399	9.1 91.9	<0.001
Colic: Yes No	39 14	73.6 26.4	19 420	4.3 95.7	<0.001
Eosinophilia : Yes No	24 29	45.3 54.7	33 406	7.5 92.5	<0.001

VI. Discussion:

Intestinal parasitic infection is a serious public health problem worldwide particularly in developing countries **[14]**. It was estimated to affect around 3.5 billion people globally and 450 million people were ill due to parasitic infection **[15]**. Intestinal parasites are responsible for morbidity and mortality worldwide, especially in low-income countries and in people with other diseases **[1]** and are more prevalent in hot and humid environments, with poor sanitation, contaminated water, poor housing and overcrowded **[16] .**

In the present study, we aimed to estimate the prevalence of *Ascaris lumbricoides* and other gastrointestinal helminthic parasites among Qena Upper Egypt**.**

The present study was done on 798 patients attended to Qena University Hospital at the period from June 2014 to June 2015 and the prevalence of parasitic infections among the studied peoples, was 359 (44.98 %) (table 1)and this agree with a study done by **Sameh *et al.*** [**17**] they found the prevalence of parasitic infection among youth and adult males was 44.4% but is slightly less than its prevalence in Sohag governorate (55%)**[18]**, also prevalence of intestinal parasites in Brazil, was (53.4%) **[8]**, and in a study in rural and remote areas of West Malaysia reported overall prevalence of intestinal parasite of 73.2% [**13**], while prevalence of intestinal parasites in Riyadh Saudi Arabia was (32.2%) [**19**].

In the present work helminthic parasitic infection were higher in children than adults it was 54.84% in comparison to adults 29.71%, and about gender its prevalence was slightly higher among male in comparison to female, it was 49.5 % and 40.25% respectively while in relation to residence helminthic parasitic infection were higher in rural areas in comparison to urban areas. It was 50.95% in rural areas and 38.35% in urban areas.

In the present work helminthic parasitic infection in children was 54.84% which agree with a study done by Hegazy ***et al.*** [**20**] done at Damanhur City, El-Behera Governorate, Egypt 500 children aged between 2-6 years that revealed 51.8% were infected *A. lumbricoides* and *E. vermicularis* together, while **El-Masry *et al.* [21]** reported that the prevalence of parasitic infections among Egyptian school children in Tamouh and rural school students in Sohag governorate villages were 60.2% and 88.5% , respectively. On the other hand parasitic infection in the present study was higher than the results obtained by **El Shazly *et al*. [22]** in a study at Dakahlia governorate, Delta region they found the prevalence of parasitic infection was 29.7% and it was more common in rural than urban areas , also **Ibrahium *et al*.** [23] reported that the prevalence of parasitic infection among Egyptian school children in El-Minia governorate village in upper Egypt was 29.3%.

In the present study prevalence of parasitic infection were as following; *Ascaris lumbricoides 53(6.64%)*, *Enterobius vermicularis 238 (29.83%)*, *Hymenolepis nana* 45(5.63%), *Ancylostoma duodenale* 14 (1.75%), *Taenia saginata 5(0.62%) Trichuris trichura 6(0.75%) (Fasciola spp* 3(0.37%) and *Schistosoma mansoni* (0.37%) (Table 1). In the current work there were high prevalence of parasitic infection especially *Enterobius vermicularis , Hymenolepis nana* and *Ascaris lumbricoides* among children and youth with a highly significant ratio (P value 0.000) (table 2)which could be attributed to the relatively high occurrence of unhygienic habits among them and overcrowding.

In a study carried out in Mozambique, on children and youth from 7 to 22 years old, were detected *Ascaris lumbricoides* (65.8%), *Trichuris trichiura* (54.0%), hookworms (38.7%), *Taenia* spp. (5.8%) and *Hymenolepis nana* (5.2%) [**24**].In Ethiopia the prevalence of *Ascaris lumbricoides* infection was 29% in the highlands, 35% in the temperate areas and 38% in the lowlands. The prevalence of hookworm infection was the highest in the lowlands (24%) followed by the temperate (15%) and highland (7%); whereas *Trichuris trichiura* infection exhibited similar prevalence's in all altitudinal regions (13% on the average) [**25**].

In the current work heavy and multiple parasitic infections were more common in children and youth who had bad habits as sucking fingers, playing in contaminated areas, lacking healthy hygiene as defecation or micturition in soil or water and lacking pure water supply especially in rural areas. For reasons not well understood, compared with any other age group, school-aged children (including adolescents) and preschool children tend to harbor the greatest numbers of intestinal worms **[26].**

Also there was a highly significant ratio (P value 0.000) among prevalence of parasitic infection in relation to residence of the study where it was higher in rural in comparison to urban peoples and this may be due to agricultural backgrounds, lack of pure water supply, bad sanitary disposal and low level of health education and this in agreement with **El Sahn *et al.* [27]** who stated that parasitic infections were higher in rural than urban regions, also **Curtale *et al.* [28]** in their study reported a significant higher incidence of parasitic infections among those from rural areas than urban ones. **Habib *et al.* [29]** suggested that difference between urban and rural prevalence was contributed to the behavioral and environmental differences that provoked the increased exposure to parasitic infection. **Esrey *et al.* [30]** reported that rural community had many factors which help in increased risk of parasitic infection as poor sanitation and usage of stools as fertilizers. On the other hand there were no significant differences among prevalence of parasitic infection in relation to gender (P value 0.295).

In the present study the most common presentation for different parasitic infection were colic and diarrhea with a highly significant difference (P value 0.001) and(P value 0.003) respectively, while anemia is not specific presentation for parasitic infection as there were no observed difference between infected or non (6.21%) (P value 0.001).

Generally, eosinophilia considered one of the most important result at investigations of parasitic infection and this agree with our study, where 20.18% of infected peoples were had eosinophilia with a highly significant difference (P value 0.001), **Moreira-Silva and Pereira [31]** reported that 81% of eosinophilia was due to parasitic infections. In 2010, an estimated 819 million people worldwide were infected with *Ascaris lumbricoides* .Infection with *Ascaris lumbricoides* is rarely fatal but cause chronic morbidity **Pullan.[6]**

In the current study, the rate of *Ascaris lumbricoides* infection was 6.64% which is in accordance with **Sameh *et al.* [17]** who found that the prevalence of ascariasis among 1000 individual in Qena Governorate in 2013 was 5.8% but higher than **Ibrahium *et al.* [23]** who found that the prevalence of Ascaris lumbricoides in El Minia Governorate was 3.2% while ***Khaled* *et al.* [32]** in Damietta State found that the prevalence of ascariasis was 2.6%,while its prevalence was very low in Sohag Governorate 0.2% in a study done by **Ahmed Fathy *et al*. [18**]. On the other hand prevalence of ascariasis in a village in Menoufia Governorate, Egypt was (27.31%) also **Bakr *et al.*, [33] i**n a study at Damanhur City, Egypt on five-hundreds children aged between 2-6 years *Ascaris lumbricoides* were detected in 14% of children.

The prevalence of ascariasis was higher in other countries as Nigeria where the frequency of occurrence of intestinal parasites from the diarrheal stools showed *Ascaris lumbricoides* was the most predominant (54.8%) **[34],** also in a study done by **Augusto *et al*. [24]** on children and youth from 7 to 22 years old at Mozambique they detected that *Ascaris lumbricoides* prevalence was (65.8%) in the studied peoples. Also **Ahmed Fathy *et al*. [18]** and **Mahfouz *et a.* [35]** stated that the higher prevalence of ascariasis in age group less than 10 years in accordance with many studies.

Infection by *Ascaris lumbricoides* in the present study was higher in children in comparison to adults with highly significant difference (P value 0.003), also there is a highly significant difference (P value 0.002)in rural population in comparison to urban population which agree with the results obtained by **Sameh *et al.* [17]** who found Young people living in rural areas had a marked significant association with parasitic infection than those living in urban areas. While there no difference among prevalence of ascarasis in relation to gender (P value 0.419). *Ascaris lumbricoides* as the common helminth among school children have been reported by several other authors**. [36][37]**

Children in rural areas of developing countries experience poor growth, anemia, and soil transmitted helminths (STH) infections. The latter are strongly associated with long-term nutritional stress which manifests in anemia, retarded growth, and cognitive impairment**.[7]**

As regards clinical presentation colic was the most common complaint (73.58%) in most of proven cases with ascarasis in the present study with highly significant ratio (P value 0.001). It should therefore be taken in consideration for clinical suspicion of parasitic infection especially in children. A similar result of higher prevalence of intestinal parasitosis with abdominal discomfort was also reported by **Khadka *et al.* [37], Shrestha *et al*. [38] and Gyawali *et al*. [39]**. Also other chronic gastrointestinal symptoms such as dyspepsia, epigastric pain, nausea and anorexia may be present with ascariasis and other helminthic infections and this agree with **Addis *et al*. [40] and Fayad *et al.* [41].**

In the present study anemia was found in (39.62%) of peoples with ascarasis with a highly significant correlation (P value<0.001).In agreement with **Crompton and Nesheim** [26] who found that parasitic infections are usually associated with anemia as a subsequent event, and this occurs through malnutrition e.g. *Ascaris*.

WHO (1998) **[42]** and **WHO** (2002) **[43]** cleared that parasitic infections were commonly associated with anemia. **WHO**, 2006 **[44]** stated that no doubt that poor iron status and iron-deficiency anemia are closely linked to diminished educational performance. Children in rural areas of developing countries experience poor growth, anemia, and soil transmitted helminths (STH) infections. The latter are strongly associated with long-term nutritional stress which manifests in anemia, retarded growth, and cognitive impairment**. [7]**

Malnutrition and anemia are associated with infection and arise from a combination of mechanisms that involve chronic inflammation, malabsorption, and blood loss. **[45] , [6]**

Miguel *et al*.[46], in a study done at Peruon Prevalence of intestinal helminths, anemia, and malnutrition stated that half of the children studied had anemia, with a higher prevalence among the youngest. The prevalence of anemia was significantly higher in three to four-year-olds compared with regional and national levels for the same age group (77% versus 46% versus 34%, respectively) [**42]**.So more research's is needed to identify the association between anemia and parasitic infection especially soil transmitted helminthes and effectiveness of deworming of those patients on improvement of anemia.

In the current study eosinophilia (> 500 eosinophils/μL) was present in 79.24% of patients with ascariasis with a highly significant correlation while **Miguel *et al*. [44],** stated that one in five children had eosinophilia (> 500 eosinophils/μL). Eosinophilia was not associated with helminth eggs in the stool, tissue migratory phase of certain parasites (e.g. *Ascaris lumbricoides*, hookworm) induces elevated eosinophil counts to up 12 weeks before stool microscopy diagnosis can be made **[47]**. High eosinophilia may be due to polyparasitesm, hyperparasitesm and /or undiagnosed blood parasites.

VII. CONCLUSION:

It necessarily implies that there is a grateful need for early diagnosis, treatment and adequate preventive and control measures for gastrointestinal Helminthic infections in Qena (upper Egypt). So we are in need to improve personal and environmental hygienic measures, regular screening and treatment for parasitic infections. More studies especially on children in rural and urban areas of Egypt should be done.

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