

# EPIDEMIOLOGIC CHARACTERISTICS OF *CLONORCHIASIS SINENSIS* IN GUANDONG PROVINCE, CHINA

Fang Yue-Yi

Guandong Institute of Parasitic Diseases, Guangzhou, People's Republic of China

**Abstract.** Extensive survey of the distribution of the liver fluke *Clonorchis sinensis* in Guandong Province, China, has revealed high frequencies in human populations in some areas and absence in others. The distribution relates in part to the demography of first and second intermediate hosts and animal reservoir hosts, but it relates more clearly to the differing food habits of various populations in particular geographic areas. Thus clonorchiasis is concentrated in the Zhu Jiang (Pearl River) delta and along the Han Jiang (Han River) but is absent in the Leizhou Peninsula and in the western region of the province. Males tend to have higher infection rates than females. Age distribution is not uniform: in some communities infection rates increase with age where adults eat raw or undercooked fish, while in other infections reaches its peak in early teenage children and declines thereafter where children eat small raw fish but the habit does not persist into adult life. While there is some evidence that high *C. sinensis* rates correlate with high liver cancer rates and vice versa, this issue requires in depth investigation at community level to differentiate hepatocellular carcinoma and early cholangiocarcinoma, since it is possible that *C. sinensis* infection promotes higher risk of the latter form of liver cancer.

## INTRODUCTION

Clonorchiasis *sinensis* is an epidemiologic zoonosis. The organism was first discovered in the bile passages of a Chinese carpenter's corpse in Calcutta, India, in 1875. Other cases were reported in Chaozhou, Chaoyang and Guangzhou in 1908. A large number of eggs were found in the feces of a Ming Dynasty corpse buried in 1513 in the eastern suburbs of Guangzhou. This discovery provides evidence that the disease has been prevalent for more than 500 years in Guandong Province.

During 1973 - 1991 an epidemiologic survey was carried out in 95 counties and cities in Guandong Province. This paper gives a summary of the results of this survey.

## MATERIALS AND METHODS

This survey utilized methods similar to those employed in the national survey of parasitic diseases in China described elsewhere (Yu *et al.* 1994).

## RESULTS

### Epidemiologic features

Sixty-two counties/cities were found to be en-

demic areas for *C. sinensis*. The endemic distribution was along the Zhu Jiang (Pearl River) and the Han Jiang (Han River) but the parasite was absent from the Leizhou Peninsula and from the western part of Guandong Province. A total of 16.2% of the population studied (110,176/680,671) were infected with *C. sinensis*. The infection rates in the Zhu Jiang delta, the upper reaches of the Zhu Jiang and the Han Jiang valley were 21.1%, 4.4% and 5.1%, respectively (Tables 1, 2, 3). There was a significant difference ( $p < 0.01$ ) between the incidence in the first and the latter two areas.

The first intermediate hosts of *C. sinensis* were *Parafossarulus striatulus*, *Alocinma longocornis* and *Bithynia fuchsionus*, with overall cercaria positive rates of 2.1% (365/1,7400), 2.7% (167/6,258) and 06% (2/335) (Table 4). Ten species of fresh water fish (*Ctenopharyngodon idellus*, *Mylopharyngodon piceus*, *Aristichthys nobilis*, *Hypophthalmichthys molitrix*, *Cyprinus carpio*, *Carassius aruatus aruatus*, *Rectoris posehensis*, *Rhodeus sinensis*, *Pseudorasbora parva*, *Hemibarbus labeo*) were found to be second intermediate hosts and their average metacercaria positive rate was 27.1% (1,610/5,947). Cats, dogs, pigs and mice were found to serve as the main reservoir hosts of the parasite. Their adult positive rate were 58.0%, 41.8%, 16.8% and 7.9%, respectively, while egg positive rates of cats and dogs on fecal examination were 41.5% and 16.7% respectively.

Table 1  
Survey on Clonorchiasis sinensis in Han Jiang drainage basin (1973 - 1987).

Counties or cities	No. of localities	No. of exam	No. of positive	Positive rate (%)	Year
Wuhua	3	6,264	991	15.8	1973 - 1982
Xingning	3	6,119	562	9.2	1973 - 1982
Pingyuan	4	4,203	78	1.9	1973 - 1982
Jiaoling	24	51,259	2,174	4.2	1973 - 1982
Meixian	7	17,166	831	4.8	1973 - 1982
Meizhou	2	820	15	1.8	1980
Dapu	5	2,958	5	0.2	1973 - 1982
Fengshun	5	1,546	1	0.1	1973 - 1978
Chaoan	4	2,684	236	8.8	1981 - 1984
Chaozhou	1	871	36	4.1	1983
Shantou	2	876	5	0.6	1982 - 1984
Raoping	1	503	40	8.0	1983
Jieyang	1	487	3	0.6	1983
Puning	1	506	2	0.4	1983
Chenghai	1	688	9	0.9	1987
Nanao	1	500	1	0.2	1987
Jiexi	1	412	1	0.2	1987
Total	66	97,862	4,987	5.1	

A sampling survey in 14 counties in the Leizhou Peninsula and surrounding areas failed to find cercaria positive first intermediate hosts, metacercaria positive second intermediate hosts or animal reservoir hosts and no infected humans were found among 7,537 persons examined.

#### Sociology of infection

The major routes of infection in humans were: (a) eating raw sliced fish, (b) eating undercooked fish, and (c) eating other foods contaminated with metacercaria. In the Zhu Jiang delta and in the lower reaches of the Han Jiang people have the habit of eating raw fish slices. Of 3,946 persons examined, 3,165 (80.2%) had this habit. In these regions the rate of infection with *C. sinensis* was rather high, in the range of 62 - 85% in many villages and even as high as 96% in some villages. The youngest age of infection observed was 3 months and the oldest was 87 years.

There were significant differences of infection rates in relation to age and sex. The infection rates

in males and adults were generally higher than in females and children, respectively. For example, among 22,283 persons examined in Xingtian District, Shunde City the infection rates were 62.3% in males, 24.6% in females, 6.5% under 15 and 40.0% over 21 years (Tables 5, 6). However, in some hilly areas along the upper reaches of the Zhu Jiang and Han Jiang children were infected by eating small raw or undercooked fish such as *Pseudorasbora parva*; here the age ratio was different, with younger age groups having higher infection rates. For example, in Dalang village, Yangshan County in 1975 the average infection rate was 48.2%, but the rate increased up to 95.4% in the 10 - 14 years age group and then decreased (Table 7).

In some cases eating foods contaminated with metacercaria was another route of infection. On the basis of an investigation in 17 fish markets in Guangzhou, the positive rates of metacercaria on chopping boards, fish containers, knives, hands of workers and files were 1.8% (4/217), 1.5% (2/134), 0.8% (1/126), 0.7% (1/153) and 0.5% (1/182), respectively.

Table 2

Survey on Clonorchiasis sinensis in upper reaches of Zhu Jiang (1973 - 1988).

Counties or cities	No. of localities	No. of exam	No. of positive	Positive rate (%)	Year
Deqing	1	573	16	2.8	1979
Yunan	1	514	5	1.0	1987
Yunfu	1	505	2	0.4	1987
Longchuan	2	775	5	0.6	1980 - 1983
Lianping	5	3,395	77	2.3	1980 - 1983
Zengcheng	2	1,095	4	0.4	1982 - 1987
Xinfeng	2	1,428	63	4.4	1980 - 1986
Longmen	1	395	5	1.3	1987
Boluo	1	824	14	1.7	1989
Nanxiong	2	2,184	364	16.9	1980 - 1981
Shixing	2	292	16	5.5	1980 - 1988
Yangshan	77	75,642	2,128	2.8	1974 - 1983
Yingde	8	7,670	736	9.6	1974 - 1988
Wengyuan	5	1,776	144	0.8	1974 - 1986
Qingyuan	3	1,359	330	24.3	1980 - 1987
Shaoguan	10	4,836	640	13.3	1981 - 1987
Qujiang	1	1,385	97	7.0	1974
Renhua	1	586	21	3.6	1986
Lianshan	1	554	3	0.5	1986
Heyuan	1	521	15	2.9	1987
Lechang	1	564	37	6.7	1987
Liannan	1	576	1	0.2	1987
Total	129	107,413	4,723	4.4	

### Factors in transmission

The prevalence and transmission of *C. sinensis* depends not only on the existence and prevalence of first and second intermediate hosts but also on people's dietary habits. For example, in Chaoyan Country, an infection rate of 16.7% (43/257) was recorded in 1908. The residents gave up eating raw fish slices since 1956 and the parasite was not found in the feces of 1,305 and 1,010 persons in 1982 and 1987, respectively. Infected first intermediate hosts (*Parafossarulus striatulus* and *Aloincinma longicornix*), second intermediate hosts (fresh water fish of various kinds) and animal reservoir hosts were found but no infected people were encountered.

### DISCUSSION

*Clonorchis sinensis* is widely distributed in China, Korea, Japan and Vietnam. In Guandong 62 out of 95 counties were found to be endemic areas for this liver fluke, with an average infection rate of 16.2% over the whole province. This means that there are about 3 million persons suffering from clonorchiasis in the province, 2 million of whom live in the Zhu Jiang delta.

According to the report by Liang and Yung in 1937, 112 out of 123 autopsy cases in Guangzhou were found to be have heavy infections with *C. sinensis* but without other evident pathology. In our study we examined 3,946 persons with stool positive clonorchiasis; 2,594 (65.8%) had evident

Table 3  
Survey on Clonorchiasis sinensis in Zhu Jiang delta (1973 - 1991).

Counties or cities	No. of localities	No. of exam	No. of positive	Positive rate (%)	Year
Zhaoqin	1	350	3	0.9	1980
Gaoyao	1	1,481	359	24.2	1981
Shihui	2	1,487	109	7.3	1977 - 1987
Dongguan	2	584	14	2.4	1982 - 1983
Huaxian	2	983	69	7.0	1980 - 1987
Panyu	2	1,830	184	10.1	1982 - 1987
Nanhai	40	76,279	18,157	23.8	1973 - 1986
Shunde	97	237,281	63,184	26.6	1987 - 1986
Zhongshan	31	76,343	6,408	8.4	1973 - 1991
Domen	2	1,215	252	20.7	1981 - 1983
Zhuhai	2	498	55	11.0	1983 - 1984
Foshan	12	13,902	3,608	26.0	1973 - 1982
Jiangmen	20	16,156	3,047	18.9	1973 - 1989
Shanshui	9	16,453	1,909	11.6	1973 - 1990
Gaoming	4	4,719	682	14.5	1976 - 1987
Heshan	4	6,136	1,072	17.5	1978 - 1988
Xinghui	9	14,218	1,196	8.4	1973 - 1988
Kaiping	1	632	13	2.1	1981
Taishan	9	1,186	78	6.6	1982
Enping	1	299	10	3.3	1982
Guangzhou	3	1,719	47	2.7	1987
Shenzhen	2	1,021	3	0.3	1989
Baoan	1	624	7	1.1	1991
Total	275	475,396	100,466	21.1	

clinical manifestations. Liu (1988) reported an autopsy on a 5 year old boy from the Guangdong countryside who had 277 adult *Clonorchis sinensis* in an expanded common bile duct with a diameter of 1.5 cm; the boy had 1,981 adult worms in the

duodenum and the entire hepatobiliary tract was clogged up with adult worms.

In 1983 we carried out a survey in Yangjiao, Shunde City, in the Zhu Jiang delta. The infection rate of *C. sinensis* was 43.1% (457/1,061) and the mortality rate due to liver cancer was 92.5

Table 4

The first intermediate host of *C. sinensis*.

Name	No. of exam	No. of positive	Infection rate %
<i>Parafossarulus striatulus</i>	17,400	365	2.1
<i>Alocinma longicornis</i>	6,258	167	2.7
<i>Bithynia fuchsionus</i>	335	2	0.6

Table 5

The infection rate of *C. sinensis* in Shunde city.

Sex	No. of exam	No. of positive	Infection rate (%)
Male	4,464	2,782	62.3
Female	6,216	1,530	24.6

Table 6

The infection rate of *C. sinensis* in Shunde city.

Year	No. of exam	No. of positive	Infection rate (%)
0 - 15	9,281	603	6.5
16 - 20	2,232	380	17.0
21 -	10,770	4,312	10.0

Table 7

The infection rate of *C. sinensis* in Yangshan county.

Age	Infection rate (%)
5 - 9	87.5
10 - 14	95.4
15 - 20	35.7
21 -	24.6

100,000. However, in the surrounding area where the infection rate was rather low the liver cancer rate was 5 - 10/100,000. In the late stages, and in the absence of autopsy, it is not usually possible to distinguish between hepatocellular carcinoma and cholangiocarcinoma, but the possibility that there may be an association between the high *C. sinensis* infection rate and cholangiocarcinoma in the Zhu Jiang delta region is intriguing, particularly where there is an increasing parasite burden with age.

Because of the high hepatocellular carcinoma incidence in southern China, epidemiologic study of cholangiocarcinoma in this region had been somewhat neglected. This should be rectified by systematic assessment for two reasons: *C. sinensis* infection could potentially be controlled by mass education campaign; this in turn may serve to avoid disappointment with the long term outcome of mass infant vaccination against hepatitis B focused on decreasing the incidence of liver cancer. While there is good reason to hope that vaccination will reduce hepatocellular carcinoma in future generations, it is unlikely to affect the occurrence of cholangiocarcinoma. Community-based ultrasound liver scan surveys in adult populations with high and low infection rates with *C. sinensis*, such as those identified in the present study, could possibly throw some light on this issue, since in the preclinical stages these two forms of liver cancer can usually be distinguished by this imaging technique.

## REFERENCES

- Liang BL, Young G. Pathological and anatomical study of *Clonorchis sinensis* in Canton. *Chin Med J* 1937; 23 : 995.
- Liu GZ. A child case of severe infection with *Clonorchis sinensis*. *Ann Bull Soc Parasitol Guangdong Province* 1988; 10 : 102.
- Yu SH, Xu LQ, Jiang ZX, *et al.* Special report : Nation wide survey of human parasites in China. *Southeast Asian J Trop Med Public Health* 1994; 25 : 4-10.