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EPIDEMIOLOGICAL STUDY ON *TRICHINELLOSIS* IN PIGS AND MAN IN UPPER EGYPT

(With 5 Tables)

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(Received at 27/2/2010)

دراسة وبائية على الترايكنوسيس في الخنازير والإنسان في صعيد مصر

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تعتبر الإصابة بالترايكنوسيس من أهم الأمراض الطفيلية على مستوى العالم ليس فقط لتأثيرها الاقتصادي في تربية الخنازير، بل نتيجة لارتفاع تكاليف تشخيص وعلاج المرضى المصابون. أجريت هذه الدراسة للوقوف على معرفة مدى الإصابة بالترايكنوسيس في بعض الأماكن في صعيد مصر متمثلة في محافظتي أسيوط وسوهاج. وأسفر فحص 150 خنزيراً بواسطة طريقة هضم أنسجة العضلات عن تواجده الإصابة بالترايكنوسيس بين الخنازير بنسبة 4% (5% في محافظة أسيوط ، 2% في محافظة سوهاج). ولوحظ أن ذكور الخنازير أكثر عرضة للإصابة (4.8%) من الإناث (2.2%). وقد وجد أن هناك علاقة عكسية بين عمر الحيوانات ونسبة الإصابة بالترايكنوسيس (أعلى إصابة 6.7% بين الخنازير الأقل من سنتين، بينما كانت 2.9% بين الخنازير الأكبر من سنتين). وأثبتت الدراسة أن التشخيص بواسطة طريقة هضم أنسجة العضلات أنها الأكثر حساسية (4% من طريقة الترايكينوسكوب (3.33%). ولدراسة مدى تواجده الترايكنوسيس بين مرضى يعانون من الألم في العضلات ولهم تاريخ سابق بتناول لحوم الخنازير. تم جمع عدد 92 عينة دم من هؤلاء المرضى من مستشفيات مختلفة في محافظتي أسيوط وسوهاج حيث تم فحص مصل الدم بواسطة اختبار ELISA وأسفرت هذه النتائج عن: تواجده الإصابة بالترايكنوسيس بين الادميين بنسبة 60.8% (67.7% في محافظة أسيوط ، 46.7% في محافظة سوهاج). وقد لوحظ وجود علاقة عكسية بين معدل الإصابة بالترايكنوسيس وعمر المرضى ، حيث كانت أعلى نسبة بين المجموعة العمرية أقل من 20 سنة (63.1%) يليها لكل من المجموعتين 20-40 سنة (58.4%) ثم أكبر من 40 سنة (25%).

SUMMARY

Trichinellosis is one of the most widespread zoonotic parasitic diseases of animals and man all over the world. This study aimed to determine the occurrence of *Trichinella spiralis* among pigs and humans in Assiut and Sohag Governorates in Upper Egypt. Trichinellosis was detected in 4.0% of the examined pigs with a prevalence rate of 5.0% and 2.0% in Assiut and Sohage Governorates, respectively. Male pigs were more susceptible (4.8%) than females (2.2%). There was a reverse relationship between the age of pigs and the occurrence of Trichinellosis. Diagnosis of *Trichinella spiralis* by digestion technique (4.0%) showed to be more sensitive than trichinoscope (3.33%) examination. Incidence of Trichinellosis in human was 60.8% with a rate of 67.7% % in Assiut Governorate and 46.7% in Sohage Governorate by using ELISA. There was a reverse relationship between the patient's age and the occurrence of Trichinellosis. Higher occurrence of Trichinellosis was detected in female patients (61.8%) than males (56.3%).

Key words: *Trichinellosis, trichinoscope, ELISA, pigs, man.*

INTRODUCTION

Trichinellosis is one of the most widespread zoonotic parasitic diseases of animals and man all over the world in most climates except for deserts (Dupouy-Camet, 2000). It is caused by a nematode parasite belonging to the genus *Trichinella*, which is an obligate intracellular parasite in both larval and immature adult stage (Capó and Despommier, 1996). It has a wide range of hosts and over 150 mammalian species and birds as well as reptiles have been found to be infected worldwide. Eight *Trichinella* species containing 11 genotypes have been identified and no morphological differences exist between the species and genotypes. However, they have been differentiated from each other by molecular and biochemical methods (Pozio, 2005).

Pigs are the main reservoir of human trichinellosis and they acquire the infection through feeding on raw pork scraps from slaughterhouses and garbage. Also the cannibalistic behavior of pigs plays a role in transmission of trichinellosis (Pozio, 2001). On the other hand, human acquires trichinellosis by ingesting raw or insufficiently cooked pork meat and other animals (horses and dogs) containing the larvae of *Trichinella* (Dupouy-Camet, 2000).

In Egypt, the disease was not given much importance and was believed to be absent (Rifaat *et al.*, 1969) until the first case of human trichinellosis was recorded by Morcos *et al.* (1978) in Alexandria. Thereafter, several cases were reported in different localities. On the other hand, few studies are available on trichinellosis in Upper Egypt and most of their localities have no records on it. Therefore, the present study aimed to study the occurrence of *Trichinella spiralis* among pigs and humans in Assiut and Sohag Governorates in Upper Egypt.

MATERIALS and METHODS

Detection of trichinellosis in pigs: A total of 150 slaughtered pigs (1.5-3 years) were selected randomly from Assiut and Sohag Governorates during the period from May, 2006 to June, 2007. Muscular part of the diaphragm and diaphragm pillar muscles of each pig were collected and kept at -20 °C until the time of the examination.

Trichinoscopic examination: Small pieces of muscle (2mm x 10mm) were compressed between two glass plates until they became translucent and examined individually for *Trichinella* larvae by using the compound microscope (15– 40 x magnification) (Gamble, 1996).

Artificial digestion method: Pieces of examined tissue (4 g) were digested in 100 ml of 1% (w/v) pepsin and 1% (v/v) hydrochloric acid (0.12 N final) and the mixture was kept on a magnetic stirrer for 3 hours at 37°C. Sediment was suspended, sieved and examined under a dissecting microscope for the presence of larvae (Gamble, 1996).

Detection of trichinellosis in human: Serum samples were obtained from patients attended Assiut health center (62) and Sohag teaching hospital (30) presented with at least three of the following symptoms and/or signs; fever, myalgia, edema, eosinophilia and digestive disorders together with history of eating pork. The collected sera were coded and kept at -20 °C until examined by ELISA. ELISA assay was performed as described by Ribicich *et al.* (2000) by using *Trichinella* IgG ELISA kit (Ridascreen No. K 7521, R-Biopharm company AG, Landwehrstr. 54, D-64293 Darmstadt, Germany).

Statistical analysis: Statistical analyses were carried out using SPSS 14 (SPSS Inc., Chicago, IL, USA <http://www.spss.com>). The χ^2 test was used for analyzing differences between the results.

RESULTS

Table 1: Prevalence of *Trichinella spiralis* in pigs with relation to age

Location	No. of examined	No. of infected	%	Below 2 years			Above 2 years		
				No. of examined	No. of infected	%	No. of examined	No. of infected	%
A	100	5	5	30	3	10	70	2	2.9
B	50	1	2	15	-	0	35	1	2.9
Total	150	6	4	45	3	6.7	105	3	2.9

A: Assiut Governorate B: Sohag Governorate

* ($\chi^2 = 1.190$, $p = 0.275$)

Table 2: Sex distribution of *Trichinella spiralis* among pigs

Location	Males			Females		
	No. examined	No. of infected	%	No. examined	No. of infected	%
A	71	4	5.6	29	1	3.5
B	33	1	3	17	-	-
Total	104	5	4.8	46	1	2.2

A: Assiut Governorate B: Sohag Governorate

* ($\chi^2 = 0.576$, $p = 0.448$)

Table 3: Detection of trichinellosis in pigs

Location	No. of examined	Muscle digestion		Trichinoscopic examination	
		No. of infected	%	No. of infected	%
A	100	5	5	4	4
B	50	1	2	1	2
Total	150	6	4	5	3.33

A: Assiut Governorat B: Sohag Governorate * ($\chi^2 = 0.0944$, $p = 0.759$)

Table 4: Sex distribution of human trichinellosis

Location	No. of examined	No. of infected	%	Men			Women		
				No. of examined	No. of infected	%	No. of examined	No. of infected	%
A	62	42	67.7	5	3	60	57	39	68.4
B	30	14	46.7	11	6	54.5	19	8	42.1
Total	92	56	60.9	16	9	56.3	76	47	61.8

A: Assiut Governorate B: Sohag Governorate * ($\chi^2= 0.174, p= 0.677$)

Table 5: Age distribution of trichinellosis in human

Location	4 – <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.	%
A	14	11	78.5	45	30	66.7	3	2	66.7
B	5	1	20	20	8	40	5	-	-
Total	19	12	63.2	65	38	58.5	8	2	25

A: Assiut Governorate B: Sohag Governorate * ($\chi^2= 3.675, p= 0.159$)

DISCUSSION

In this study, the occurrence of *T. spiralis* among the examined pigs was 4.0% by using muscle digestion technique (Table 1). The obtained result coincides with the results obtained by El-Nawawy (1981) and considered higher than that recorded by Morsy *et al.* (2000). It was lower than those reported by Yassien *et al.* (1989). The difference in the reported prevalence rates are expected and attributed to difference in the localities, methods for detection, control measures applied as well as

management and feeding of pigs in such countries. Higher prevalence rate was detected in Assiut Governorate (5%) than Sohag Governorate (2 %) and may be attributed to the free rearing of pigs and feeding of pigs on food waste or garbage.

Trichinellosis was higher in pigs below 2 years (6.7%) than in pigs above 2 years (2.9%) and was not statistically significant (Table1). Similar finding was reported previously and attributed to the incomplete development of immune system of young pigs (Monroy *et al.*, 2001).

Trichinellosis was detected in 4.8% of males and 2.2% of females (Table 2) although the difference was not statistically significant. The obtained result coincides with Cowen *et al.* (1990). The higher resistance of females was attributed to the effect of female sex hormone (progesterone) which increases the parasitocidal effect of the leukocytes involved in the death of the newly born larvae (Nunez *et al.*, 2005).

Muscle digestion technique was more sensitive (4%) than the compression method (3.33%) (Table 3) however, the variation was not statistically significant. Our result coincides with the results obtained by El-Nawawy (1981). Conversely, it is considered higher than that recorded by Morsy *et al.* (2000) and lower than those reported by Yassien *et al.* (1989). Although trichinoscope is the technique that still used in the Egyptian abattoirs and many countries to detect trichinellosis and it offers the advantage that each pig is examined individually and the results can be obtained shortly after slaughtering, but it is less reliable in very mild infection and very difficult to demonstrate the non-encysted larvae. For this reason, it is recommended to use muscle digestion technique due to its better sensitivity.

Diagnosis of trichinellosis in human by using indirect ELISA test is the most sensitive test in comparison of other immunological tests like indirect haemagglutination, latex agglutination and indirect immunofluorescence. The sensitivity of the IgG-ELISA reaches 100% on the 50th day and the test remains positive for more than 2 years in 88% of the infected people (Morakote *et al.*, 1992). In this study trichinellosis was detected in 60.9% of the examined humans by using ELISA. The obtained prevalence was lower than that reported by Barennes *et al.* (2008) and higher than that obtained by Wang *et al.* (2006).

Results illustrated in (Table 4) reveal that women were more susceptible to infection (61.8%) than men (56.3%) however, it was not statistically significant. Similar finding were reported by De-la-Rosa

et al. (1998). On the contrary the obtained results disagreed with that obtained by Turk *et al.* (2006). Moreover, Wang *et al.* (2006) did not found significant effect of the patient's sex in the prevalence of *T. spiralis*.

A reverse relationship between the age of the examined patient and trichinellosis was reported in our study. Higher seroprevalence were recorded in young (63.2%) and middle aged (58.5%) groups while, it was 25% in patients aged above 40 years (Table 5) and it was not statistically different. The obtained results coincide with that reported by Wang *et al.* (1997). In conclusion, trichinellosis is considered a public health problem in Upper Egypt. Control of trichinellosis among human need prevention of illegal slaughtering of pigs outside slaughterhouses.

Acknowledgements: Great thanks to staff members of health center in Assiut Governorate and Sohag teaching hospital for their great help in selecting human cases.

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