

Recent Patterns of Intestinal Helminth Infections among the Residents in Taegu City, Korea*

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INTRODUCTION

Epidemiological, clinical and therapeutic studies on the subject of intestinal helminths among general populations by various age groups and regional groups in Korea have been carried out by many investigators since Matsumoto's (1915) first report on *Clonorchis sinensis* and other intestinal parasite infections among Koreans and Japanese in Taegu and Yeongcheon areas, Kyungpook Province, Korea.

Lee *et al.* (1960) studied the incidence of intestinal parasites among the residents in Kyungpook Province and reported that the infection rate of *Ascaris lumbricoides* was 83.3 per cent, 81.1 per cent and 83.6 per cent for primary school children, middle school students and the residents in the Province, respectively.

As a part of nation-wide survey on the status of helminthic infections in Koreans, Seo and co-workers (1969) conducted a survey based on the discovery of helminth eggs by Kato's cellophane thick smear and formalin-ether sedimentation techniques from the fecal specimens obtained throughout the country. They reported that the overall positive rate of helminths was 91.2 per cent, and that of *Trichuris trichiura* was by far the most common helminth parasite followed by *A. lumbricoides* and *Trichostrongylus orientalis*.

Subsequently, Choi and co-workers (1971) also

conducted an intestinal parasite survey based on fecal examinations on the in- and outpatient clinic of Kyungpook National University Hospital. But aside from these studies, no data are available with regard to the epidemiological patterns of occurrence of these parasites in Taegu City, Korea.

The purpose of this survey was to obtain some information on the recent patterns of helminthic infections among residents in Taegu City and to secure other data which might be useful in the prevention and control of parasitic diseases.

GEOGRAPHICAL CONDITION OF SURVEYED AREA

Taegu City, 35° 50'N. and 128° 50'E, is situated in the southeast portion of Korea and is about 300 kilometers, by road, from Seoul.

The City consists of six districts (Ku): Central, East, West, North, South, and Suseong, with total population of about 1,900,000 and covers an area of 178,513 square kilometers. The average elevation is about 50 meters above sea level.

The surveyed areas are in an inland basin with a typical continental climate of eastern coast affected by both the high atmospheric pressure from the cold continent and the low one from the Pacific Ocean in the summer season. Temperature of the coldest month is below -16°C and the rainfall in the driest month is at least 15.8mm.

There is a wide seasonal variation in both temperature and precipitation throughout the

* The results of this survey were presented at the 25th annual meeting of the Korean Society for Parasitology (1983).

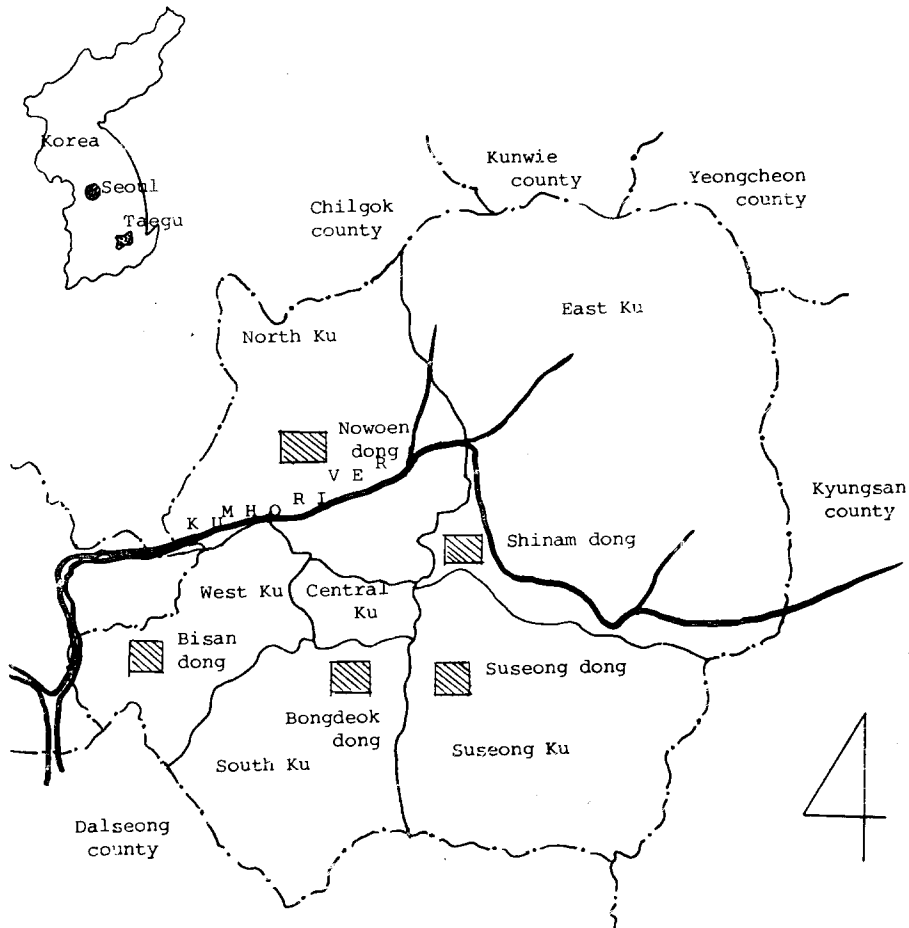


Fig. 1. Map showing the Taegu City under survey. ▨ Surveyed areas

year, especially between winter and summer seasons.

The area under study included 5 villages (Dong) in Taegu City (Fig. 1). Rice and other vegetables are planted in the outskirts of these villages. Domesticated animals, such as cattle, goats, dogs, and fowls, are common.

MATERIALS AND METHODS

During the period of March–September in 1983, the author carried out a parasitological survey in order to estimate the recent patterns of intestinal helminth infections among the residents of Taegu city.

A total of 1,697 fecal specimens were collec-

ted from 854 male and 843 female residents from 5 villages (Dong), each of whom were selected randomly to represent 1,000 persons referred to the census in 1982.

The specimens, collected in cartons, were brought to the Parasitology Laboratory and examined routinely one time by the formalin-ether sedimentation technique (Ritchie, 1948). In order to discover the pinworm eggs, the modified Graham's scotch-tape swab technique was applied.

RESULTS

Table 1 shows the prevalence of intestinal helminths by stool examination and modified

Graham's scotch-tape swab technique. Among the 1,697 individuals examined, one or more species of helminths were found in 473, which becomes an overall positive rate of 27.9 per cent.

Of the intestinal parasites, *T. trichiura* was found most frequently, the rate being 13.2 per cent among the residents, followed by *Enterobius*

Table 1. Prevalence of intestinal helminths based on formalin-ether sedimentation technique in the residents of Taegu City, Korea(1983)

Parasites	No. Male infected (%)	No. Female infected (%)	No. Total infected (%)
<i>Ascaris lumbricoides</i>	47 (5.5)	61 (7.2)	108 (6.4)
<i>Clonorchis sinensis</i>	42 (4.9)	17 (2.0)	59 (3.5)
<i>Enterobius vermicularis</i> *	58 (6.8)	60 (7.1)	118 (7.0)
Hookworm	2 (0.2)	5 (0.6)	7 (0.4)
<i>Metagonimus yokogawai</i>	12 (1.4)	7 (0.8)	19 (1.1)
<i>Taenia</i> species	7 (0.8)	4 (0.5)	11 (0.6)
<i>Trichostrongylus</i> species	3 (0.4)	9 (1.1)	12 (0.7)
<i>Trichuris trichiura</i>	99(11.6)	125(14.8)	224(13.2)
No. examined	854	843	1,697

* The results of *Enterobius vermicularis* were based on modified Graham's scotch-tape swab technique.

Table 2. Infection rates of intestinal helminths by sex and age groups among the residents of Taegu City, Korea (1983)

Age group (Y)	Sex	No. tested	<i>A. lumbricoides</i>		<i>C. sinensis</i>		<i>E. vermicularis</i>		<i>T. trichiura</i>	
			No.	%	No.	%	No.	%	No.	%
0~9	M	182	11	6.0	4	2.2	23	12.6	10	5.5
	F	156	11	7.1	1	0.6	27	17.3	15	9.6
10~19	M	223	9	4.0	6	2.7	17	7.6	23	10.3
	F	206	10	4.9	5	2.4	20	9.7	26	12.6
20~29	M	137	11	8.0	7	5.1	6	4.4	24	17.5
	F	131	13	9.9	5	3.8	4	3.1	23	17.6
30~39	M	115	6	5.2	11	9.6	3	2.3	16	13.9
	F	153	13	8.5	3	2.0	7	4.6	23	15.0
40~49	M	111	7	6.3	7	6.3	6	5.4	13	11.7
	F	109	8	7.3	3	2.8	—	—	15	13.8
50~59	M	53	2	3.8	5	9.4	2	3.8	7	13.2
	F	58	5	8.6	—	—	2	3.4	18	31.0
60~	M	33	1	3.0	2	6.1	1	3.0	6	18.2
	F	30	1	3.3	—	—	—	—	5	15.2
Total	M	854	47	5.5	42	4.9	58	6.8	99	11.6
	F	843	61	7.2	17	2.0	60	7.1	125	14.8

vermicularis with the prevalence rate of 7.0 per cent and *A. lumbricoides* with 6.4 per cent. Hookworm was the least prevalent. *Taenia* species were detected from only 0.6 per cent of the residents. *C. sinensis* was the more frequently found fluke, being present in 3.5 per cent of the population as compared with 1.1 per cent for *Metagonimus yokogawai*.

As to the sex-specific rate of overall helminth infections, females were a little higher than males, while, in the cases of *C. sinensis*, *M. yokogawai* and *Taenia* species, the infection rates in males were higher than in females. The data shown in Table 2 present the prevalence of common intestinal parasites by sex and age groups.

E. vermicularis showed the highest prevalence among the 0~9 age group in both sexes but was uniformly high in all age groups over 10 years. *C. sinensis* infection rates increased with age while those of *A. lumbricoides* decreased. *T. trichiura* was most prevalent in the 20~29 age group and showed about the same prevalences in males and females of all age groups. Since few individuals had hookwo-

Table 3. Single, double and triple infections with 8 common intestinal helminths among 473 positive cases of residents in Taegu City, Korea(1983)

Parasites	No. infected(%)
Single infection	390(82.5)
<i>Ascaris lumbricoides</i>	70(14.8)
<i>Clonorchis sinensis</i>	48(10.1)
<i>Enterobius vermicularis</i>	95(20.1)
Hookworm	3 (0.6)
<i>Metagonimus yokogawai</i>	11 (2.3)
<i>Taenia</i> species	8 (1.7)
<i>Trichostrongylus</i> species	5 (1.1)
<i>Trichuris trichiura</i>	150(31.7)
Double infections	80(16.9)
<i>A.lumbricoides</i> & <i>C.sinensis</i>	2 (0.4)
<i>A.lumbricoides</i> & <i>T.trichiura</i>	29 (6.1)
<i>C.sinensis</i> & <i>T.trichiura</i>	6 (1.3)
<i>E.vermicularis</i> & <i>T.trichiura</i>	18 (3.8)
<i>M.yokogawai</i> & <i>T.trichiura</i>	8 (1.7)
<i>Taenia</i> species & <i>T.trichiura</i>	3 (0.6)
Other combinations	14 (3.0)
Triple infections	3 (0.6)
<i>A.lumbricoides</i> , <i>C.sinensis</i> & <i>T.trichiura</i>	1 (0.2)
<i>A.lumbricoides</i> , <i>E.vermicularis</i> & <i>T.trichiura</i>	1 (0.2)
<i>E.vermicularis</i> , Hookworm & <i>T.trichiura</i>	1 (0.2)

rms, *Trichostrongylus* species, *Taenia* species and *M. yokogawai*, no reliable age or sex distribution could be charted. The status of single, double and triple infections with intestinal helminths is given in Table 3. Single and double infections were 82.5 per cent and 16.9 per cent of all positive cases, respectively.

It was shown that *T. trichiura* had the highest prevalence in 31.7 per cent of all single infections by intestinal helminths and the next was *E. vermicularis* in 20.1 per cent and *A. lumbricoides* in 14.8 per cent. Of all double infections, the combination of *A. lumbricoides* and *T. trichiura* comprised 6.1 per cent. In these instances, the percentage of *T. trichiura* infection in combination with other intestinal helminths was higher than that of *A. lumbricoides* combined with others.

DISCUSSION

The findings in this study are based on discovery of helminth eggs by formalin-ether sedimentation and modified Graham's scotch-tape anal swab techniques on 1,697 subjects. In practice, this is no indication of the true prev-

Table 4. The reported prevalences of intestinal helminths among the residents in Taegu City, Korea

Helminth	Matsumoto (1915)	Nishimura (1943)	Lee <i>et al.</i> (1960)	Yun <i>et al.</i> (1968)	Choi <i>et al.</i> (1971)	The Author (1984)
No. of persons examined	351	341	384	1,370	5,288	1,697
Total positive rate(%)	—	62.2	—	81.2	86.7	27.9
<i>A. lumbricoides</i>	77.9	33.7	84.9	40.9	40.9	6.4
<i>C. sinensis</i>	18.6	3.5	5.7	2.2	29.8	3.5
<i>E. vermicularis</i>	—	—	1.3	0.1	1.8	7.0*
Hookworm	29.2	10.3	43.8	9.2	22.4	0.4
<i>M. yokogawai</i>	—	1.2	0.7	—	0.2	1.1
<i>Taenia</i> sp.	3.8	0.6	0.7	1.1	0.6	0.6
<i>Trichostrongylus</i> sp.	—	5.6	35.7	35.0	61.6	0.7
<i>T. trichiura</i>	82.8	45.7	68.8	65.9	83.6	13.2
Method employed	MGL technique	Direct smears	MGL technique	MGL technique	MGL technique	MGL technique
Group tested	Mostly school children	Middle school students	Primary school children	Residents & school children	In- and outpatients in K.N.H**	Residents

* The results by modified Graham's scotch-tape method

** Kyungpook National University Hospital

alence among the residents in Taegu City, because one time fecal examination and Graham's anal swab are not sufficient to determine the true infection rate of all helminthic diseases. However, the results are quite comparable with earlier reports based on one time examination of feces by means of similar laboratory procedure. From the data presented in Table 4, it is noted that, although higher prevalences are expected if examinations were repeated, the present results show a marked decrease in the prevalence of helminthic infections compared with earlier reports available.

Choi and co-workers (1971) and Yun and co-workers (1968) reported overall positive rates for intestinal helminth infections of 81.7%~86.7% among the residents in Kyungpook Province. In the present study, one or more species was found in 473 subjects, an overall positive rate was 27.9%. The positive rate seems to vary according to the socio-economic levels of the persons examined, the local geographical areas studied, and the natural habits of the persons.

The rates given for the common intestinal helminths, *A. lumbricoides*, hookworms, *Trichostrongylus* species and *T. trichiura* in this survey are considerably lower than that recorded in similar previous surveys made in Kyungpook Province (Lee *et al.*, 1960; Yun *et al.*, 1968; Choi *et al.*, 1971).

The exact cause of the lower prevalences of the soil-transmitted helminths is not known, but there are several factors possibly related to the increasing recognition of importance of parasitic diseases, *i.e.*, public health education, specific anthelmintic administrations and improved hygienic and dietary life.

The sex-specific rate of overall soil-transmitted helminths was a little higher in females than in males, while in the cases of *C. sinensis*, *M. yokogawai* and *Taenia* species, the infection rates in males was higher than in females. It is in agreement with previous findings reported by many investigators (Matsumoto, 1915; Nishimura, 1943; Lee *et al.*, 1960; Yun *et al.*,

1968; Choi *et al.*, 1971).

It is considered that the female group had more opportunities to come in contact with raw vegetables, and the male group had more opportunities to consume raw meat and fish with rice wine. Such consideration was recognized also by Hunter and co-workers (1949), Soh and co-workers (1961) and Joo (1981).

The infection rate of *E. vermicularis* among the residents of Taegu City was not known, but a reliable report by Joo and Jheon (1983) indicated that 13.1% of elementary school children in the City were infected. In the present survey, the prevalence of the pinworm was found to be 7% of the population by single, modified Graham's scotch-tape technique, and showed the highest prevalence for both sexes in the 0~9 age group, but was uniformly high for all age groups over 10 years. This figure in general is similar to Joo and Jheon (1983), though it is far less than that reported by Chung and Shin (1959) and Choi and co-workers (1973).

The frequency of single or multiple infections found in this survey is dissimilar to that reported by Choi and co-workers (1971) on the Kyungpook National University Hospital patients, and also differs from the pattern in Kyungpook Province (Lee *et al.*, 1960). By case of these two studies, triple infections were most frequent followed by double infections. By comparison in this study, it was pointed out that the single infection was the highest percentage, and the percentage of *T. trichiura* in combination with other intestinal helminths was higher than that of *A. lumbricoides*.

The results of this study generally indicate an uncontested evidence that the infection rates of intestinal helminths among the residents in Taegu City are still relatively high. However, eradication of these parasitic diseases in the residents is possible by twice-a-year administration of specific anthelmintics combined with an extensive public health education and improvements in the dietary life.

SUMMARY

In order to estimate the recent patterns of intestinal helminth infections among the residents in Taegu City, Korea, a survey based on discovery of helminth eggs by formalin-ether sedimentation and modified Graham's scotch-tape anal swab techniques, were performed during the period from March to September in 1983. A total of 1,697 fecal specimens were collected from 854 male and 843 female residents from 5 village(Dong), each of whom were selected randomly to represent 1,000 persons referred to the census in 1982.

Among the specimens examined, one or more species of helminth parasites were found in 473, revealing the overall positive rate of 27.9 per cent. Of them, *Trichuris trichiura* was found most frequently, in 13.2 percent, followed by *Enterobius vermicularis* in 7.0 per cent. Hookworm was the least prevalent.

The sex-specific rate of overall helminth infections was a little higher in females than in males, while in cases of *Clonorchis sinensis*, *Metagonimus yokogawai* and *Taenia* species, the infection rates in males was higher than in females. *T. trichiura* was most prevalent in the 20~29 age group and showed about the same prevalence in males and females of all age groups. *C. sinensis* infection rate increased with age while those of *Ascaris lumbricoides* decreased.

Single infections were 82.5 per cent of all positive cases. Of these, *T. trichiura* revealed the highest prevalence in 31.7 per cent, followed by *E. vermicularis* in 20.1 per cent and *A. lumbricoides* in 14.8 per cent. Of the double infections, the percentage of *T. trichiura* in combination with other intestinal helminths was higher than that of *A. lumbricoides*.

It was concluded that although the infection rates of intestinal helminths among the residents in Taegu City, Korea is still high, eradication of these parasitic diseases seems to be possible with twice-a-year administration of specific

anthelmintics, in combination with extensive public health education and improvement of the dietary life.

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=國文抄錄=

大邱市民들에 있어서 腸內蠕蟲類의 最近 感染狀

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大邱市民들에 있어서 腸內 寄生蠕蟲類의 最近 感染狀을 알아보기 위해 1983年 3月부터 9月까지 大邱市內 5個洞 (남구 봉덕동, 북구 노원동, 서구 비산동, 동구 신암동 및 수성구 수성동)住民를 調査 對象으로 選定하여 formalin-ether 집란법 및 scotch-tape 항문주위도말법으로 蠕蟲類 蟲卵 檢査를 실시하였다.

總 被檢者 1,697名中 腸內蠕蟲類 感染率은 27.9%이었으며, 이中 편충이 13.2%로 가장 높았고, 그 다음은 7.0%를 나타내는 요충이었으며, 구충은 0.4%로 가장 낮았다.

性別 感染率에 있어서 남자의 경우 간흡충, 요꼬가와흡충, 조충등은 여자에 비해서 그 율이 다소 높았으나, 편충의 경우에는 양자간에 유의적 차를 인정할 수 없었다.

연령군별 감염률에 있어서는 편충은 20~29세군에서 남자 17.5%, 여자 17.6%로 가장 높았으며, 0~9세군에서는 남자 5.5%, 여자 9.6%로 가장 낮았다.

肝吸蟲은 30~39세군에서 가장 높았으며 요꼬가와흡충도 肝吸蟲과 비슷한 양상을 나타내었다.

혼합기생상에 있어서는 1종기생이 가장 많았고 다음은 2종의 중복기생이었으며, 3종의 혼합기생은 매우 적었다. 이상의 성적으로 미루어 보아 대구직할시 주민들에서의 장내 기생 율충류 감염은 아직도 고율임을 알 수 있었다.