Some Epidemiological Aspects of Hydatidosis of Lungs and Livers of Sheep and Goats in Quetta, Pakistan

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Abstract.- To determine prevalence, intensity and fertility r atio of hydatid disease in sheep and goats in the district of Quetta, a survey was conducted in Army Supply Corps abattoir between August 2001 and March 2002. Overall incidence of hydatid disease in livers of s heep and goats was 46.74 and 23.28%, while in lungs these were 17.37 and 13.68%, respectively. Intensity of the metacestode was higher in livers. Fertile cysts being 66.46 and 52.17% in sheep and goat livers, while 95.29 and 58.82% in sheep and goat lungs, respectively. The factors responsible for prevalence, intensity and fertility of hydatid disease are discussed.

Key words: Hydatidosis of lungs, hydatid disease in sheep and goat, zoonotic disease, Echinococcus, Quetta.

INTRODUCTION

Hydatidosis is an important economic and zoonotic disease, caused by metacestode of adult worms of the genus Echinococcus. It commonly develops in dogs, although several other carnivores can also act as definitive hosts; ungulates are the intermediate hosts (McManus and Smyth, 1986). Genus Echinococcus consists of four species, E. granulosus, E. multilocularis, E. vogeli and E. oligarthrus (Bowles et al., 1995). Thompson and Lymbery (1996) proposed three more species and their strains E. sp., E. ortleppi and E. equinus on the basis of host-parasite interaction and their probable geographical distribution. The dog-sheep cycle has been reported to be predominant for E. granulosus (Altintas et al., 1999).

Fertility of hydatid cysts is very necessary to be determined in surveys of hydatidosis, because it gives an idea about the diversity and level of threat in a particular area from different species of Echinococcus, especially the species that are dangerous for the general public. This paper reports some epidemiological aspects of hydatid disease in sheep and goats based on survey of slaughtered animals at Quetta, Pakistan.

RESULTS AND DISCUSSION

Incidence

In sheep, a total of 122 out of 261 livers examined were found infected with hydatidosis making overall percentage infection 46.74% (Table I). In Pakistan, lower incidence has been reported by different workers, such as 24% by Iqbal et al. (1986a), 8% by Hayat et al. (1986), 14.8% by Iqbal et al. (1989), 2.83% by Anwar et al. (1993), 15.9%
by Iqbal et al. (1995). All these workers studied the status of hydatidosis in the city of Faisalabad. Ellis et al. (1993) in southern and central Sierra of Peru, El-Metenawy (1999) in Saudi Arabia, and Mehrabani et al. (1999) in Shiraz, Iran found 6.5, 2.13 and 2.09% incidence, respectively, in livers. Nevertheless, high infection of 64% was reported by Moro et al. (1997) in central Peruvian Andes. Larrieu et al. (2001) found 50% sheep in Rio Negro province of Argentina whose livers were infected, whereas 29.4% showed involvement of both the lungs and livers.

Overall incidence of hydatidosis in liver of goats was 23.28%. Anwar et al. (1993) and Iqbal et al. (1995) in Faisalabad, Islam et al. (1995) in Bangladesh and El-Metenawy (1999) in Saudi Arabia though have reported lower hydatidosis, they did not report it separately for livers and lungs. They reported an overall infection of 0.43, 7.7, 11.13 and 2.13% respectively. Iqbal et al. (1989) found 5.9% infection in goats at Faisalabad; however, majority of them were in lungs. Sharkhuu (2001) observed a respective prevalence of 2 and 3% in goats of steppe and forest steppe-zones of Mongolia. Similarly, Mehrabani et al. (1999) reported 2.17% incidence in livers of goats.

In our study, a total of 41 (17.37%) out of 236 sheep lungs had hydatidosis. Hayat et al. (1986) reported 12% infection in lungs of goats of Faisalabad. They in addition also reported 4% animals having hydatidosis in both their lungs and livers. An 8.3% infection was reported by Ellis et al. (1993) from Central and Southern Sierra of Peru. A very low prevalence (2.68%) was reported by Mehrabani et al. (1999). Moro et al. (1997) from central Peruvian Andes however, reported a very high prevalence of 86%.

A total of 13 (13.68%) goat lungs were found infected out of 95 examined. Iqbal et al. (1986b) found 8% infection of hydatid disease in teddy goats of Faisalabad. Mehrabani et al. (1999) found even far lower infestation rate of 2.36% in lungs of goats in Shiraz, Iran. Iqbal et al. (1989) reported a prevalence of 5.9% in goats of Faisalabad, majority being in lungs (54.9%). In addition, they also reported 19.5% cases involving both lungs and livers. Iqbal et al. (1995) reported 7.7% hydatidosis in goat lungs and livers.

Intensity
Mean intensity of hydatid cysts in liver of sheep was 4 (range 1-28). However, in contrast, a very low mean intensity was found in goat liver i.e., 2 (range 1-6). Similarly, higher intensity of hydatid cysts was found in lungs of sheep compared with goats. They had, on an average, 2 (range 1-9) and 1 (range 1-2) hydatid cysts, respectively (Table I). El-Metenawy (1999) also found majority of cysts in the livers of ruminants. Nevertheless Mehrabani et al. (1999) found lungs of sheep and goats to be more infected than the livers. The intensity of hydatid cyst found by Hayat et al. (1986a) in sheep ranged between 1-17. Iqbal et al. (1989) categorized intensity in mild, moderate and extensive depending upon area of organ discarded due to hydatidosis. It was mild when one fourth of liver was condemned; moderate when half the organ was condemned and extensive when the whole organ was condemned. This way, they found mild, moderate and extensive infection in sheep and goat livers to be 52, 30, 18% and 62, 25, 13% respectively. Sheep lungs had 53% moderate, while 47% extensive infection. Goat lungs had 34, 35 and 31% mild, moderate and extensive infection respectively. Iqbal et al. (1989) found infection to be weak in lungs of 76% teddy goats of Faisalabad. In 20% infection was medium and in 5% it was high.

Fertility ratio of hydatid cysts
Overall prevalence of fertile, viable and nonviable hydatid cysts in sheep and goat livers was 66.46, 15.72 and 17.80%; and 52.17, 17.39 and 30.43%, respectively (Table I). Sheep and goat lungs, on the other hand, had 95.29 and 58.82% fertile, 3.52 and 41.17% viable and 1.17 and 0% nonviable hydatid cysts. Hence, fertile hydatid cysts were predominant in our study. However, in livers of sheep and goats nonviable hydatid cysts were more predominant than viable cysts. The reverse is true about lungs. Anwar et al. (1993) found high fertility ratio in sheep and goats. The fertility ratios were 80.95% (81.62% in lungs, 78.92% in liver) in sheep and 65.48% (69.53% in lungs, 55.96% in liver) in goats. Larrieu et al. (2001) studied that 63.8% of parasitized sheep presented viable hydatid cysts, 53.3% of which included fertile cysts. Gordo and Bandera (1998) observed over 80% viability of
Table I.- Overall prevalence, intensity and fertility ratio of hydatid cysts between August 2001 to March 2002.

<table>
<thead>
<tr>
<th>Organ</th>
<th>No. of organs examined</th>
<th>Hydatid cyst infection Number</th>
<th>Percent</th>
<th>Intensity Mean (Range)</th>
<th>Fertile cysts (%)</th>
<th>Viable cysts (%)</th>
<th>Nonviable cysts (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep liver</td>
<td>261</td>
<td>122</td>
<td>46.74</td>
<td>4 (1-28)</td>
<td>66.46</td>
<td>15.72</td>
<td>17.80</td>
</tr>
<tr>
<td>Goat liver</td>
<td>43</td>
<td>17</td>
<td>23.28</td>
<td>2 (1-6)</td>
<td>52.17</td>
<td>17.39</td>
<td>30.43</td>
</tr>
<tr>
<td>Sheep lungs</td>
<td>236</td>
<td>41</td>
<td>17.37</td>
<td>2 (1-9)</td>
<td>95.29</td>
<td>3.52</td>
<td>1.17</td>
</tr>
<tr>
<td>Goat lungs</td>
<td>95</td>
<td>13</td>
<td>13.68</td>
<td>1 (1-2)</td>
<td>58.82</td>
<td>41.17</td>
<td></td>
</tr>
</tbody>
</table>

Different factors responsible for the epidemiology of hydatidosis

The variance of data within different areas of a country is usually seen. As in Spain, Gordo and Bandera (1998) reported that infection varies between 5-80%. Accordingly, this variance depended upon origin of sheep. Moreover, other factors as control programmes and strategies also effect hydatidosis. An interesting situation was discussed by Larrieu et al. (2001), who studied hydatid control programme during 1980-1999 in the province of Rio Negro, Argentina, where they found that in sheep 81% prevalence level fell to 18.3% by the end of 20th years. Todorov and Boeva (1999) observed in Bulgaria the decline and rise in hydatidosis in human, sheep and dogs over three periods spanning 46 years. The different percentage infection seen by them were 41% in 1965-70, which decreased to 18% in 1972. However, increase was seen during 1981-85 and 1986-1991 to be 24 and 30%, respectively. The factor responsible for this decline and rise was discussed to be control strategies of the government.

A number of factors such as, extrinsic, socio-ecological and intrinsic factors have been discussed by Gemmell and Lawson (1986) to influence the domestic life cycle of taeniidae. Among extrinsic factors were environmental temperature, environmental humidity and agents to disperse eggs, from faeces into environment. Thompson (1987) suggested blowflies as a source of spreading E. granulosus eggs from dog's faeces to large areas. Among socio-ecological factors were farming practices, feeding behavior of domestic definitive and intermediate hosts, legislation and meat inspection etc., level of awareness of human population, dietary preferences of human population and level of hygiene of human population. Among intrinsic factors were biotic potential of parasite and...
Hydatidosis in human population is due to a number of other factors (ethnic/cultural factors, occupational factors, economic variables and husbandry practices and beliefs) (Schwabe, 1986). In the same literature it was discussed in reference to several workers that the status of E. granulosus got changed in some countries (Kuwait, Japan, Uganda, the United States) due to introduction or movement of livestock. One of the best instance of introduction and spread of E. granulosus is studied by Crellin et al. (1982). According to these workers, E. granulosus that got introduced from Australia via dogs (ref. in Crellin et al., 1982), resulted in spread in central Utah. Such factors as use of local people as herders played important role in prevalence of parasite in local human population. Transport of animals resulted in spread of parasite to some of the adjoining areas. The sheepdogs that move along sheep herds pass E. granulosus eggs all their way in faeces, hence causing pasture contamination. Schantz (1977) found that the local Indian tribesmen in Arizona and New Mexico had close contacts with sheep herds. The situation in Pakistan is not very different from findings of these workers. In a survey, the different socio-cultural factors observed by Iqbal et al. (1997) were that most people are unaware of hydatid disease, and have close contacts (especially children) with dogs. It is mostly in this age that the infection with the parasite takes place, while the symptoms appear several years later; mostly around 25 years of age (as observed by Altintas et al., 1999 in Turkey). Dogs are essential for shepherds to control their livestock. Illegal slaughter especially in villages, unhygienic disposal of offal and most importantly the practice of feeding discarded organs to dogs were discussed by Iqbal et al. (1997) to be common practice in Pakistan. The reason for lack of slaughterhouses was given by Mittendorf (1978) to be their being economically unsuitable in developing countries, which is the opposite of situation in developed countries. Herlich (1978) emphasized prevention of grazing field contamination for helmint control, and also use of new and stronger drugs against them. It is also necessary to know other important helmint fauna of the area where control strategies have to be taken, since some parasites induce positively the existence of other parasites. As Jenkins (1998) saw one instance of survival of E. granulosus worms in a dog despite drug dosage. That dog also carried another cestode (Spirometra erinace) that needs higher dosage of the same drug. Presence of this parasite was considered a reason for the survival of the sixty E. granulosus worms in the intestine of host.

The life cycle of E. granulosus may involve sheep, cattle, pigs, goats, camels, buffaloes or horses (Gemmell and Lawson, 1986), but there are situations where E. granulosus occurs naturally without involving domestic animals. Such a situation was discussed by Thompson (1987) in western Australia, where 0.2% endemicity in sheep and 1% in cattle suggested that the area might be of low endemicity. Nevertheless, due to involvement of dingo-kangaroo life cycle a high prevalence was seen in kangaroos and feral pigs. Jenkins and Thompson (1995) by experimentally infecting wild rabbit in laboratory also suggested that they might play important role in epidemiology.

To conclude, the prevalence of hydatidosis in lungs and livers of sheep and goats in Quetta is high. Moreover, high intensity of cysts and their fertility ratio in sheep suggest the predominance of sheep strain in the country.
HYDATIDOSIS IN SHEEP AND GOATS OF QUETTA

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