

Occurrence of *Taenia solium* and Cysticercosis in Man in Egypt

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Abstract

Cysticercosis is emerging as a serious public health and agricultural problem. In Egypt *Taenia solium*/ human cysticercosis is rare. Therefore, this study aims to survey the occurrence of *T. solium* and cysticercosis in human in Assiut and Sohage Governorates. Stool samples were collected from 425 patients suffering from gastrointestinal disturbances, who attended some hospitals in Assiut and Sohage Governorates. Stool samples were examined by both direct smear method and simple gravity sedimentation technique. Ninety two serum samples were collected randomly from the patients. IgG antibodies against *Taenia solium* and its cysticerci (*Cysticercus cellulose*) were detected in human serum by using ELISA. The occurrence of *T. solium* among 425 examined patients in the present work was 0.7% by using sedimentation stool examination technique. The seroprevalence of *Taenia solium*/cysticercosis in humans in Assiut and Sohage Governorates was 6.5% by using ELISA test. A great variation in the ecological distribution of *Taenia solium*/Cysticercosis in human was detected between Assiut and Sohage Governorates (8.1% & 3.33% respectively). Higher seroprevalence was detected in women (8.5%) than men (3.0%). There was positive correlation between the age of the patient and the infection rate which was 5.3% in the age group below 20 years, 5.5% in the age group 20-40 years and 11.1% in the age group above 40 years. Results obtained in this study reveal that cysticercosis is prevalent among man in the examined areas. Public health education is considered the key factor for control of cysticercosis.

Key words: Cysticercosis, *Taenia solium*, ELISA, man, Parasite, Public Health, Zoonosis.

Introduction

The recent emergence and re-emergence of infectious diseases, most of which have involved zoonotic parasitic disease agents of public health importance, represents a growing global concern. Parasitic zoonoses of international importance include cysticercosis represent a significant hazard in most developing countries. Although these infections are not among the leading causes of parasite-induced mortality worldwide, they cause considerable losses in human health and agricultural production (Ito et al., 2003).

Cysticercosis is emerging as a serious public health and agricultural problem in many poor countries of Latin America, Africa, and Asia. However, it is not common in Islamic nations because of religious dietary laws abstain from eating pork (Hira et al., 2004). This zoonotic disease forms larval cysts in humans and pigs that can lead to epilepsy and death in humans, reduces the market value of pigs and makes pork unsafe to eat. It occurs where pigs managed freely, poor sanitation, and absence of meat inspection or inadequate meat inspection, thus it is strongly associated with poverty

and smallholder farming. Although theoretically cysticercosis is easy to control, it remains neglected in most endemic countries due to the lack of information and awareness about the extent of the problem, suitable diagnosis, management capacity and appropriate prevention/control strategies (Willingham and Engels 2006). In Egypt *Taenia solium*/human cysticercosis is rare. However, some cases occurred in people who ate pork as well as people around them were susceptible to cysticercosis.

Materials and Methods

The present study was carried out during the period between May, 2006 and June, 2007 in the department of animal hygiene and zoonoses, faculty of Vet. Med, Assiut University and the department of parasitology, Assiut regional lab (Animal Health Research Institute).

Stool samples: Stool samples were collected from 425 patients (272 men and 153 women) suffering from gastrointestinal disturbances with history of eating pork or dealing with pigs, who attended some hospitals in Assiut Governorate [El-Eman general hospital (120

Table -1. Occurrence of *T. solium* gravid segment in human stools

Location	No. of samples	Men			Women		
		No. of Examined	No. of Infected	%	No. of Examined	No. of Infected	%
Assiut city	120	70	-	-	50	-	-
El_ Ezeia Village	105	61	-	-	44	1	2.3
El- Mattiea Village	100	70	-	-	30	-	-
Sohage City	65	46	-	-	19	-	-
Bardees Village	35	25	-	-	10	-	-
Total	425	272	-	-	153	1	0.7

patients), El-Matieea hospital (100 patients) & El-Ezeia Village health center (105 patients) and Sohage Governorate [Sohage educational hospital (65 patients), Bardees Village health center (35 patients)].

10 g of stool sample were collected from each patient directly after defecation in clean labeled plastic container with snap-on lids and transferred rapidly to the laboratory for examination. Samples were fixed using 10% formalin saline solution in a ratio of 3 parts fixative to 1 part feces and stored in labeled vials at room temperature until examination. The physical characters of the stool was studied (colour, consistency, presence of blood /or mucus) and presence of the gravid segment of *Taenia solium*. Stool samples were examined by direct smear method and simple gravity sedimentation technique (Urquhart et al., 1994).

Serum samples: Ninety two serum samples were collected randomly from the patients previously examined by stool examination. Sixty two serum samples were examined from Assiut Governorate [9 from Assiut city, 35 from El-Ezia health center & 18 from El-Matieea hospital] and 30 serum samples were collected from patients at different localities in Sohage Governorate who attended Sohage educational hospital.

Indirect Enzyme linked immunosorbent assay (ELISA): Qualitative determination of IgG antibodies against *Taenia solium* and its cysticerci (Cysticercus cellulose) in human serum was done by using ELISA kit *Taenia solium* IgG (Ridascreen No. K 7721). The kit was obtained from R-Biopharm company AG, Landwehrstr. 54, D-64293 Darmstadt, Germany.

Results and Discussion

The occurrence of *T. solium* among 425

examined patients in the present work was 0.7% by using sedimentation stool examination technique (Table1). The obtained result in this study coincides with the results reported by El-Saieh, 1982 (0.76%); and Culha, 2006 (0.7%) while, it was higher than those reported by Morsy et al., 1991 (0.41%); Mohamed, 1996 (0.42%); Hassan and Hany, 2001 (0.25%); Esteves et al., 2005 (0.2%); and El-Shazly et al., 2006a (0.1%). On the other hand the obtained result was lower than those reported by El-Shazly et al., 2006b (1.1%) and Waikagul et al., 2006 (2.8%). The differences reported in the prevalence rates may be due to difference in the location of the study, the number of the examined patients as well as personal hygiene, educational level, control and eradication programs in such localities.

The seroprevalence of *Taenia solium*/cysticercosis in humans in Assiut and Sohage Governorates was 6.5% by using ELISA test (Table 2). Six cases were positive for *Taenia solium* / cysticercosis by ELISA while, stool examination of these patients revealed only one patient was positive for *Taenia solium*. This result suggests that the first five cases had cysticercosis while, the sixth case may have *Taenia solium* adult worm and / or cysticercosis. This finding is nearly similar to those recorded by Parija and Sahu, 2003 (6.1%) while it was higher than those reported by DeGiorgio et al., 2005 (1.8%) and Rodriguez-Hidalgo et al., 2006 (2.25%). On the other hand our finding was lower than that obtained by Carrique-Mas et al., 2001 (22%) and Oliveira et al., 2006 (11.3%).

Results in Table 2 clarify a great variation in the ecological distribution of *Taenia solium*/Cysticercosis in human between Assiut and Sohage Governorates (8.1% & 3.3% respectively). The difference may be due to variation in the sanitary measures such as washing

Table -2. Occurrence of *Taenia solium* and cysticercosis in human by using ELISA

Location	No. of examined	No. of Infected	%
Assiut city	9	-	-
El_ Ezeia Village	35	*5	14.3
El- Mattiea Village	18	-	-
Total	62	5	8.1
Sohage Governorate	30	1	3.3
Overall prevalence	92	6	6.5

* One sample of the five serum samples was positive for *Taenia solium* in stool examination

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Table-3. Seroprevalence of *Taenia solium* and cysticercosis in humans in relation to sex.

Location	No. of samples	Men			Women		
		No. of Examined	No. of Infected	%	No. of Examined	No. of Infected	%
Assiut city	9	6	-	-	3	-	-
El_Ezeia Village	35	11	1	9.1	24	*4	16.7
El- Mattiea Village	18	13	-	5	-	-	-
Total	62	30	1	3.3	32	4	12.5
Sohage Governorate	30	3	-	-	27	1	3.7
Overall prevalence	92	33	1	3	59	5	8.5

of the hands after using toilets and before preparation of food, washing of vegetables before eating, detection and treatment of infected patients as well as sewage treatment system or deactivation of teaniid eggs before using it as fertilizers (Ferrer et al. 2003).

Regarding to the gender of the patients (Table 3), higher seroprevalence was detected in women (8.5%) than men (3%). Similar results were reported by Moore et al., 1995 (1.8% & 0.71%) and Oliveira et al., 2006 (15.1% & 11.3%) in both women and men, respectively. On the contrary, the obtained results disagreed with Buitrago et al. (1995) who found that 60% of the infected cases were men. Also Li et al. (2006) reported that the seroprevalence of cysticercosis was higher in men (6.6%) than women (1.8%). Moreover, many authors have been reported that there was no significant statistical difference between the gender of the patient and the infection with cysticercosis (Adjide et al., 1996; Fleury et al., 2006). High susceptibility of women may be attributed to the hetero-infection of the housewives from their children through childcare activities.

The influence of the patient's age on the seropositivity of *Taenia solium* /cysticercosis as illustrated in Table 4 revealed that there was positive correlation between age of the patient and the infection rate which was 5.3%, 5.5% and 11.1% in the age group below 20 years, 20-40 years and above 40 years, respectively. Similar results were obtained by Sarti et al. (1994) who found that the seropositivity increase with age and reach the peak at 46-55 years. Fleury et al. (2006) mentioned that the frequency of infection

significantly increases with age and the highest age group was above 46 years (18 % of infected cases). Ikejima et al. (2005) found that the peak of the infection with cysticercosis was in the adulthood (20-29 & 40-49 age group) and (18-59 age group), respectively. Furthermore, Oliveira et al. (2006) reported that the highest incidence (26.1% of infected cases) were above 15 years age group. On the contrary the obtained result disagreed with Escalante et al. (1995) who mentioned that the highest incidence of cysticercosis was in the youngest patients. On the other hand Adjide et al. (1996) found no statistical significance according to the age of the patients. The positive influence of the patient's age on the seroprevalence of cysticercosis may be attributed to the cumulative exposure to the eggs of *T. solium*. Also, the age between 20-40 years and above 40 years are the working age groups whom always eat junk food and they can contract the infection from infected food handlers with *T. solium*. In conclusion, results obtained in this study confirm that cysticercosis is prevalent among man in the examined areas. Public health education is considered the key factor for control of cysticercosis

Acknowledgement

Authors are sincerely grateful for the great help of members of Parasitology Dept .Faculty of Medicine at Assiut University for their great help and advice.

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Table-4. Seroprevalence of *Taenia solium* and cysticercosis in human in relation to age

Location	No. Of samples	3 - <20 years			20 - 40 years			>40 years		
		No. of Examined	No. of Infected	%	No. of Examined	No. of Infected	%	No. of Examined	No. of Infected	%
Assiut city	9	3	-	-	4	-	-	2	-	-
El_Ezeia Village	35	6	1	16.7	22	*2	9.1	7	2	28.6
El- Mattiea Village	18	1	-	-	8	-	-	9	-	-
Total	62	10	1	10	34	2	5.9	18	2	11.1
Sohage Governorate	30	9	-	-	21	1	4.8	-	-	-
Total	92	19	1	5.3	55	3	5.5	18	2	11.1

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