



ORIGINAL ARTICLE

Prevalence of *Clonorchis sinensis* Infections Along the Five Major Rivers in Republic of Korea, 2007

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Abstract
Objectives

The prevalence of *Clonorchis sinensis* infection was investigated among residents of the five major river basins, that is, Hangang, Nakdonggang, Seomjingang, Yeongsangang, and Geumgang River basins in Korea.

Methods

From January to December 2007, a total of 31,268 stool samples were collected from 29 localities and examined by the formalin-ether sedimentation technique.

Results

Intestinal parasite eggs and/or protozoan cysts were detected from 2957 (9.5%) inhabitants. Number of residents harbouring helminth eggs in the faeces was 2542 (8.1%) for *C. sinensis*, 255 (0.8%) for *Heterophyes* spp., 36 (0.1%) for *Echinostoma* spp., 30 (0.1%) for *Trichuris trichiura*, 8 (0.03%) for *Ascaris lumbricoides*, 7 (0.02%) for *Gymnophalloide seoi*, and 50 (0.02%) for *Trichostrongylus orientalis*. Number of residents harbouring protozoan cysts in the faeces was 133 (1.3%) for *Entamoeba* spp. and 50 (0.2%) for *Giardia lamblia*. The positive rates of *C. sinensis* in Nakdonggang, Seomjingang, Yeongsangang, Geumgang, and Hangang River basins were 12.2%, 9.5%, 3.3%, 3.0%, and 1.0%, respectively. The egg positive rate of *C. sinensis* was higher in male (10.6%) than in female (6.1%), and the age group of 50s had the highest positive rate (10.4%).

Conclusion

The result of this study revealed little decrease in positive rate of *C. sinensis* compared with the result of southern endemic areas of Korea in 2006.

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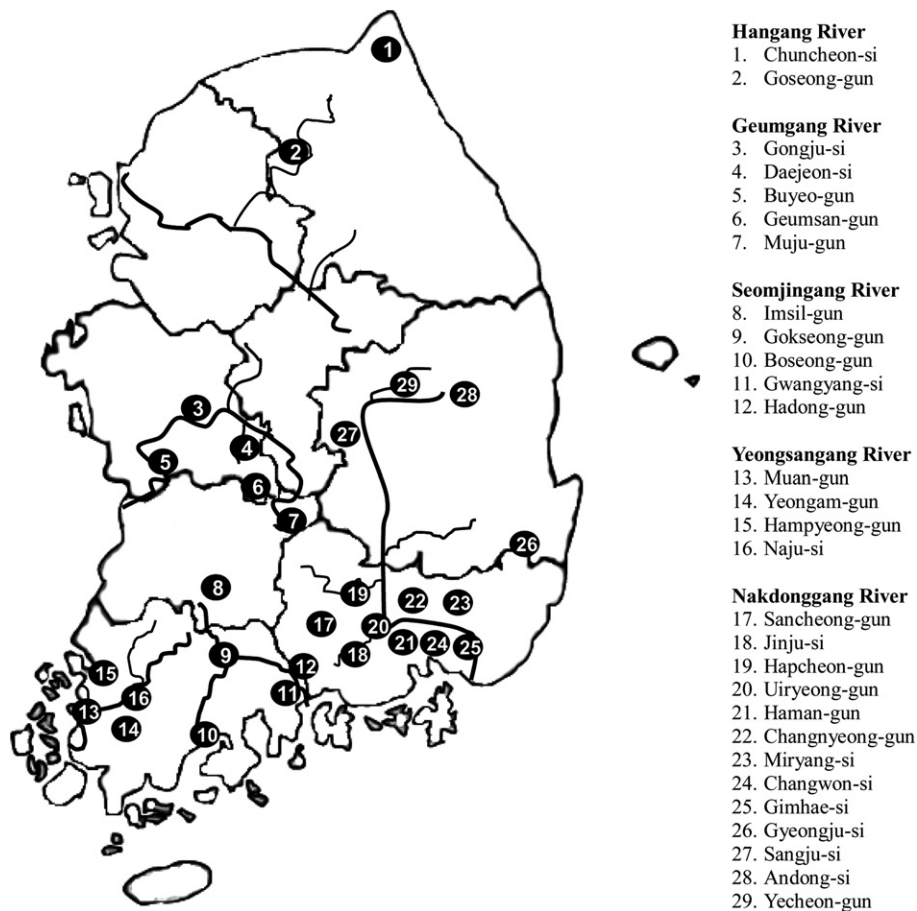


Figure 1 The surveyed areas and five major rivers located in Korea.

1. Introduction

Intestinal parasitic infections were highly prevalent until 1970s in Korea, especially among residents of major river basins of the country. During the past decade, a rapid decrease in the overall prevalence of intestinal parasites has been observed and is attributed mainly by nationwide control programs and health education undertaken by the Korean government along with increases in living conditions and quality of life among people living in Korea. Despite the remarkable decrease in soil-transmitted nematode infections,¹ however, the prevalence of fish-borne trematode infections such as with *Clonorchis sinensis* and *Metagonimus yokogawai* has been maintained at relatively high level.

The liver fluke, *C. sinensis*, is currently the most important parasite infecting humans in Korea. Egg positive rates of *C. sinensis* in general population were 4.6% in 1971, 1.8% in 1976, 2.6% in 1981, 2.7% in 1986, 2.2% in 1992, 1.4% in 1997, and 2.4% in 2004.² In 1981, the egg positive rates of people living in those river basins differed considerably; 40.2% in Nakdonggang, 30.8% in Yeongsangang, 17.3% in Seomjingang, 15.7% in Hangang, 15.9% in Tamjingang, 12.0% in Geumgang, and 8.0% in Mangyeonggang Rivers.³

The infection of *C. sinensis* is contracted by eating undercooked fishes that harbour the metacercariae. Contaminated fishes are mainly found from streams and rivers where the freshwater snail *Parafossarulus manchouricus* thrive. The liver fluke in the biliary passage provokes severe pathologic changes therein, such as bile duct dilatation, ductal wall thickening, ductal inflammation, biliary mucosal hyperplasia, and biliary cirrhosis. The infection with *C. sinensis* was also found to induce cholangiocarcinoma in experimental hamsters acting as a promoter.⁴ Clonorchiasis has been recognized as one of several factors of cholangiocarcinoma in humans.^{5,6}

Although some local data are previously available on this issue, no nationwide surveys have been conducted. The present survey on the prevalence and distribution of human clonorchiasis is one of the prerequisites for the government to implement its national control measures.

2. Materials and Methods

2.1. Surveyed area

Twenty-nine counties (Figure 1 and Table 1) were selected in five major river basins, which were located near or alongside the major rivers of Korea with reference

Table 1 The subject of investigation according to localities and sex

Locality (river basin)		No. of residents examined		
		Total*	Male	Female
Hangang	1	1,029	477	550
	2	988	453	535
	Subtotal	2,017	930	1,085
Guemgang	3	1,038	480	558
	4	868	390	478
	5	1,120	532	588
	6	1,056	528	528
	7	1,076	467	609
	Subtotal	5,158	2,397	2,761
Seomjingang	8	1,213	547	666
	9	2,424	1,120	1,304
	10	1,193	545	648
	11	1,072	508	563
	12	922	411	511
	Subtotal	6,824	3,131	3,692
Yeongsangang	13	1,256	468	788
	14	1,098	426	672
	15	1,009	397	612
	16	1,049	503	546
	Subtotal	4,412	1,794	2,618
Nakdonggang	17	836	349	486
	18	919	430	489
	19	1,001	359	642
	20	1,002	334	668
	21	936	414	522
	22	1,175	515	660
	23	1,165	589	575
	24	880	371	509
	25	1,172	670	502
	26	695	302	393
	27	953	397	556
	28	1,163	526	637
	29	960	421	539
	Subtotal	12,857	5,677	7,178
Total		31,268	13,929	17,334

*Sex unidentified: five.

to the nationwide survey in 2004.² The study was undertaken for 1 year from January to December 2007.

2.2. Stool collection and examination

Stool specimens were collected in plastic containers and transferred to the laboratory of Korea National Institute of Health. A total of 31,268 subjects were recruited from villages for stool collection by a random household sampling method to assess the prevalence of parasitic infection. The formalin-ether sedimentation technique was used to examine helminth eggs, larvae, and protozoan cysts. One gram of each faecal sample was fixed with 10% neutral formalin in a 10-mL test tube. The

formalin-fixed stool specimen was further processed by the formalin-ether concentration technique and examined for parasites in the laboratory. Parasite-positive individuals were treated with praziquantel and other appropriate anti-parasitic drugs at the end of the study.

3. Results

3.1. Number of positive cases of total intestinal parasites

Of 31,268 stool samples examined, 2957 (9.5%) were found to contain various intestinal parasite eggs, cysts, or larvae. Eggs of *C. sinensis*, *Heterophyes* spp., *Echinostoma* spp., *Trichuris trichiura*, *Ascaris lumbricoides*, *Gymnophalloide seoi*, and *Trichostrongylus orientalis* were detected from 2542 (8.1%), 255 (0.8%), 36 (0.1%), 30 (0.1%), 8 (0.03%), 7 (0.02%), and 5 (0.02%) individuals, respectively. Protozoan cysts were detected from 133 (1.3%) individuals for *Entamoeba* spp. and 50 (0.2%) for *Giardia lamblia* (Table 2).

3.2. Egg positive cases of *C. sinensis* by river basin and gender

Infection rates of *C. sinensis* by river basin, locality, and gender are summarized in Table 3. The overall egg positive rate of *C. sinensis* was 8.1%. The highest rate was observed in the Nakdonggang River basin, which showed an average infection rate of 12.2%, ranging from 2.8% to 23.1% by counties. Yecheon-gun showed the highest rate at 23.1%, followed by Sangju-si (20.8%). The next highest rate was observed in the Seomjingang River basin with an average infection rate of 9.5%, ranging from 6.8% to 14.4%. The lowest infection rate was observed in the Hangang River basin, which showed an average of 1.0%.

The egg positive rate of *C. sinensis* was higher in male (10.6%) than in female (6.1%). The highest rate of male residents infected with *C. sinensis* was observed in the Nakdonggang River basin, which showed an average infection rate of 15.3%, ranging from 3.6% to 28.5%. Male residents living in Yecheon-gun showed the highest infection rate at 28.5%, followed by Sangju-si (22.9%). The next highest rate was observed in the Seomjingang River basin (12.7%), followed by the Yeongsangang (5.1%) and the Geumgang (4.6%) River basins. The overall egg positive rate of female residents was 6.1%. The highest female egg positive rate was also observed in the Nakdonggang River basin with an average of 9.7%, ranging from 1.8% to 19.2%. The next highest rate was in the Seomjingang River basin (6.8%), followed by Yeongsangang (2.1%), Geumgang (1.8%), and Hangang (0.6%) River basins.

Table 2 Positive cases of intestinal helminths and protozoa according to locality and parasites species

Locality (river basin)		No. of Examined	No. of Positive (%)	Helminth							Protozoa		Others*
				Cs (%)	Het	Ech	Gs	Al	Tt	To	Am	Gl	
Hangang	1	1,029	21 (2.0)	19 (1.8)	1	0	0	0	0	0	0	2	0
	2	988	12 (1.2)	2 (0.2)	1	0	0	1	0	0	4	1	3
	Subtotal	2,017	33 (1.6)	21 (1.0)	2	0	0	1	0	0	4	3	3
Geumgang	3	1,038	9 (0.9)	3 (0.3)	0	0	0	0	1	0	3	1	1
	4	868	45 (5.2)	41 (4.7)	0	0	0	0	2	0	1	1	1
	5	1,120	37 (3.3)	30 (2.7)	0	0	0	0	3	0	4	1	0
	6	1,056	58 (5.5)	48 (4.5)	0	0	0	0	4	0	3	3	0
	7	1,076	45 (4.2)	37 (3.4)	5	0	0	1	1	0	0	0	1
	Subtotal	5,158	194 (3.8)	159 (3.1)	5	0	0	1	11	0	11	6	3
	8	1,213	96 (7.9)	83 (6.8)	5	0	0	0	0	0	7	2	3
Seomjingang	9	2,424	284 (11.7)	247 (10.2)	43	1	0	0	0	0	11	3	2
	10	1,193	124 (10.4)	111 (9.3)	4	0	0	0	1	2	7	2	0
	11	1,072	109 (10.2)	77 (7.2)	16	0	1	2	0	0	14	5	0
	12	922	182 (19.7)	133 (14.4)	50	0	0	0	0	0	11	2	0
	Subtotal	6,824	795 (11.7)	651 (9.5)	118	1	1	2	1	2	50	14	5
Youngsangang	13	1,256	101 (8.0)	40 (3.2)	37	33	0	0	1	0	7	1	0
	14	1,098	58 (5.3)	44 (4.0)	3	1	2	0	1	0	8	2	0
	15	1,009	41 (4.1)	30 (3.0)	10	0	1	0	0	0	5	1	0
	16	1,049	56 (5.3)	31 (3.0)	7	0	1	0	3	1	12	3	0
Subtotal	4,412	256 (5.8)	145 (3.3)	57	34	4	0	5	1	32	7	0	
Nakdonggang	17	836	109 (13.0)	99 (11.8)	10	0	0	0	0	0	0	0	0
	18	919	141 (15.3)	141 (15.3)	5	0	0	0	0	0	0	0	0
	19	1,001	63 (6.3)	59 (5.9)	4	0	0	0	0	0	0	0	0
	20	1,002	80 (8.0)	73 (7.3)	5	0	0	0	2	0	0	0	0
	21	936	149 (15.9)	142 (15.2)	1	0	1	0	2	0	2	1	0
	22	1,175	150 (12.8)	138 (11.7)	4	0	0	0	1	1	4	4	0
	23	1,165	154 (13.2)	145 (12.4)	6	0	0	0	1	0	2	6	0
	24	880	101 (11.5)	98 (11.1)	3	0	0	0	0	0	0	0	0
	25	1,172	57 (4.9)	33 (2.8)	0	0	1	2	1	0	19	0	1
	26	695	103 (14.8)	94 (13.5)	14	0	0	0	2	0	0	0	0
	27	953	211 (22.1)	198 (20.8)	3	1	0	0	3	1	2	7	1
	28	1,163	131 (11.3)	124 (10.7)	10	0	0	0	1	0	3	0	0
	29	960	230 (24.0)	222 (23.1)	8	0	0	2	0	0	4	2	2
Subtotal	12,857	1,679 (13.1)	1,566 (12.2)	73	1	2	4	13	2	36	20	4	
Total		31,268	2,957 (9.5)	2,542 (8.1)	255	36	7	8	30	5	133	50	15

Cs, *Clonorchis sinensis*; Het, *Heterophyes* spp.; Ech, *Echinostoma* spp.; Gs, *Gymnophalloides seoi*; Al, *Ascaris lumbricoides*; Tt, *Trichuris trichiura*; To, *Trichostrongylus orientalis*; Am, *Entamoeba* spp.; Gl, *Giardia lamblia*.

*Hook worm, *Diphyllobothrium latum*, *Enterobius vermicularis*, *Paragonimus westermani*.

3.3. Egg positive cases of *C. sinensis* by age group

Among the 31,268 cases examined by age group, the positive rate of *C. sinensis* was highest in the age group between 50 and 59 years (10.4%), followed by the order of 40–49 (8.7%), 60–69 (8.3%), and 70–79 (7.7%) years (Table 4).

4. Discussion

The present study indicated that the overall prevalence of intestinal parasites was 9.5% and 2957 individuals

were infected with 13 species of intestinal parasites. This result, however, is considerably lower than that of 2006, which was observed a 14.3% positive rate in southern endemic areas.⁷

The positive rate of *C. sinensis* was the highest, covering 85.6% of all positive cases. The egg positive rate of *C. sinensis* (8.1%) decreased slightly compared with the result of 2006 investigation. In the nationwide surveys in 1997 and 2004, *C. sinensis* positive rates were 1.4% and 2.4%, respectively, and these results suggested that *C. sinensis* are prevalent along major river basins. The present study was mainly focused on residents of villages where clonorchiasis has been endemic or suspected. Thus, it is the main reason for the

Table 3 Positive rates of *C. sinensis* according to localities and gender

Locality (river basin)		Total*		Male		Female	
		No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)
Hangang	1	1,029	19 (1.8)	477	13 (2.7)	550	6 (1.1)
	2	988	2 (0.2)	453	1 (0.2)	535	1 (0.2)
	Subtotal	2,017	21 (1.0)	930	14 (1.5)	1,085	7 (0.6)
Guemgang	3	1,038	3 (0.3)	480	2 (0.4)	558	1 (0.2)
	4	868	41 (4.7)	390	23 (5.9)	478	18 (3.8)
	5	1,120	30 (2.7)	532	24 (4.5)	588	6 (1)
	6	1,056	48 (4.5)	528	33 (6.3)	528	15 (2.8)
	7	1,076	37 (3.4)	467	28 (6)	609	9 (1.5)
	Subtotal	5,158	159 (3.1)	2,397	110 (4.6)	2,761	49 (1.8)
	Seomjingang	8	1,213	83 (6.8)	547	61 (11.2)	666
	9	2,424	247 (10.2)	1,120	149 (13.3)	1,304	98 (7.5)
	10	1,193	111 (9.3)	545	71 (13)	648	40 (6.2)
	11	1,072	77 (7.2)	508	40 (7.9)	563	36 (6.4)
	12	922	133 (14.4)	411	77 (18.7)	511	56 (11)
	Subtotal	6,824	651 (9.5)	3,131	398 (12.7)	3,692	252 (6.8)
Yeongsangang	13	1,256	40 (3.2)	468	24 (5.1)	788	16 (2)
	14	1,098	44 (4.0)	426	28 (6.6)	672	16 (2.4)
	15	1,009	30 (3.0)	397	16 (4)	612	14 (2.3)
	16	1,049	31 (3.0)	503	23 (4.6)	546	8 (1.5)
	Subtotal	4,412	145 (3.3)	1,794	91 (5.1)	2,618	54 (2.1)
Nakdonggang	17	836	99 (11.8)	349	49 (14)	486	50 (10.3)
	18	919	141 (15.3)	430	73 (17)	489	68 (13.9)
	19	1,001	59 (5.9)	359	31 (8.6)	642	28 (4.4)
	20	1,002	73 (7.3)	334	36 (10.8)	668	37 (5.5)
	21	936	142 (15.2)	414	74 (17.9)	522	68 (13)
	22	1,175	138 (11.7)	515	81 (15.7)	660	57 (8.6)
	23	1,165	145 (12.4)	589	97 (16.5)	575	48 (8.3)
	24	880	98 (11.1)	371	56 (15.1)	509	42 (8.3)
	25	1,172	33 (2.8)	670	24 (3.6)	502	9 (1.8)
	26	695	94 (13.5)	302	58 (19.2)	393	36 (9.2)
	27	953	198 (20.8)	397	91 (22.9)	556	107 (19.2)
	28	1,163	124 (10.7)	526	78 (14.8)	637	46 (7.2)
29	960	222 (23.1)	421	120 (28.5)	539	102 (18.9)	
	Subtotal	12,857	1,566 (12.2)	5,677	868 (15.3)	7,178	698 (9.7)
Total		31,268	2,542 (8.1)	13,929	1,481 (10.6)	17,334	1,060 (6.1)

*Sex unidentified: five.

higher egg positive rate of *C. sinensis* of the present study (8.1%) than that (2.4%) of 2004.

Clonorchiasis has been regarded as a persisting helminthiasis and has largely disappeared throughout the country.¹ In 2006, the total egg positive rate of *C. sinensis* was 11.1% among residents living in the river basins of South Korea. The egg positive rates observed in the river basins of Nakdonggang, Seomjingang, Yeongsangang, and Geumgang were 17.1%, 11.2%, 5.5%, and 4.6%, respectively. In 2007, the total egg positive rate of *C. sinensis* was 8.1% (Table 3). The positive rates observed in the river basins of Nakdonggang, Seomjingang, Yeongsangang, Geumgang, and Hangang were 12.2%, 9.5%, 3.3%, 3.1% and 1.0%, respectively (Table 3). Especially, the river basins of Nakdonggang and Seomjingang Rivers still appear to be endemic.

The average egg positive rate of *C. sinensis* among male was 10.6%, which ranged from 0.2% to 28.5% by river basin areas, whereas the average positive rate among female was 6.1% with a range from 0.2% to 19.2% (Table 3). Infection rates of male and female residents showed between 3.0% and 2.8% decrease compared with results of 2006.

The egg positive rate increased as age increased, reaching a maximum of 10.4% in the age group of 50–59- years (Table 3), followed by 40–49 (8.4%), 60–69 (8.3%), 70–79 (7.7%), and older than 80 (6.5%) years. The infection status of *C. sinensis* among Koreans by age in this study showed the same peak at the 50- to 59-year-old group as compared with the result in 2006.³ This result appears to be the typical pattern of *C. sinensis* infection, showing a peak at the age group of

Table 4 Positive rates of *C. sinensis* according to localities and age groups

Locality (river basin)	Age group (yr)								
	Total		1–19		20–29		30–39		
	No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)	
Hangang	1	1,029	19 (1.8)	65	0 (0.0)	18	0 (0.0)	44	0 (0.0)
	2	988	2 (0.2)	39	0 (0.0)	19	0 (0.0)	46	122
	Subtotal	2,017	21 (1.0)	104	0 (0.0)	37	0 (0.0)	90	0 (0.0)
Guemgang	3	1,038	3 (0.3)	10	0 (0.0)	15	0 (0.0)	42	0 (0.0)
	4	868	41 (4.7)	91	0 (0.0)	39	1 (2.6)	46	2 (4.3)
	5	1,120	30 (2.7)	0	0 (0.0)	33	1 (3.0)	62	2 (3.2)
	6	1,056	48 (4.5)	78	0 (0.0)	24	0 (0.0)	55	0 (0.0)
	7	1,076	37 (3.4)	94	0 (0.0)	14	0 (0.0)	38	3 (7.9)
Subtotal	5,158	159 (3.1)	273	0 (0.0)	125	2 (1.6)	243	7 (2.9)	
Seomjingang	8	1,213	83 (6.8)	48	1 (2.1)	13	1 (7.7)	50	1 (2.0)
	9	2,424	247 (10.2)	37	1 (2.7)	31	1 (3.2)	81	6 (7.4)
	10	1,193	111 (9.3)	2	0 (0.0)	9	1 (11.1)	31	2 (6.5)
	11	1,072	77 (7.2)	74	1 (1.4)	44	1 (2.3)	56	6 (10.7)
	12	922	133 (14.4)	26	4 (15.4)	12	2 (16.7)	36	6 (16.7)
Subtotal	6,824	651 (9.5)	187	7 (3.7)	109	6 (5.5)	254	21 (8.3)	
Youngsangang	13	1,256	40 (3.2)	36	0 (0.0)	28	0 (0.0)	28	1 (3.6)
	14	1,098	44 (4.0)	11	0 (0.0)	14	0 (0.0)	25	1 (4.0)
	15	1,009	30 (3.0)	4	0 (0.0)	14	0 (0.0)	39	0 (0.0)
	16	1,049	31 (3.0)	9	0 (0.0)	9	0 (0.0)	38	1 (2.6)
Subtotal	4,412	145 (3.3)	60	0 (0.0)	65	0 (0.0)	130	3 (2.3)	
Nakdonggang	17	836	89 (10.6)	1	0 (0.0)	4	0 (0.0)	23	3 (13.0)
	18	919	141 (15.3)	69	1 (1.4)	4	0 (0.0)	24	4 (16.7)
	19	1,001	59 (5.9)	0	0 (0.0)	0	0 (0.0)	5	0 (0.0)
	20	1,002	73 (7.3)	0	0 (0.0)	2	0 (0.0)	14	0 (0.0)
	21	936	142 (15.2)	18	1 (5.6)	11	0 (0.0)	34	4 (11.8)
	22	1,175	137 (11.7)	9	0 (0.0)	8	2 (25.0)	18	0 (0.0)
	23	1,165	145 (12.4)	24	2 (8.3)	22	2 (9.1)	37	1 (2.7)
	24	880	98 (11.1)	15	0 (0.0)	9	0 (0.0)	41	3 (7.3)
	25	1,172	33 (2.8)	0	0 (0.0)	15	0 (0.0)	85	0 (0.0)
	26	695	94 (13.5)	17	0 (0.0)	29	5 (17.2)	40	4 (10.0)
	27	953	198 (20.8)	62	4 (6.5)	25	3 (12.0)	31	3 (9.7)
	28	1,163	124 (10.7)	12	0 (0.0)	27	0 (0.0)	43	2 (4.7)
29	960	222 (23.1)	3	0 (0.0)	6	1 (16.7)	20	1 (5.0)	
Subtotal	12,857	1,555 (12.1)	230	8 (3.5)	162	13 (8.0)	415	25 (6.0)	
Total	31,268	2,531 (8.1)	854	15 (1.8)	498	21 (4.2)	1,132	56 (4.9)	

40–49 or 50–59 years,⁷ which is then rapidly decreased afterwards. Because the life span of *C. sinensis* is known to be up to 30 years, the infection peak in the age group of 50s is comprehended as an accumulation effect of reinfection or superinfection with age because epidemiologic studies indicate that humans do not develop any resistance to reinfection or superinfection by the parasites.⁴ However, the egg positive rate decreased after the peak, in spite of the cumulative effect in the age group of 60s or more. This decreasing phenomenon in senior groups has been commonly observed in previous investigations^{4,7–9} and may suggest the possibility of shorter lifespan of residents with clonorchiasis than those of uninfected ones at the endemic areas.¹⁰ This

decrease of 27% compared with the previous year appears to be an outcome of low endemicity by praziquantel medication. The clonorchiasis in the endemic area of South Korea is under continuous anthelmintic intervention, and the intervention makes the decrease in positive rate.¹¹ Our data have been updated the status of clonorchiasis in endemic area of Korea as reduced egg positive rate and lower intensity of infection compared with previous reports.^{3,8,9,11,12}

In conclusion, the result of this study revealed little decrease in positive rate of *C. sinensis* compared with the result of southern endemic areas of Korea in 2006. Therefore, continuous and repeated praziquantel medication is necessary in the endemic in Korea.

Age group (yr)											
40–49		50–59		60–69		70–79		Over 80		Unknown	
No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)	No. of Examined	No. of Positive (%)
167	5 (3.0)	249	6 (2.4)	244	3 (1.2)	153	1 (0.7)	28	2 (7.1)	61	2 (3.3)
122	0 (0.0)	192	1 (0.5)	324	0 (0.0)	198	1 (0.5)	42	0 (0.0)	6	0 (0.0)
289	5 (1.7)	441	7 (1.6)	568	3 (0.5)	351	2 (0.6)	70	2 (2.9)	67	2 (3.0)
122	1 (0.8)	194	0 (0.0)	275	1 (0.4)	295	1 (0.3)	69	0 (0.0)	16	0 (0.0)
116	8 (6.9)	137	12 (8.8)	205	11 (5.4)	188	7 (3.7)	35	0 (0.0)	11	0 (0.0)
114	5 (4.4)	250	9 (3.6)	320	5 (1.6)	287	8 (2.8)	46	0 (0.0)	8	0 (0.0)
161	5 (3.1)	257	13 (5.1)	233	22 (9.4)	165	6 (3.6)	34	2 (5.9)	49	0 (0.0)
124	7 (5.6)	179	12 (6.7)	311	10 (3.2)	244	4 (1.6)	72	1 (1.4)	0	0 (0.0)
637	26 (4.1)	1,017	46 (4.5)	1,344	49 (3.6)	1,179	26 (2.2)	256	3 (1.2)	84	0 (0.0)
136	10 (7.4)	194	17 (8.8)	349	25 (7.2)	340	23 (6.8)	81	5 (6.2)	2	0 (0.0)
304	25 (8.2)	421	47 (11.2)	750	79 (10.5)	617	67 (10.9)	135	13 (9.6)	48	8 (16.7)
95	13 (13.7)	213	26 (12.2)	365	31 (8.5)	383	33 (8.6)	82	5 (6.1)	13	0 (0.0)
125	13 (10.4)	215	15 (7.0)	274	23 (8.4)	209	14 (6.7)	44	1 (2.3)	31	3 (9.7)
94	16 (17.0)	156	28 (17.9)	267	37 (13.9)	269	35 (13.0)	62	5 (8.1)	0	0 (0.0)
754	77 (10.2)	1,199	133 (11.1)	2,005	195 (9.7)	1,818	172 (9.5)	404	29 (7.2)	94	11 (11.7)
134	5 (3.7)	240	8 (3.3)	435	16 (3.7)	296	9 (3.0)	58	1 (1.7)	1	0 (0.0)
88	2 (2.3)	216	12 (5.6)	390	16 (4.1)	289	11 (3.8)	65	2 (3.1)	0	0 (0.0)
91	1 (1.1)	154	9 (5.8)	278	7 (2.5)	303	10 (3.3)	82	1 (1.2)	44	2 (4.5)
115	1 (0.9)	223	10 (4.5)	361	14 (3.9)	252	4 (1.6)	41	1 (2.4)	1	0 (0.0)
428	9 (2.1)	833	39 (4.7)	1,464	53 (3.6)	1,140	34 (3.0)	246	5 (2.0)	46	2 (4.3)
71	5 (7.0)	146	18 (12.3)	391	55 (14.1)	182	7 (3.8)	16	1 (6.3)	2	0 (0.0)
91	19 (20.9)	160	31 (19.4)	316	55 (17.4)	210	28 (13.3)	35	3 (8.6)	10	0 (0.0)
58	5 (8.6)	164	11 (6.7)	422	23 (5.5)	317	18 (5.7)	35	2 (5.7)	0	0 (0.0)
66	7 (10.6)	126	15 (11.9)	350	25 (7.1)	389	23 (5.9)	55	3 (5.5)	0	0 (0.0)
97	14 (14.4)	205	41 (20.0)	282	37 (13.1)	239	37 (15.5)	34	3 (8.8)	16	5 (31.3)
75	9 (12.0)	202	41 (20.3)	398	41 (10.3)	378	35 (9.3)	54	6 (11.1)	33	3 (9.1)
147	26 (17.7)	309	56 (18.1)	346	33 (9.5)	248	22 (8.9)	30	3 (10.0)	2	0 (0.0)
110	13 (11.8)	216	31 (14.4)	276	30 (10.9)	171	20 (11.7)	17	0 (0.0)	25	1 (4.0)
202	5 (2.5)	298	14 (4.7)	307	7 (2.3)	207	7 (3.4)	57	0 (0.0)	1	0 (0.0)
60	11 (18.3)	127	26 (20.5)	180	21 (11.7)	188	21 (11.2)	52	6 (11.5)	3	0 (0.0)
103	13 (12.6)	168	42 (25.0)	271	68 (25.1)	227	49 (21.6)	60	15 (25.0)	6	1 (16.7)
120	12 (10.0)	210	23 (11.0)	330	41 (12.4)	311	38 (12.2)	74	6 (8.1)	36	2 (5.6)
125	31 (24.8)	203	54 (26.6)	258	54 (20.9)	278	66 (23.7)	67	15 (22.4)	0	0 (0.0)
1,325	170 (12.8)	2,534	403 (15.9)	4,127	490 (11.9)	3,345	371 (11.1)	586	63 (10.8)	134	12 (9.0)
3,433	287 (8.4)	6,024	628 (10.4)	9,508	790 (8.3)	7,833	605 (7.7)	1,562	102 (6.5)	425	27 (6.4)

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