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SOIL TRANSMITTED PARASITES IN QUALYOBIA GOVERNORATE

By

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Abstract

The study determined the relation between prevalence of intestinal parasites and soil-transmitted parasites among households in Shiblanga representing a rural area of Qualyobia Governorate and Benha City representing an urban area of the same Governorate. The effect of soil's type on the intensity of parasites and to provide guidance on the prevention and control of soil transmitted parasitic infections for future studies in this field. This study was conducted at Benha City and Shiblanga village representing the urban and rural areas of Qualyobia Governorate. Geoparasites were investigated in-doors, around houses, in the fields and the streets from both areas. One hundred soil samples from Benha city and one hundred soil samples from Shiblanga village were collected .each hundred soil samples was collected in the form of: 25 samples from the fields, 25 samples in-indoor yards, 25 samples the streets,25 samples around houses. Approximately 200g soil was collected in plastic bags at 2-10cm depth from different parts. Stool samples from households in same areas were collected after taken oral consent. All soil samples were screened for parasites using different parasitological methods (Zinc sulphate flotation, ether sédimentation technique, modified Baerman's apparatus and modified Berlese technique). All stool samples were examined using direct smear, formalin–ether concentration techniques for detection of helminthes eggs, and modified acid-fast staining for detection of protozoa.

The results showed that86/200soil samples were contaminated with different parasites, the prevalence rate of 43%. Soil samples from Shiblanga village showed higher level of parasitic contamination (56%) and Benha city showed a lower level of contamination by different parasites (30%). Soil samples obtained from Manshiet El-Nour district, Benha revealed the highest level of parasitic contamination. While, in Shiblanga, El-Mansheya district revealed the highest level of parasitic contamination. Clay soil was the most type of soil contaminated by helminthes.The10 houses out of 50 houses had the same parasites in the soil and in stool of their households, 8 houses in Shiblinga village and 2 houses in Benha city.

Key words: Egypt, Qualyobia G., Soil, Geoparasites, Intestinal parasites, Mites.

Introduction

The epidemiology of STH infections is influenced by several keys determinants, including environment, population heterogeneity, age, household clustering, genetics and polyparasitism (Hotez *et al*, 2008). Adequate warmth and moisture are key for infection with one or more STH species in Africa in 2005 and considerable geographical variation in the occurrence of STH infections (Brooker *et al*, 2009). Several epidemiological studies were done on STPs in Egypt and worldwide, however most of these studies were based on stool examination with no direct estimation of parasitic burden in soil samples. Therefore, they cannot actually indicate the extent to which residents may be at risk, but only indicate the parasitic distribution in a certain population at a given time. Therefore as obtaining soil samples are more convenient then obtaining stool samples, in the future, assessment of soil contamination may be used to partially replace study of stool samples (Nurdian, 2004).

The morbidity caused by the worms is commonly associated with heavy infection intensities. School-aged children and preschool children are the most vulnerable group and they harbor the greatest numbers of intestinal worms. As a result, they experience growth stunt. These adverse the health consequences combine to impair childhood educational performance and reduce school attendance and STH infections might also increase host susceptibility to other important illnesses such as malaria, tuberculosis, and HIV infection (Le Hesran *et al,* 2004).

The study aimed to determine the relation between prevalence of intestinal parasites and soil Transmitted parasitic infections among households in Shiblanga representing a rural area of Qualyobia Governorate and Benha City representing an urban area of the same governorate.

Subjects, Materials and Methods

Ethics Statement: Before the study began, the study objective was explained to households from Benha City, the Capital and from Shiblanga village. The oral consent was taken. The study protocol was reviewed and approved by the ethical review board of the Faculty of Medicine, Benha University.

Collection of stool samples: Stool samples were collected and examined all over the period of the study, October 2011 to July 2012. Two hundred stool samples from households of 50 houses; 25 houses from different districts in Shiblanga village and 25 houses from different districts in Benha City. Each sample was collected in a plastic container labeled with name, sex, age, residence and date

Parasitological examination of stool the following techniques were used: The formol ether sedimentation technique to isolate helminthes eggs and larvae. The modified Ziehl-Neelsen stain (Henriksen and Pohlenz, 1981) was used to detect the coccidian cyst and oocyst. Fecal smear was prepared from the stool sample. It was allowed to air dry, and then fixed in acetone free methanol for 3 minutes. The smear was stained with strong Carbol-fuchsin for 15-20 minutes. The smear was washed in tap water, decolorized in

Sulfuric acid 5% for 15-20 seconds, and then washed thoroughly in tap water. The smear was counter stained by methylene blue for 30-60 seconds. It was washed and allowed to be air dry. Finally the smear was examined using x40 and x100 objectives lens.

A total of 200 soil samples were collected from houses' yards, streets, fields, and around houses of households. The samples were of different types (sandy, clay and loamy), which were collected from five districts in Shiblanga village and Benha City. Each sample was approximately 200g soil and collected in plastic bags at 2-10cm depth. The sampling areas were five districts as follows: Benha City; Manshiet El-Nour, the National Guard, Taba housing, Ezbet of Agriculture and Benha Center. Shiblanga village; El-Mansheya, Christians, Judge, Al-salakhana and Bani-Hashim.

Parasitological examination of soil was done by Zinc sulphate flotation technique (Dada, 1979): The soil sample was sieved through 100u mesh. Ten gram of soil was transferred to volumetric flask containing 40 ml of tween 80%. It was vortexed for 30 minutes. The suspension was transferred to 50 ml centrifuge tube, and centrifuged at 2000-3000 rpm for 10 minute. The supernatant was decanted. $ZnSo_4$ solution was added (S.G:1.27) .It was vortexed again .It was centrifuged at 2000-3000 rpm for 10 minutes. More solution was added to the top. The top was covered with cover slip. After 15 min cover slip was carefully removed. Formol ether sedimentation technique (Ritchie *et al*, 1960): Five gm stool was put in a test tube containing 7ml formol saline, and were shaken well to form a suspension. The suspension was strained by 2 layers of gauze into a centrifuge tube thus preventing passage of large particles and debris. The suspension was centrifuged for 3 minutes at 3000 rpm. If the supernatant was not clear, it was removed and formol saline was added and centrifuge again till the supernatant became clear. The clear supernatant was removed and sediment was emulsified by adding 3 ml formol saline & equal amount of ether. The modified Baerman's technique (Graeff-Teixeira *et al*, 1997): To isolate nematode larvae from soil as larvae are thermotropic and hydrotropic. Modified Berlese technique (Morsy *et al,* 1994): To isolate mites, slight heat and dry the soil so the soil animals move downward (positive geotaxis in response to dryness) and away from the heat, and then mounted using Hoyer's media.

Statistical analysis: Data was done by using the Statistical analysis system (SPSS); version 16. Frequency and percentage were used with qualitative data. Z test and chi square were used to compare frequencies.

Results

In the present work 86 soil samples out of 200 samples collected from five districts in Shiblanga village and Benha City were contaminated with different types of parasites. Out of 200 samples, 77 were contaminated with helminthes, three were contaminated with protozoa and six samples were contaminated with helminthes and protozoa,

The soil contaminated with arthropods was 71.5% (143/200 soil sam-

ples). (Tab. I). Arthropods were free living mites and Springtail. They were non-medically important except *Tyrophagus putrescentiae* mites (67). The most prevalent mite in both areas of this study was *Acarus siro* (103) (Tab. 4). The contaminated samples were in a mixed pattern in most of the samples.

The prevalence rate of soil contamination with different parasites in Shiblanga village was 56%. Soil samples from El-Manshey Street revealed the highest level of parasitic contamination (26.8%), Judge Street showed the lowest level of parasites (12.5%). Prevalence rate of soil contamination with different parasites in Benha City was 30% (Tab. I). Soil samples obtained from Manshiet El-Nour district revealed the highest level of parasitic contamination (36.7%), Benha centre district showed the lowest level of parasitic contamination (3.3%),with statistical significance

The soil types were 99 clays, 35 sandy and 66 loamy. Clay soil was the most contaminated with parasites; helminthic contamination was 50.5%, protozoan contamination was 2% and mixed helminthes and protozoa was 3% with statistical significance. Parasites were eggs of *H. nana, H. diminuta,* taeniid*, A. lumbricoides, Toxocara* spp., *Ancylostoma duodenale,* larvae of nematode, *E. histolytica*cysts*, Cryptosporidium parvum* oocysts and *T. gondii* oocysts. The parasitic prevalence among Egyptian households stool samples in Qualyobia G. was 30.5%, containing *H. nana* eggs, *A. lumbricoides, E. vermicularis* eggs, *A. duodenale*, *E. histolytica* cysts, *Cryptosporidium parvum* oocysts, *Blastocystis hominis* cysts and *Isospora belli* oocysts. There was no statistically significant difference in sex regarding infection**.** School age group was the commonest infected one (59%). Parasites detected were 10/50 houses. *A. duodenale* ova were detected in soil of 4 houses with the same parasite in households' stools, *A. lumbricoides* eggs were detected in 4 houses with the same parasite in households stools and *E. histolytica* cysts were detected in 2 houses with the same parasite in households stools.

The details are given in tables (1 to 5) and figures (1 to 13).

Table 1: Distribution of contaminated soil samples

Residence	No. of samples taken		Positive samples with helminthes & protozoa		No. of positive samples with Arthropods	
	No	%	No	%	No	%
Shiblanga (rural)	100	100.0	56	56.0	83	83.0
Benha (urban)	100	100.0	30	30.0	60	60.0
Total	200	100.0	86	43.0	143	71.5

Table 2: Number of contaminated soils samples according to soil's type

Soil's type	Clay (99)		Loamy (66)		Sandy (35)		Total (200)		X2 test	P value
	No	%	No	%	No	%	No	%		
Sample with helminthes	50	50.5	17	25.5	10	28.5	77	89.5	12.01	0.002 HS
Sample with protozoa	2	2.0	1	1.5	0	0.0	3	3.4	0.714	0.70 NS
Sample with both	3	3.0	2	3.0	1	2.9	6	6.9	0.003	0.999 NS
X2 test	0.55		0.572		0.523					
P value	0.76 NS		0.75 NS		0.77 NS					

Table 3: Geoparasites in study locality in Qualyobia Governorate (G.).

Parasites recovered	(N=200)	Percentage
Hymenolepis nana eggs	5	2.5
Taenia spp. eggs	3	1.5
Hymenolepis diminuta eggs	3	1.5
Ascaris lumbricoides eggs	18	9.0
Ancylostoma duodenale eggs	22	11
Toxocara spp. eggs	27	13.5
Nematoda larvae	43	21.5
Entamobea histolytica cysts	6	3.0
Cryptosporidum parvum oocysts	2	1.0
Toxoplasma gondii oocysts	1	0.5

Table 4: Arthropods detected in the 143 soil samples in Qualyobia G.

Arthropods	Habitat	No. of samples	%
Acarus siro	Free living on cheese or flour	103	51.5
Parasitidae eugamasus	Feed on acari mites, live on floor dust	86	43.0
Tryophagus putrescentiae	Free living on seeds as wheat grains	67	33.5
Kleemania pulmosus	Free living or saprophytic on decayed materials	43	21.5
Cryptostigmata oppia	Fungi fours and saprophytic	6	3.0
Rizoglyphus callae	Free living on Narcissus and onion pulp	1	0.5
Spring tail	Leaf litter, a pest on agricultural croups	6	3.0

Table 5: Parasite in households' stools in Qualyobia G.

Residence	Urban (100)		Rural (100)		Total (200)		Z test	P value
Parasite	No	%	No	%	No	%		
H. nana eggs	3	50.0	3	50.0	6	100.	0.0	0.5 NS
A. lumbricoides eggs	2	22.2	7	77.8	9	100.	2.004	0.0225 S
E. vermicularis eggs	1	33.3	2	66.7	3	100.	0.612	0.27 NS
A. duodenale eggs	0	0.0	6	100.0	6	100.	-	-
E. histolytica cysts	15	48.4	16	51.6	31	100.	0.18	0.429 NS
C. parvum oocysts	1	33.3	2	66.7	3	100.	0.612	0.27 NS
B. hominis cysts	0	0.0	2	100.0	2	100.	-	-
I. belli oocysts	0	0.0	1	100.0	1	100.	-	-

Discussion

In the current study the prevalence rate of soil contamination with different parasites was 43% (86/200 soil samples). Soil in different districts was found to be contaminated with different parasites; soil samples with pure helminthes (89.5%), soil samples with pure protozoa (3.4%) and soil samples with mixed infections (6.9%).

Regarding other Egyptian Governorates, several reports detected different STPs with higher prevalence rates (53.4% and 92.5%) in soil samples collected from agricultural villages in El-Dakahlia Governorate (Hanafi *et al,* 1987; El-Beshbishi *et al,* 2005). In Alexandria, a previous study at 2010 was done on soil samples; the prevalence rate of soil contamination with different parasites was 31.9% (67 out of 210 soil samples). Alexandria soil in different districts was found to be contaminated with 18 different parasites of

medical importance that belong to; helminthes (55%), protozoa (34%) and arthropods (4%) (Hussien *et al,* 2010). Kishk and Allam (2000) in Alexandria found prevalence rate of soil contamination with helminthes to be 38.33%.

These differences in the prevalence rates in comparison to the present results could be explained by difference in the locality and the difference in methodology used in the current study.

Several studies were done upon STPs abroad and found the prevalence rate of soil contamination with parasites ranged from 9.4% to 84.4% (Ulukanligil, 2001; Motazedian *et al,* 2006).

In the present study, the prevalence of parasitic infection among the households in Qualyobia G. was 30.5%. A cross-sectional stool examination survey was performed on 430 randomly chosen households among inhabitants of El-Meaddeya, Egypt comprising 2219 individuals. The prevalence of parasitic infection was 84.7% (Abou-Basha *et al,* 2000).

In Riyadh, Saudi Arabia, out of 6012 participants, 1933 (32.2%) were infected by intestinal parasite (Al-Shammari *et al,* 2001).

In the current study, coproparasitological studies were performed on the inhabitants of the 50 houses; 25 houses from Shiblanga village and 25 houses from Benha City The following parasites were found *Hymenolepis nana* eggs 6 (3%), *A. lumbricoides* eggs 9 (4.5%), *E. vermicularis* 3 (1.5%), *A. duodenale* eggs 6 (3%), *E. histolytica* cysts 31 (15.5%), *C. parvum* 3 (1.5%), *B. hominis* cysts 2 (1%), and *I. belli* 1 (0.5%). Abd El-Badea *et al.* (2005) in Dakahlia governorate reported that *E. histolytica* cyst (66.7%) was the most prevalent intestinal parasite among the Mansoura University residential students.

In Mexico, coproparasitological on inhabitants of 26 houses, showed *A. lumbricoides* (9.3%), *E. vermicularis* (7.3%), *H. nana* (4.6%), *Trichuris trichiura* (1.3%), *E. histolytica* (11.9%), *G. lamblia* (6.6%), none was found in the inhabitants of three houses, where a smaller number of eggs were found in the soil with respect to the number of parasites (Huerta *et al*, 2008).

In the current study, parasitic infections were detected among households of 10/50 houses; 8 houses in Shiblinga village and 2 houses in Benha City had the same parasites in the soil and in stool of the households as *A. duodenale* ova were detected in the soil of 4 houses that had the same parasite in the stool of their households, *A. lumbricoides* eggs were detected in 4 houses that had the same parasite in the stool of their households and *E. histolytica* cysts were detected in 2 houses that had the same parasite in the stool of their households .

The present study clearly documented the significance of soil contamination in rural areas by parasites that can potentially affect human health. Results showed high frequency of intestinal parasites found in the inhabitants of this community. Several factors can contribute to the high level of parasite contamination in the soil of positive households' houses as the breeding of domestic animals in the house, pres-

ence of dogs, cats, the lack of compartmentalization of the houses and the presence of soil floors. Also, the present study gave preventive measures against STPs, to households; the infected households were advised by the drug of choice and health education by advising them to avoid contamination with soil, proper hand-washing before and after eating and using the latrines, proper washing the vegetables before consumption and prohibition of the use of night soil or human faces as fertilizers.

Conclusion

The soil contamination was found to be higher in Shiblinga village. While Benha City showed lower level of soil contamination with parasites. So, it can be concluded that soil contamination with parasites is related directly to thepopulation density, old sewage disposal system and lack of programs of health education and environmental sanitation. The type of soil had an impact on the contamination of soil with different parasites. School children are the most affected group.

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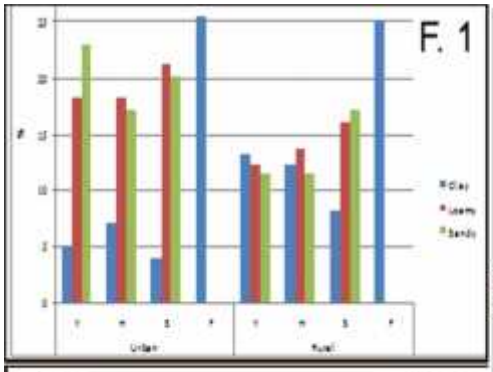
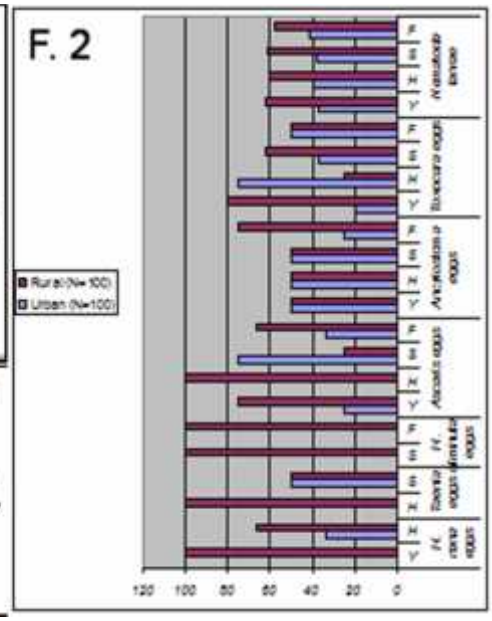
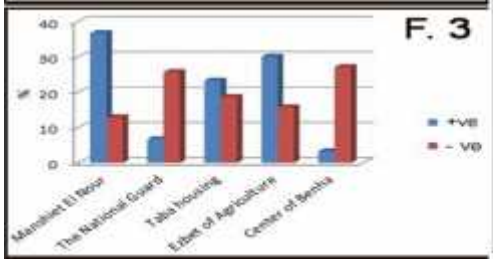
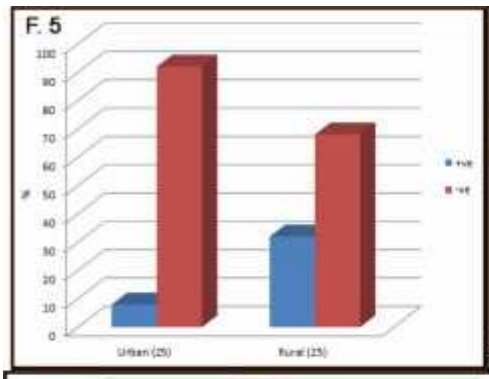
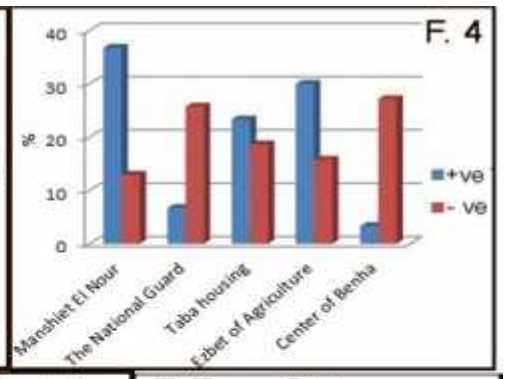
Fig. 1: Sites of sampling in relation to soil's types, Fig. 2: Helminthes recovered from soil in Qalyubia G. soil sampling, Fig. 3: Positive soil samples according to street name in Shiblinga village, Fig. 4: Number of positive soil samples according to district area in Benha City, Fig. 5: Parasites in positive soil samples and infected households. Fig. 6: Correlation between parasites and soil contamination, Fig. 7: Age groups of infected persons in Qualyobia Governorate.

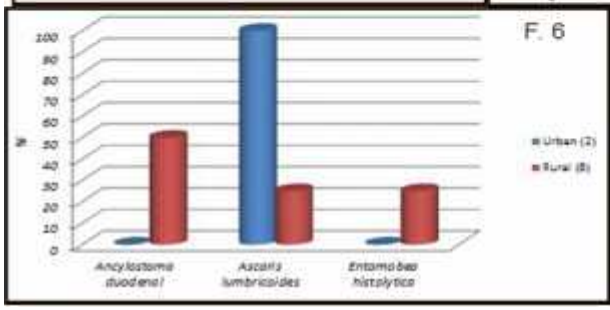


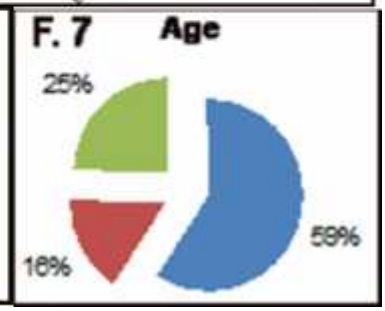












Types of Arthropods detected in the soil samples

Fig. 8: *Acarus siro* X100,
Fig. 9: *Tryophaguspu putrescentiae* X100,
Fig. 10: *Rhizoglyphus callae* X100
Fig. 11: *Parasitidae eugamasus*X100
Fig. 12: *Kleemania plumosus*X100,
Fig.13: *Crypostigmata oppia*X100
Fig. 14: Spring tail X100