

Worm Burden, Dispersion and Egg Count of *Echinococcus granulosus* in Stray Dogs of Mosul City, Iraq

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ABSTRACT

Worm burden, dispersion and egg count of *Echinococcus granulosus* were studied in Mosul city during 1997 to 1999. One hundred and twenty adult stray dogs were killed and necropsied for detection and determination of the actual number and dispersion of *E. granulosus* along the small intestine. Results revealed that worm loads ranged between 52 to 2000 worms with an average 1026 worm per dog. The commonest site of worms was the second third of the small intestine (75%), followed by the first third (20%). Few helminths were recovered in the last third which constituted 5% . The number of ova observed in the uteri of a gravid segment was 80 to more than 3000. The findings showed that 16.66% of the dogs harbour the cestode.

Echinococcus

granulosus

Echinococcus

	.1999 -1997		<i>granulosus</i>
.			(120)
	1026	2000-52	.
.%5			(%20)
.	3000	80	(%75)
.			%16.66

INTRODUCTION

Hydatidosis is a well-known helminthic disease of major public health and economic importance affecting human and various domestic livestock (Abdel-Hafez and Kamhawi, 1997). *E. granulosus* is a minute worm basically infects small intestine of the dog which represents the final host (see Abdullah and Jarjees, 1999). A bulk of studies has been conducted on the incidence of the disease in different animal species (see Tarish et al.,1986 ; Abdullah and Jarjees, 1999). In Baghdad, it was found that a stray dog may harbour 2-30000 worms (Babero et al.,1963), while, 10000 worms represent the highest number of parasite found in a single dog (Al-Tae et al.,1988). However, in Mosul, Abul-

Eis (1983) mentioned that 212-2500 helminths could be present in a stray dog. Studies on the distribution of the strobilate worm in the small intestine of a dog revealed its existence either in the first third (duodenum) (Smyth, 1967) or within duodenum and jejunum (Ajlouni et al., 1984). In Iraq, with the exception of Babero et al. (1963) work, dispersion and egg count of *E. granulosus* has not been tackled. However, the latter worker found that egg count of these worms ranged between 400 to more than 500 in a gravid proglottid. The current work determines worm burden, egg count as well as elucidates the dispersion of *E. granulosus* in the intestine of stray dogs killed in Mosul city.

MATERIALS AND METHODS

A total of 120 adult stray dogs of both sexes from different localities of Mosul areas were shot and necropsied over a period of three successive years (1997 – 1999). The whole small intestine of each dog was removed after tying at both ends. Additionally, the small intestine was subdivided into duodenum (the first 25cm part after pylorus); jejunum (the middle portion of the small intestine) and the ileum (the last 15 cm) as mentioned by Evans and Christensen (1979). Detection of worms was done under dissecting microscope in the fecal substance. Also, a hand lense was used to check for the presence of *Echinococcus* tapeworm in the epithelial lining of the intestine. The number of worms in each third of intestinal material and scrapping was counted immediately, and were collected and kept in separate jars. Collection of worms from the intestinal materials and scrappings was performed using precise forceps. They were kept in separate jars containing Hanks Balanced Salt Solution for 30 minutes at 37°C. The worms were subsequently immersed in 10% formalin, washed carefully with tap water. Later, the parasites were stained with Aceto-Alum Carmine, dehydrated in a series of ascending concentrations of ethyl alcohol cleared in xylol, and finally mounted in Canada Balsam. Identification of the worms was conformed to that verified by Kumaratilake and Thompson (1984). Releasing of eggs for counting was done by crushing a gravid segment of the worm on a slide, covering it with cover slip, then counting the ova under a lens of a high-magnified microscope as given in the literature (Abdullah, 1996).

RESULTS

The worms collected turned to be *Echinococcus granulosus* which was distinguished and well-identified by merely morphological criteria. It was found that the overall infection rate was 16.66% concerning worm burden, the number of worms recovered ranged between 52-2000 per dog with an average 1026 worms. Regarding to the dispersion of the worms, they were mainly observed in the second third *i.e.* “jejunum” (75%) then in the first third “duodenum” (20%).

In few cases, the parasites were encountered in the “ileum” (5%). The majority of the worms were found to be firmly attached to the intestinal mucosa. However, only few worms were free in the intestinal lumen or within contents. Differences in dispersion did not appear to be related to sex or age of the dog autopsied. Also, there was no significant relationship between the total number of worms recovered and the proportion in each intestinal segment. The number of eggs in the uteri of a gravid segment was 80 to more

than 3000. No obvious clinical signs were seen with respect to the number of worms obtained *i.e.* the dogs were apparently healthy.

DISCUSSION

The dog may act as a potential risk to human, particularly in case of harbouring parasites of anthro-zoonotic characters (Abdullah and Jarjees, 2001). The infection rate in the current study is 16.66% which represents relatively similar figure to the infection rates recorded in different parts of Iraq (Senekji and Beattie, 1940 ; Al-Khalidi et al.,1988). Admittedly, there is a great difference in the worm burden in the available literature. The mean worm load of this study was 1026 parasites. The obtained worm burden is relatively low when compared with other local and foreign studies. In Iraq, Babero et al.(1963) , Abul-Eis (1983) and Al-Tae et al.(1988) mentioned that the numbers of this cestode were 2-30000 ; 212-2500 and 10000, respectively. Universally, an infected dog may harbour 14493 (Soulsby, 1968) ; few to several thousands (Faust et al.,1975; Flynn, 1988) ; 30000 (Thornton and Gracey, 1976 ; Guarino et al., 1981) ; $4-5 \times 10^4$ (Macpherson et al.,1983) ; 200-more than 5×10^4 (Macpherson et al.,1985) ; 325-302000 (average 44700) (Gasser et al.,1988). The comparatively low burden in our country could mainly be attributed to the unavailable chances of the dog to get access into infected offals and raw meat. Burdens of *E. granulosus* are often heavy, no doubt due to large number of protoscolices ingested at a meal containing one or more hydatid cysts. In a heavily infected dog, the intestine is carpeted by tiny white, blunt projections, partially between the villi, the lesions may resemble lymphangiectasia (Flynn, 1988). The discrepancy in worm numbers is quite expected and accepted since several factors are involved which ultimately determine their number. The importance of the number of worms harboured by the host may refer to the number of eggs shed by the worms. Consequently, large number of helminths reflect large number of their ova and vice versa. Nevertheless, ther factors related to the dog's age, breed, susceptibility and condition may determine the intensity or degree of infection. In Jordan, a neighbouring country, worm load of *E. granulosus* recovered ranged from 5 to 400 per dog (Ajlouni et al., 1984) and 4484/dog (Kamhawi and Abdel-Hafez, 1995). Yamashita et al.(1956) found the adult *Echinococcus* in the intestine of dogs after 375 days in experimental infection. On the other hand, according to the World Health Organization (1959), the life of the tapeworm after maturity is limited to some six months.

As regards to the tapeworm dispersion, in spite of the fact confirmed by Macpherson et al. (1985) that the worms are usually located between 37 and 125 cm from the pylorus, there is some conflict in the available literature. Some veterinary authorities reported that the worm is restricted to the anterior third of intestine (Smyth, 1967 ; Faust et al.,1975; Thornton and Gracey, 1976). The forementioned workers explained that high existence of these worms in the upper duodenum is occurred following the action of pepsin in the stomach and the recent exposure to the bile. On the other hand, other studies have mentioned that the worm is confined to duodenum and jejunum (Yamashita et. al.,1956 ; Ajlouni et al.,1984). However, according to our findings, there is no effect of both the alteration of the pH of the intestine or the secretion of the bile, since the predominancy of the worms had occurred in the middle third of the intestine. Interestingly, in Iraq, Babero et al. (1963) found the cestode in the entire small intestine. However, Rausch and Schiller (1956) mentioned that the density of *E. granulosus*

increases posteriorly as far as the mid-ileum when it begins to decrease. Determination of the worm location within the small intestine provide better understanding to the life-cycle of the parasite which further determine suitable drug for perfect therapy and entire destruction. The association between worm count and portion of intestine was studied by Thompson and Eckert (1983) and Macpherson et al. (1985) who found that count of worm in segments of small intestine have usually yielded small number in the duodenum and ileum and large numbers in the jejunum. Also, Lymbery et al. (1989) found that the mean proportion of worms in each segment was 0.69 in the first (most anterior), 0.27 in the second and 0.03 in the third. Unhesitatingly, the present findings are quite similar to the notes deduced by other investigators.

Egg counts of *Echinococcus* was broadly demonstrated in several countries and was found to be 500 (Thornton and Gracey, 1976) ; 800 (Guarino et al.,1981). It should be borne in mind that in Baghdad, Babero et al. (1963) reported that the number of eggs in the uterus of a gravid segment was 400 to more than 500. Amazingly, according to Thompson (1986) the gravid proglottid of *E. granulosus* contains as many as 15000 eggs. Consequently, the attained number which was 80 to more than 300 is somewhat close to other studies.

In the current study, the worms were found firmly fixed to intestinal villi and mucosa. This note was also observed by previous researchers (Babero et al.,1963 ; Guarino et al., 1981).

In the present work, all dogs autopsied were evidently healthy, *i.e.* the worms did not cause serious disease. Nevertheless, Babero et al. (1963) ;Thompson and Eckert (1983) ; Macpherson et al. (1985) and Flynn (1988) urged that dogs infected with echinococcosis are apparently healthy.

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