Letter to the Editor

Analysis on Serum Trace Element Levels of Echinococciasis Patients in Garze Tibetan Autonomous Prefecture in Sichuan, China, 2011*

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In Garze Tibetan autonomous prefecture in Sichuan province, China, 41 echinococciasis patients who had received surgical treatment were recruited in the study, and 82 health persons who had lived in Garze for at least 10 years were selected as controls. The serum levels of Zn, Se and Cu of the cases and controls were detected. The results showed that most echinococciasis cases were distributed in Shiqu county (17.1%, 7/41), and only 1 case was distributed in Yajiang county (2.4%). The male to female ratio of the cases was 1:1.56. The echinococciasis patients were mainly aged 30-39 years (36.59%, 15/41). And, the cases aged 20-49 years accounted for 68.29% (28/41). Compared with health controls, the serum levels of Zn and Se of the cases significantly declined. However, the serum level of Cu of the cases had no significantly change. It was confirmed that the serum levels of Zn and Se were interrelated with the prevalence of echinococciasis.

Echinococciasis, hydatid disease, is a serious zoonosis caused by the ingestion of eggs of echinococcus. The disease is worldwide distributed and can cause serious financial loss[1]. In China, it is mainly distributed in western provinces (autonomous region), i.e. Xinjiang, Tibet, Sichuan, Qinghai, Yunnan, Gansu, and Ningxia. According to the survey of major human parasitic diseases in 2004, the prevalence of echinococciasis were very high in some provinces. The average infection rate and the serum positive rate were 1.1% and 12.0% respectively in the disease endemic areas. Garze, a Tibetan autonomous prefecture of Sichuan province, is one of areas with high prevalence of echinococciasis, where 78.8% of the population (737,000 persons) might be affected by the disease. The case number in Garze might be 94,000[2].

Liver, as an important metabolic organ, is the parasitic site of echinococcus. Meanwhile, it is the site where trace elements are stored and metabolized. Zinc (Zn), selenium (Se), copper (Cu), iron (Fe), and magnesium (Mg) are important trace elements. The changes of levels of the 5 trace elements can influence people's immunologic function and the infection status of parasite[3]. Recently, more researchers have studied the relationship between trace elements and echinococciasis. But, the reports about the change of serum levels of trace elements in Tibetan are limited. In this study, we analyzed the data of echinococciasis patients in Garze. But, due to the lack of detection devices, only the serum levels of Zn, Se, and Cu of the echinococciasis patients were evaluated in our study.

In 2011, 41 echinococciasis patients who had received surgical treatment were selected to be the subjects of the study, all the patients were confirmed through B-ultrasonic examination in 2010. The control group were the healthy people matched by age, sex and area, and all of them had lived in Garze for at least 10 years. The case to control ratio was 1:2. All the cases were the patients in Garze Prefecture People's Hospital, and were confirmed by Garze Prefecture Center for Disease Control and Prevention. All the study protocols were approved by the Ethical Committee of Garze Prefecture Center for Disease Control and Prevention.

Blood samples (5 mL) were collected from the

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cases and controls with coagulant and centrifuged at 1800 g for 10 min. The serum were collected and stored at -20 °C.

Put 10 mL glass pipes in high concentration acid overnight, and they were cleaned and dried. Then, they were put in 10% nitric acid overnight, and washed with deionized water for 3 times. After drying. 0.5 mL serum was taken and fixed in 2 mL diluents (nitric acid: perchloric acid=4:1), heated at 120 °C until white crystal appeared in pipes. The white crystal was dissolved in 1% nitric acid, transferred in other glass pipe. After than, the nitric acid was added to 10 mL and mixed it. 50 μL mixed liquor was detected in influorescence photometer for Se. And, another 30 μL mixed liquor was detected in atomic absorption spectrophotometer for Cu and Zn.

The data of living area, sex and age of the cases were analyzed with descriptive statistical methods. The data of the Zn, Se, and Cu serum levels were analyzed with *t* test with software SPSS.

The 41 echinococciasis cases were distributed in 9 counties, i.e. Baiyu, Seda, Shiqu, Garze, Xinlong, Litang, Dege, Daofu, and Yajiang. The case number was highest in Shiqu (7 cases, 17.1%), followed by Dege (6 cases, 14.6%), Baiyu (6 cases, 14.6%), Litang (6 cases, 14.6%), Garze (5 cases, 12.2%), Seda (4 cases, 9.8%), Xinlong (3 cases, 7.3%), Daofu (3 cases, 7.3%), and Yajiang (1 case, 2.4%) (Table 1).

In the 41 echinococciasis cases, 16 were males (39%), 25 were females (61%). The male to female ratio of the cases was 1:1.56.

The echinococciasis patients were divided into 7 age groups. The oldest patient was 60 years old, and the youngest patient was 6.6 years old. Fifteen patients were aged 30-39 years (36.59%). And, the patients in age group 20-49 years accounted for 68.29% (Table 2).

In this study, the serum levels of Zn, Se, and Cu of the echinococciasis patients were different. The serum levels of Zn and Se of the case group declined, but no change was observed in the serum level of Cu, which were 6.928±1.2374, 0.003±0.0005, and 1.576±0.0194 respectively, and the serum levels of Zn, Se, and Cu in the control group were 13.193±1.9458, 0.008±0.0001, and 1.860±0.1098 respectively. The serum levels of Zn and Se of the case group were significantly lower than those of the control group ($P<0.05$). But, the serum level of Cu of the case group was similar to that of the control group ($P>0.05$) (Table 3).

There is also an important relationship between trace element and parasite infection. Many parasites can reduce the levels of trace elements of host, such as Zn, Se, and Cu[4], the body might need more trace element when infected with parasite. Parasite also need trace element to growth. So, it is maybe a new cure method for parastie disease. As an important parasite, the growth and development of echinococcus cyst would absorb trace element from host. So, the serum level of Zn and Cu of echinococciasis patient is lower than in echinococcus cyst fluid[5]. However, Zn can cause the oxidative stress response in echinococciasis patient body, and the serum level of Zn of camel infected with echinococcus cyst is lower than that of healthy camel[6]. But, the serum level of Cu would increase after the infection of echinococcus cyst. This might be explained by that echinococus cyst can cause the anemia of host body[7]. But, the serum level of Cu can increase with the infection time[8].

In this study, the data of 41 echinococciasis patients in Garze were analyzed in 2011. The cases were mainly distributed in Shiqu, Dege, Baiyu, Litang, and Garze counties, accounting for 73.1% of the total.

The number of echinocociasis patients was highest in Shiqu (17.1%), which is consistent with the distribution of the disease[4]. In the 41 echinococciasis patients, 16 were males (39%), 25 were females (61%). The male to female ratio of the cases was 1:1.56, which might be explained by the Tibetan production habit. Tibetan women are usually engaged in animal raising and housework, they have more contacts with dogs. So, they are prone to be infected with echinococcus cyst[3]. The echinococciasis patients were mainly aged 30-39 years (36.95%), similar to the finding in a previous study[4]. The patients were mainly labor people. They had more opportunities to be infected with echinococcus cyst during the working time. Due to the lack of early diagnosis of echinococciasis, young patients infected with echinococcus cyst could not be found[9]. This is why there were more echinococciasis patients who had received surgical treatment in Ganzi. In this study, the serum levels of Zn and Se of the echinococciasis patients in Garze significantly declined compared with the healthy people, which was consistent with the result of a previous study[10]. But, no change was observed in the

Table 1. Area and Sex Distribution of Echinococciasis Cases in Garze, 2011

Sex	Baiyu		Seda		Shiqu		Xinlong		Litang		Dege		Daofu		Yajiang		Garze	
	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %
Male	2	33.3	3	75.0	3	42.9	1	33.3	3	50.0	3	50.0	1	33.3	0	0	0	0
Female	4	66.7	1	25.0	4	57.1	2	66.7	3	50.0	3	50.0	2	66.7	1	100	5	100
Total	6	14.6	4	9.8	7	17.1	3	7.3	6	14.6	6	14.6	3	7.3	1	2.4	5	12.2

Table 2. Age Distribution of Echinococciasis Cases in Garze, 2011

County	Age Groups													
	0-		10-		20-		30-		40-		50-		60-	
	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %	Cases	Ratio %
Baiyu	0	0.00	2	4.88	2	4.88	1	2.44	0	0.00	1	2.44	0	0.00
Seda	0	0.00	0	0.00	0	0.00	2	4.88	1	2.44	1	2.44	0	0.00
Shiqu	1	2.44	0	0.00	2	4.88	2	4.88	1	2.44	1	2.44	0	0.00
Xinlong	0	0.00	0	0.00	0	0.00	3	7.32	0	0.00	0	0.00	0	0.00
Litang	0	0.00	1	2.44	2	4.88	3	7.32	0	0.00	0	0.00	0	0.00
Dege	0	0.00	1	2.44	1	2.44	2	4.88	1	2.44	0	0.00	1	2.44
Daofu	2	4.88	0	0.00	0	0.00	1	2.44	0	0.00	0	0.00	0	0.00
Yajiang	0	0.00	0	0.00	1	2.44	0	0.00	0	0v	0	0.00	0	0.00
Garze	0	0.00	2	4.88	1	2.44	1	2.44	1	2.44	0	0.00	0	0.00
Total	3	7.32	6	14.63	9	21.95	15	36.59	4	9.76	3	7.32	1	2.44

Table 3. Serum Levels of Trace Elements of Echinococciasis Patients and Healthy People

Trace Elements	Echinococcus Cases ($\bar{x}\pm s$)	Healthy People ($\bar{x}\pm s$)
Zn	6.928±1.2374	13.193±1.9458*
Se	0.003±0.0005	0.008±0.0001*
Cu	1.576±0.0194	1.860±0.1098

Note. *P<0.001.

serum level of Cu of the echinococciasis patients, suggesting that Zn and Se are important trace elements for the treatment and prevention of echinococciasis, but the role of Cu in the process of echionocciasis is unclear. The change of trace element might be due to host resistance to ehcinococcus cyst, or the growth of echinococcus cyst by absorbing trace element and despoiling trace element. The reduction of trace element can cause the reduction of peroxidase in phagocyte, resulting in the lethality of peroxidase. The synthesis of host antibody is inhibited. And, host immunologic function decline. Then, immune organs and anti-parasitic capacity are also reduced[10]. But, the research about the relationship between trace element and echinococciasis are limited, so, the study on the role of trace elements in survival and development of echinococcus cyst and the intensified dose of trace elements in the prevention and treatment of echinococciasis are needed. Also, the influence of trace elements on host immune function is unknown. The evaluation criteria and standard of the level of trace elements in populations in different areas are different. Therefore, related research might find new ways to prevent and treat echinococciasis.

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