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Hydatidosis Infection Study in Human and Livestock Populations During 2002-2007

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Abstract: Aim of this study is to determine prevalence of hydatidosis infection in human and livestock populations during recent five years (2002-2007) and to propose guidelines for prevention and control of it. In this analytical-descriptive study, rate of infection to hydatid cyst in slaughtered livestock in 28 provinces of Iran (in term of detected infected organs) and also prevalence of human hydatidosis in mentioned provinces were evaluated and analyzed epidemiologically in the five year period. Average rate of infection to hydatid cyst in slaughtered livestock was determined as 6.73%. 4,298,882 livers and lungs in 63,851,561 slaughtered animals were taken out from consumption cycle due to hydatid cyst infection. Lung infection was 1.8 times more than liver one. Among 28 studied provinces, Khorasan and Yazd with 18.71% and 2.4% ranked highest and lowest infection rates respectively. In addition, economic damage caused by omitting infected organs in this five-year period was estimated to be about 17 million US dollars. Average prevalence of human hydatidosis during years 2002 to 2007 was determined 0.61 (in each 100,000 persons). Khorasan province with 615 cases out of 2083 ones (29.52%) and Hormozgan province without any cases took the first and the last positions respectively. Health and economic significance evaluations and epidemiologic studies for each infection are the first steps for prevention and controlling and also a confident starting point for facing with infection. Livestock hydatidosis has been endemic in Iran and have had an ever-increasing rate during studied five-year period. As this infection is zoonose disease, proposed suggestions could be useful.

Key words: Hydatidosis · Hydatid Cyst · Iran · Prevalence Rate

INTRODUCTION

Hydatidosis is a zoonotic infection that has a significant position among parasite infections. It has spread all around the world but more prevalent in South Europe, Mediterranean Borders, Middle East, East Africa, Australia, New Zealand, Latin America and generally where people ranch livestock and use dogs to protect their animals. It is also prevalent in some Asian countries like Jordan, Syria, Iraq, Saudi Arabia and as a zoonose endemic infection in Iran. In traditional ranching in Iran, sheepdogs always live beside the cattle and unfortunately no matter of health is obeyed about them so mentioned parasite can grow among dog races (main host), cow, sheep and goat (mid-host) and humankind (chancy mid-host) [1].

Hydatid cyst is the larva stage of Echinococcus granulosus worm in the shape of a multilayered cyst, full of fluid and brood capsules containing protosculex on its inner walls. Among hosts, rambling dogs play a big role in spreading the infection due to their high population and lack of health controlling by veterinary services. E. granulosus eggs are defecated by dung of final hosts and live for some months in humid soil. Mid-hosts (generally sheep, goat and cow) get infected by eating them. Then, membrane of eggs are torn in intestine and spread all around the body especially livers, lungs etc. by means of blood current and gradually grow up there. If these mid-hosts (sheep, goat and cow) or their infected organs are eaten by dog races, mentioned cyst is torn in duodenum, its embryo fetus are stuck to the walls of narrow intestine and grew adult. Finally with the birth, life cycle of parasite continues. If the mid-host is humankind, life cycle of parasite does not continue because infected organs of human being are usually out of reach of dog races. Humankind cyst infection is caused from mouth due to eating green, food, and drinking water that contains dung of a dog infected to the E. granulosus [2]. Based on Food and Agricultural Organization (FAO) report, economicdamages caused by

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parasite infections in developed and developing countries are respectively 16% and 30% of their whole livestock production and it is even more in countries where there is no serious prevention policy against parasite infections. As 75% of world populations live in developing countries and they possess 65% of tame animals, economic damages are more serious [3]. These damages of parasite infection are not limited to livestock productions such as infected organs, milk reducing, loosing weight, low quality of meat, pregnancy rate decreasing, wool production decreasing etc. It also includes infection diagnosis costs, working incapability costs and many other damages [4].

In some countries including Iran, slaughterhouse investigations are used as valuable resources for epidemiologic evaluation of some infections such as parasite ones. Slaughterhouses are the sole and the best place for estimating rate of infestations such as hydatidosis. Liver and lung complications can be detected by gross examination [5]. Based on this detection, these infected organs are brought out from the consumption cycle. Being endemic in human and livestock population of Iran, it is of prime importance to conduct epidemiologic studies for evaluation of hydatidosis prevalence status in order to control and prevent spreading of this zoonotic infection. This is the first epidemiologic study to determine prevalence rate of human and livestock hydatidosis in Iran.

MATERIALS AND METHODS

This analytical-descriptive study is conducted in a five-year period from 2002 to 2007. In this study, all data related to livestock slaughters in 28 provinces of Iran were gathered from Veterinary Organization of Iran and through these data; daily records of hydatid cyst infection during studied period were extracted out. Annual slaughters and hydatid cyst infected lungs, livers were counted, and average infection rate in each year was determined. In order to determine human hydatidosis in this period, required data about infection prevalence rate (per each 100,000 persons) were gathered from health and treatment centers of various provinces and Disease Control Center of Ministry of Health. Gathered data were evaluated and analyzed.

RESULTS

In this five year period, 63,851,516 livestock (56,521,362 sheep and goats, 7,330,154 cows) were slaughtered in slaughterhouses of Iran and 3,505,308 lungs and livers of sheep and goat (6.21%) and 793,574 (10.82%) lungs and livers of cow were taken out from consumption cycle because of hydatid cyst infection. From 4,298,882 hydatidosis infected organs, 2,764,984 (4.33%) of all were lungs and 1,533,898 (2.4%) were livers. This indicates that cyst infection in lungs were 1.8 times more than livers (Table 1).

As indicated in Table 1, average infection percentage for slaughtered livestock group during five years of this study is 6.73% and infection rate in this period had an increasing trend. In 28 studied provinces, most infection rate was observed respectively in Khorasan (18.71%), Semnan (13.29%), East Azerbaijan (12.61%), Mazandaran (11.21%) and lowest rate was observed in Yazd (2.40%), Kermanshah (2.41%), Qazvin (2.71%) and Kerman (2.95%) respectively (Table 2). Economic damage caused in this period due to taking out infected organs from consumption cycle was estimated about 17 million US dollars. On the other hand, all recorded and reported human hydatidosis cases during 2002 to 2007 were 2083 ones in Iran which means 0.61 in each 100,000 persons (Table 3). In study period, the year 2002 had the highest infection incidence rate and contrary to livestock hydatidosis, human one had a decreasing trend. Highest human infection rate were observed respectively in Khorasan (615 cases), Tehran (338 cases), Isfahan (167 cases), Hamedan (124 cases) and the lowest rates

Table 1: Contamination Rate to Hydatid Cyst in Slaughtered Animals (cow and sheep) Form Iran (2002-2007)

Year	N. Contamination Longs To Hydatid Cyst	N. Contamination Liver To Hydatid Cyst	Total N. Slaughtered Animals	Percent	Total
2002	417/900	236/596	10/781/324	6.07	654/496
2003	443/338	243/936	11/054/800	6.21	687/274
2004	578/748	335/248	14/503/248	6.30	913/996
2005	499/586	279/406	11/746/634	6.63	778/992
2006	825/412	438/712	15/765/410	8.01	1/264/124
Total	2/764/984(%4/33)	1/533/898 (%2/40)	63/851/516	6.73	4/298/882

Table 2: Contamination Rate to Hydatid Cyst in Slaughtered Animals Form Iran Provinces (Percent) During (2002-2007)

	Province															
Year	E. Azarbayjan	W Azarbayjan	Semnan	Isfahan	Ilam	Boshehr	Tehran	Charmahal	Zanjan	Khosestan	Sistan o Khorasan	Ardabil	Balochestan	Fars	Qazvin	Qom
2002	10.86	9.66	14.79	4.86	4.99	7.02	5.03	6.03	4.27	6.15	16.24	4.36	6.64	4.10	1.80	10.30
2003	14.46	7.87	7.33	5.35	4.50	3.77	4.69	7.28	4.16	8.12	20.13	4.77	7.37	2.86	1.99	9.36
2004	15.34	9.30	13.45	6.16	3.80	2.79	5.07	5.77	5.26	4.71	18.26	4.55	3.18	4.71	2.53	7.18
2005	5.48	12.51	15.76	9.13	5.66	3.57	4.53	6.04	4.83	5.33	19.36	4.55	4.48	5.04	3.54	7.14
2006	16.94	7.86	15.15	12.56	5.69	9.89	5.82	10.27	5.80	5.57	19.57	5.10	5.92	5.18	3.72	5.05
Mean	12.61	44.00	13.29	7.61	4.92	5.40	5.02	7.07	4.88	5.97	18.71	4.66	5.51	4.26	2.71	7.80

Continued

	Province												
Year	Kordestan	Kerman	Kermanshah	Kohkiloyeh	Golestan	Gilan	Lorestan	Mazandaran	Markazi	Hormozgan	Hamedan	Yazd	Total
2002	4.66	2.40	2.11	6.04	8.76	6.88	8.61	11.15	5.93	3.46	6.94	1.53	6.07
2003	4.72	2.61	2.03	9.03	9.45	13.79	10.20	10.80	4.73	3.39	6.32	2.88	6.21
2004	7.51	2.56	2.40	17.45	8.17	6.39	9.33	13.35	3.92	3.84	7.18	2.51	6.30
2005	4.56	3.48	2.89	15.82	9.93	7.11	4.26	10.60	7.18	3.84	5.67	2.33	6.63
2006	5.13	3.34	2.64	11.87	7.95	9.29	6.23	10.15	8.04	4.14	5.01	2.76	8.01
Mean	5.31	2.95	2.41	10.04	8.85	8.69	7.72	11.21	5.96	3.73	6.22	2.40	6.73

Table 3: Number of Reports Cases and Incidence Rate of Hydstidosis Iran (2002-2007)

Year	N. Reported Cases	Incidence Rate (per 100000 population)
2002	470	0.72
2003	429	0.62
2004	414	0.60
2005	406	0.59
2006	364	0.54
Total	2083	0.61

Table 4: Number of Reports Of Hydstidosis According Different Provinces (2002-2007)

	Province															
Year	E Azarbayjan	W Azarbayjan	Semnan	Isfahan	Ilam	Boshehr	Tehran	Charmahal	Zanjan	Khosestan	Sistan o Khorasan	Ardabil	Balochestan	Fars	Qazvin	Qom
2002	15	11	7	49	2	0	62	5	0	20	137	14	1	21	1	6
2003	3	10	14	44	0	2	85	11	12	8	75	16	0	48	10	5
2004	11	13	9	31	0	1	61	5	16	11	104	15	1	40	16	10
2005	16	6	12	18	1	0	50	6	11	20	170	14	5	14	3	3
2006	16	6	1	25	0	0	80	3	7	16	129	7	4	22	3	5
Total	61	45	43	167	3	3	338	30	46	75	615	66	11	150	33	29

Countinued

	Province													Incidence Rate (per 100000
Year	Kordestan	Kerman	Kermanshah	Kohkiloyeh	Golestan	Gilan	Lorestan	Mazandaran	Markazi	Hormozgan	Hamedan	Yazd	Total	population)
2002	5	1	8	1	2	13	13	10	25	0	29	7	470	0.72
2003	6	0	4	0	3	10	10	7	12	0	31	1	429	0.62
2004	5	0	5	0	0	2	6	6	16	0	31	0	414	0.60
2005	8	0	10	0	0	3	2	3	8	0	22	1	406	0.59
2006	4	2	6	1	2	3	0	4	7	0	11	0	364	0.54
Total	28	3	33	2	5	31	33	30	68	0	124	9	2083	0.61

were reported with respect in Hormozgan (no cases), Kohkilooyeh and Boye Ahmad (two cases) and Booshehr, Ilam and Kerman (three cases) (Table 4).

DISCUSSION

Zoonotic diseases are a significant part of diseases and play a big role in human health. Number of infected patients to worms all around the world and children infected to worms in USA are estimated to be 4.5 milliard and 55 million persons respectively [6]. Health and economic significance evaluation of every disease is the first step towards determination of preferences and plans for disease control and prevention. Hydatidosis is a parasite zoonose caused by the larva life stage of E. granulosus [2]. Infection controlling primarily requires enough information about infection spreading templates in endemic regions, which has become somehow complicated due to parasite subgroup variety. Hydatid cyst causes a serious infection in mankind and would have uncompensatory damages. Considering its medical and economic significance, it is necessary to conduct epidemiologic studies about infection prevalence in livestock and human populations and to design plans for controling and preventing it.

Statistics of livestock slaughters are gathered daily and sent to Veterinary Organization of Iran by Provincial Veterinary Institutes. These institutes were sources of this study to determine prevalence of livestock hydatidosis [7]. Although there might be some faults in data gathering but we can say that slaughterhouses are the sole and best places for infestation rate estimation because infections like hydatidosis, Fascioliasis, Dichroceliosis, Tuberculosis, lung lesions etc. can be detected by gross examination and based on it, infected organs are taken out from consumption cycle [5]. Information about human hydatidosis were gathered through provincial health and treatment centers and Disease Control Center of Ministry of Health as the sole certified units collecting such data [8]. Results of this investigation demonstrate that prevalence of livestock hydatidosis during years 2002 to 2007 had an increasing rate. Average infection rate during 2002 turned from 6.07% to be 8.01% during 2007 (Table 1) and this could be a warning for Veterinary Organization. It is also found that hydatidosis prevalence in Iran was more than Iraq [9] and Jordan and Syria [10].

Some studies have been conducted on hydatid infection rate in livestock population of various regions and economic damages of hydatidosis in Iran such as Noorjah [4], Sharifi [11], Bokaie and Rokni [12], Taghizadeh and Hoshiar [3], Dalimi *et al*. [13] and Ansari [14] but no comprehensive epidemiologic investigation have been done on comparison between livestock and human hydatidosis during a specific period of time. Average prevalence of hydatidosis among slaughtered sheep and cows in slaughterhouse of Lavasan, Tehran were 8.1% and 12% respectively [12] which in both animals infection rate were higher than that of this study (6.21% and 10.82%). In the other study on 4664 livers in slaughterhouse of Semnan Province, infection rate was reported 4.65% while our study shows that average infection rate in slaughtered livestock of mentioned province in recent five years was 13.29% [11] (Table 2).

Based on findings of this investigation, contrary to livestock hydatidosis, that of human has a decreasing trend in studied five years. Recorded cases are reduced from 470 ones (0.72 in each 100,000 persons) in 2002 to 364 cases (0.54 in each 100,000 persons) in 2007 and this trend shows paying more attention of Ministry of Health to of infection control and prevention or paying less attention of Veterinary Organization to infection control in livestock and sheepdogs or probably lack of mutual cooperation between these two organizations.

According to this study, highest rate of livestock and human hydatidosis prevalence has occurred in Khorasan Province (Tables 2 and 4) and this shows that prevalence of hydatid cyst in livestock of a region is dangerous and can end to infection prevalence among human population of that region. In Hormozgan, Kerman, Ilam and Booshehr Provinces, prevalence of hydatidosis rate have almost low (Tables 2 and 4).

Being endemic in Iran, causing many economic damages annually and being a zoonotic infection, below directions are recommended to control and prevent hydatidosis infection.

- Killing rambling dogs
- Preparing identity card and collar for dogs
- Treatment of infected dogs with anti-parasite medicines (especially sheepdogs)
- Preventing illegal slaughtering, making healthy slaughterhouses and fencing them (not to allow rambling dogs enter to the field of slaughterhouses)
- Public health learning trough radio, TV etc. and teaching livestock holders and people who are at risk
- Periodic epidemiologic investigations

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