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Incidence of Parasites in Seoul Area Based on An Examination of the Severance Hospital Out-Patients

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ABSTRACT

Of 14,682 samples of feces examined, 81.7% were positive for intestinal helminths. Trichocephalus trichiurus was observed most frequently, in 73.2%. Eight other species of helminths found were Ascaris lumbricoides, Hookworm, Trichostrongylus orientalis, Clonorchis sinensis, Tapeworm, Hymenolepis nana, Paragonimus westermani and Enterobius vermicularis, listed in decreasing order. Double infections were found more frequently than single infections, and mixed infection of five or more species of helminths occurred in 0.2%.

Of 10,320 samples of feces examined, 22.3% were positive for intestinal protozoa. Entamoeba coli was observed most frequently, in 11.1%. Six other species, Endolimax nana, Giardia lamblia, Entamoeba histolytica, Iodamoeba butschlii, Chilomastix mesnili and Isospora hominis were found, in this order. It was noticed that E. histolytica was found more frequently in trichurial infection than with other helminths.

Of 1,050 samples of sputum from the T. B. Clinic, 7.0% were positive for paragonimus eggs.

Trichomonas vaginalis were found in 35.8% of 1,146 vaginal swabs examined.

Seven cases of Plasmodium vivax infection were found among 140 suspected blood smears.

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INTRODUCTION

Parasitic infection among Korean people has been considered a major public health problem, which must be solved as soon as possible on a nation-wide scale. In spite of many investigations of parasite incidence by several investigators-Kessel (1925), Choi (1926), Chiba (1928), Hunter et al. (1949), Brooke et al. (1951)-a true picture of parasite incidence in the whole nation has not yet been obtained.

The present data are reviewed as a supplement to former reports.

MATERIALS AND METHODS

From July 1, 1958, to June 30, 1961, 14,682 samples of feces were sent from the out-patient clinics of Severance Hospital for the detection of intestinal helminths. For protozoan examination, 10,320 samples of feces from out-patients during two years (July 1, 1959~June 30, 1961) were available for presentation.

The materials dealt with were from the general run of medical cases, not a selection from suspected patients. Feces from in-patients and foreigners were excluded. Match boxes were used as the main container. Routinely, only one stool specimen was collected from each person, and immediately on arrival in the laboratory a small portion of the sample was removed from the sample box with a wooden stick.

Specimens were concentrated by the formalin-ether sedimentation technic (M. G. L. method) for the

recovery of protozoan cysts and helminthic eggs. In the case of protozoa, Iodine solution was dropped on the smear for the easy detection of cysts. Whole smears were examined for helminths under low power (10×10), and ten or more fields were examined for protozoa under high or oil immersion.

In the case of taenia, a field survey by means of a questionaire form (or interview) seemed more reliable than a laboratory examination in determining its incidence. A survey by questionaire, as a complementary proof of taenia infestation is shown in Table 2, was carried out in a rural area (Kaejong). During home visiting, it was asked whether the person had discharged any segments of Taenia recently.

Sputa from The Chest Clinic of Severance Hospital were examined for Paragonimus eggs as well as for tubercle bacilli for two years (July 1, 1959~June 30, 1961). Each sample was treated with 10% antiformin in order to facilitate concentration by a centrifuge. The sediment was examined under a microscope.

Blood smears from feverish patients, and those suspected of malaria from July 1, 1959, to June 30, 1961, were checked for the malaria parasite. Following thin and thick films, giemsa stain was applied.

Vaginal discharge specimens were obtained at the clinic, from females who complained of leucorrhea or local itching, for the same period as the examination of protozoa, by the cotton swab method. The material was soaked in a warm saline solution and carried to the laboratory for the examination of Trichomonas vaginalis. Wet direct smears were examined by microscope.

SURVEY FINDINGS

I. Helminthic Infection among Out-Patients

Of 14,682 stool specimens examined, 11,997 or 81.7 per cent were positive for intestinal helminths. (Table 1)

Trichocephalus trichiurus was observed most frequently, in 73.7%, and next Ascaris lumbricoides in 46.9%, Hookworm in 23.5%, Trichostrongylus orientalis in 22.6% and Clonorchis sinensis in 3.8%, in decreasing order. The incidence of Tapeworm, Enterobius vermicularis and Paragonimus westermani shown in this table was determined merely as the result of routine examination, and not by special methods for the respective helminths.

There were 32 Hymenolepis (nana) infections found among 80 positive cases of Tapeworm, and 87.5% of H. nana infections were found among children.

A complementary survey of Taenia infection in rural areas in questionaire form showed a relatively high incidence. Among 3,615 persons interviewed, 129 or 3.6% reported the output of Taenia segments. (Table 2)

The male group showed a higher incidence (4.2%) than the female (2.9%). Also, higher percentage of

Table 1. Incidence of Helminths among the Severance Hospital Out-Patients (July 1, 1958 ~ June 30, 1961)

Method of Examination: Formalin-Ether Sedimentation Method

Number of Patients Examined: Male 7,140; Female 7,542; Total 14,682

Helminths	Male		Female		Total	
	No.	%	No.	%	No.	%
Ascaris lumbricoides	3,190	44.7	3,694	49.0	6,884	46.9
Trichocephalus trichiurus	5,030	70.4	5,567	73.8	10,597	72.2
Hookworm	1,606	22.5	1,847	24.5	3,453	23.5
Trichostrongylus orientalis	1,433	20.1	1,888	25.0	3,321	22.6
Clonorchis sinensis	402	5.6	160	2.1	562	3.8
Tapeworm	47	0.7	33	0.4	80	0.5
Paragonimus westermani	9	1.2	5	0.06	14	0.09
Enterobius vermicularis	5	0.07	5	0.07	10	0.07

Table 2. Incidence of Tapeworm Infection among the Rural Inhabitants
Area surveyed: Kaejong-Ri, Kaejong-Myon, Okku-Kun, Cholla-Pukdo
Number of households covered: 469

Age	Male			Female			Total		
	No.	Posit.	%	No.	Posit.	%	No.	Posit.	%
0 ~ 5	363	5	1.4	334	12	3.6	697	17	2.4
6 ~ 10	232	6	2.6	240	6	2.5	472	12	2.5
11 ~ 15	259	3	1.2	210	4	1.9	469	7	1.5
16 ~ 20	201	2	1.0	163	0	—	364	2	0.6
21 ~ 25	149	2	1.3	141	3	2.1	290	5	1.7
26 ~ 30	107	7	6.5	122	4	3.3	229	11	4.8
31 ~ 35	113	8	7.1	107	4	3.7	220	12	5.5
36 ~ 40	108	10	9.3	85	4	4.7	193	14	7.3
41 ~ 45	75	12	16.0	92	4	4.3	167	16	9.6
46 ~ 50	49	5	10.2	61	5	8.2	110	10	9.1
51 ~ 55	54	7	13.0	53	2	3.8	107	9	8.4
56 ~ 60	36	3	8.3	53	1	1.9	89	4	4.5
61 ~	83	7	8.4	125	3	2.4	208	10	4.8
Total	1,829	77	4.2	1,786	52	2.9	3,615	129	3.6

infection was manifested in the adult group than in children.

a) Helminthic infection by sex: In general, helminthic infection among females was revealed to be a little higher than among males, while, in the case of Clonorchis sinensis, the incidence in males was clearly higher than in females (table 1).

b) Helminthic infection by age: A higher incidence

Table 3. Incidence of several Helminths among the Severance Hopital Out-Patients by Age (July 1, 1958 ~ June 30, 1961)

Age	Total Number Examined	Incidence (%)					
		A. l.*	T. t.	H. w.	T. o.	C. s.	T. w.
0 ~ 1	89	6.7	10.1	2.2	—	—	—
1 ~ 5	989	33.5	33.2	3.9	3.1	0.5	0.7
6 ~ 10	1,197	44.9	64.5	10.9	8.4	0.5	1.3
11 ~ 15	1,225	47.3	74.3	16.5	14.4	1.4	1.1
16 ~ 20	1,370	48.0	78.3	23.3	20.1	3.8	0.2
21 ~ 25	1,980	49.7	77.6	28.9	26.1	3.3	0.2
26 ~ 30	2,500	50.4	77.5	27.1	25.9	4.9	0.5
31 ~ 35	1,652	50.7	76.9	29.3	29.4	5.5	0.4
36 ~ 40	1,377	49.7	75.3	28.4	30.4	5.2	0.5
41 ~ 45	839	46.5	75.2	28.7	27.2	5.0	0.5
46 ~ 50	615	43.1	77.6	28.0	31.1	6.0	0.3
51 ~ 55	418	41.1	70.1	24.6	27.8	5.5	0.7
56 ~ 60	241	39.8	75.9	28.2	32.4	6.2	0.8
61 ~	190	43.7	73.7	27.9	29.5	7.4	0.5
Total	14,682	46.9	72.2	23.5	22.6	3.8	0.5

* A.l.....Ascaris lumbricoides T.t.....Trichocephalus trichiurus H.w.....Hookworm
T.o.....Trichostrongylus orientalis C.s.....Clonorchis sinensis T.w.....Tapeworm

of intestinal helminths was found among adults as compared with the children's age group (Table 3). Such a tendency was clearly indicated in the case of Clonorchis infection.

c) Monthly incidence of intestinal helminths: In general, no significant seasonal fluctuation of helminthic infection was observed, except in the case of Hook-worm (Table 4a, 4b). During the winter season, from October to March, the average incidence was 19%, while during the warm season, from April to September, the incidence was 26%.

Table 4~a. Monthly Incidence of Intestinal Helminths among Out-Patients of Severance Hospital (July 1, 1958~June 30, 1961)

Month	Total No. Examined	Incidence (%)			
		A.l.	T.t.	H.w.	T.o.
January	1,136	44.9	67.4	14.7	20.6
February	1,152	45.1	73.8	20.6	24.6
March	1,278	49.2	70.7	21.8	25.8
April	1,102	48.4	68.5	23.0	23.0
May	1,232	44.6	72.4	26.1	20.9
June	1,464	38.7	68.4	22.2	21.9
July	1,483	45.4	70.9	32.0	20.5
August	1,336	48.1	71.2	25.5	19.5
September	1,517	51.9	74.3	28.9	23.1
October	1,218	49.8	74.4	21.6	25.8
November	909	46.2	76.8	20.7	23.4
December	855	51.1	79.1	18.9	22.7

Table 4~b. Seasonal Incidence of Intestinal Helminths among the Out-Patients (Calculated from Table 4~a)

Duration	Total No. Examined	Incidence (%)			
		A. l.	T. t.	H. w.	T. o.
October~ March	6,548	47.9	73.6	19.9	23.6
April~ September	8,134	46.1	71.0	26.5	21.5

d) Single, double or multiple infection with intestinal helminths: As shown in Figure 1, single and double infections comprised approximately 3/10ths and 4/10ths of all positive cases, Triple infection was found to be in more than 2/10ths.

Of all single infections by intestinal helminths, Trichocephalus trichiurus had the highest incidence, in 67.3%; and next was Ascaris in 20.6%.

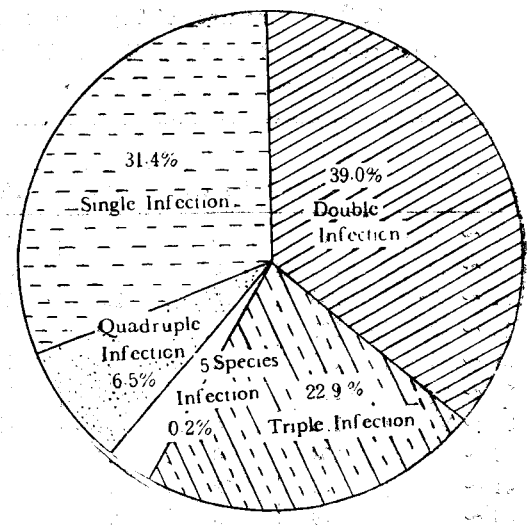

Fig. 1. Single, Double or Multiple Infection by the Number of Helminth's Species in Each Person among 11,983 Positive Cases of Severance Hospital Out-patients (July 1, 1958~June 30, 1961).

It was shown that the combination of T. trichiurus and A. lumbricoides comprised 63.2% of all double infections. The incidence of trichuris in combination with other helminths was higher than that of Ascaris (Figure 2 and 3).

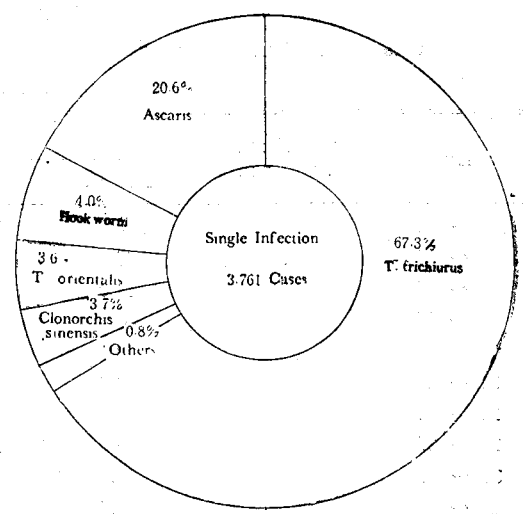

Fig. 2. Single Infection of Helminths among Severance Hospital Out-Patients (July 1, 1958~June 30, 1961).

Total number of patients examined:	*14,682*
Total number of positive cases:	11,983
Total number of single infection cases:	3,761

Number of single infection of the species / Total No. of single infection cases

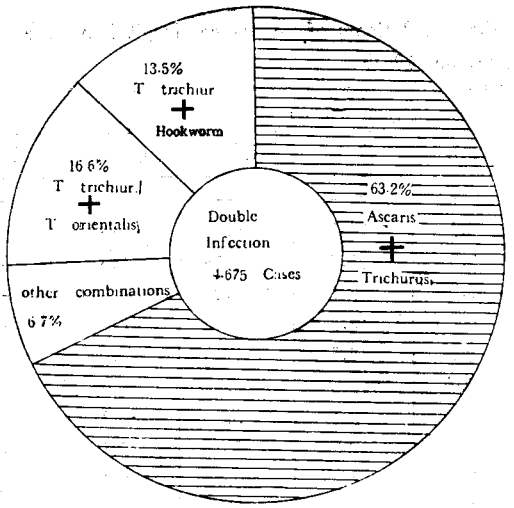

Fig. 3. Double Infection of Helminths in Each Person among Severance Hospital Out-Patients (July 1, 1958~June 30, 1961).

e) Incidence of Paragonimus westermani:

From July 1, 1959, to June 30, 1961, 1,050 samples of sputum from the Chest Clinic were checked for Paragonimus eggs as well as for T.B.bacilli(Table5).

The total positive rate was 7.0%. The female group showed a little higher percentage than males, and the teenage group showed much a higher incidence than any other age group examined.

II. Protozoan Infection among Out-Patients

a) Intestinal protozoa: Through the examination of 10,320 samples of fecal materials, it was demonstrated that 2,302 or 22.3% of cases harbored some kind of protozoa(Table 6).

Entamoeba coli was the highest and Endolimax nana, Giardia lamblia, Entamoeba histolytica, Iodamoeba butschlii, Chilomastix mesnili and Isospora

Table 5. Incidence of Paragonimus westermani among the Out-Patients of Severance Hospital (July 1, 1959~June 30, 1961)

Age	Male			Female			Total		
	No. Exam.	No. Posit.	%	No. Exam.	No. Posit.	%	No. Exam.	No. Posit.	%
0 ~ 10	10	5	—	8	0	—	18	5	27.8
11 ~ 20	76	9	11.8	31	8	25.8	107	17	15.9
21 ~ 30	240	14	5.7	121	9	7.4	361	23	6.4
31 ~ 40	177	7	4.0	80	1	1.3	257	8	3.1
41 ~ 50	122	6	4.9	42	7	16.7	164	13	7.9
51 ~ 60	64	4	6.3	32	2	6.3	96	6	6.3
61 ~	29	1	3.5	18	0	—	47	1	2.1
Total	718	46	6.4	332	27	8.0	1,050	73	7.0

Table 6. Incidence of Intestinal Protozoa among the Out-Patients of Severance Hospital (July 1, 1959~June 30, 1961)

Number of patients examined: Male 5,136
Female 5,178
Total 10,320

Protozoa	Male		Female		Total	
	No.	%	No.	%	No.	%
Entamoeba histolytica	190	3.7	254	4.9	444	4.3
Entamoeba coli	472	9.2	669	12.9	1,141	11.1
Endolimax nana	345	6.7	443	8.6	791	7.7
Giardia lamblia	298	5.8	191	3.7	489	4.7
Iodamoeba butschlii	18	0.4	31	0.6	49	0.5
Chilomastix mesnili	14	0.3	22	0.4	36	0.4
Isospora hominis	1	—	2	—	3	0.03

Table 7. Incidence of Intestinal Protozoa among the Out-Patients of Severance Hospital by Age (July 1, 1959~June 30, 1961)

Age	Total No. Examined	Incidence (%)						
		E. h.*	E. c.	E. n.	G. l.	I. b.	C. m.	I. h.
0 ~ 1	54	7.4	—	—	—	—	—	—
1 ~ 5	676	0.8	2.7	2.8	10.7	0.2	—	0.2
6 ~ 10	875	3.3	6.9	3.8	11.7	0.1	0.5	—
11 ~ 15	872	4.5	11.9	7.7	8.7	0.2	0.1	—
16 ~ 20	903	5.5	13.5	9.2	5.1	0.3	0.2	—
21 ~ 25	1,380	5.1	13.8	9.4	4.7	1.0	0.4	0.08
26 ~ 30	1,847	4.4	10.9	7.9	3.5	0.6	0.6	0.06
31 ~ 35	1,134	4.2	10.0	7.0	2.4	0.3	0.2	—
36 ~ 40	962	5.3	12.1	9.6	2.0	0.6	0.4	—
41 ~ 45	572	3.9	12.4	10.0	1.2	0.4	0.4	—
46 ~ 50	469	5.1	15.8	9.8	1.2	1.3	0.9	—
51 ~ 55	282	4.6	12.8	6.7	1.1	—	0.4	—
56 ~ 60	161	1.9	11.8	5.0	0.6	0.6	—	—
61 ~	133	3.0	11.3	9.8	0.8	—	—	—
Total	10,320	4.3	11.1	7.7	4.7	0.5	0.4	0.03

*E. h. .....Entamoeba histolytica E. c. .....Entamoeba coli E. n. .....Endolimax nana G. l. .....Giardia lamblia
I. b. .....Iodamoeba butschlii C. m. Chilomastix mesnili I. h. .....Isospora hominis

Table 8. Monthly Incidence of Intestinal Protozoa among the Out-Patients of Severance Hospital (July 1, 1959~June 30, 1961)

Month	Total No. Examined	Incidence (%)					
		E. h.	E. c.	E. n.	G. l.	I. b.	C. m,
January	835	3.6	10.7	8.4	3.7	0.5	0.2
February	899	3.7	11.5	8.6	4.9	0.7	0.7
March	882	4.3	12.6	10.7	5.6	0.4	0.4
April	740	3.8	11.8	11.8	3.5	0.4	0.3
May	908	2.5	10.1	6.0	5.0	0.3	—
June	993	2.2	11.0	8.0	3.6	0.4	0.3
July	943	4.0	8.9	4.9	5.8	0.4	—
August	902	5.2	12.3	7.3	5.3	1.2	1.0
September	1,084	5.2	11.1	6.8	5.7	0.5	0.2
October	891	5.8	9.8	6.1	4.7	0.6	0.6
November	637	5.7	11.8	7.1	5.0	0.2	0.5
December	606	6.1	11.7	7.4	3.1	—	0.2
Total	10,320	4.3	11.1	7.7	4.7	0.5	0.4

hominis were found in decreasing order.

Generally, the female group showed a little higher positive rate than the males, except in the case of Giardia. Giardia lamblia was also found from samples from children more often than in the older group (Table 7). From present data, no seasonal fluctuation was observed (Table 8).

b) Trichomonas vaginalis: From July 1, 1959, to June 30, 1961, 1,146 samples of vaginal swabs were examined (Table 9).

The total incidence was 35.8%. Among positive cases, the youngest was a 14-year-old girl; but in general, the senior adult group showed a much higher percentage of this infection.

Table 9. Incidence of Trichomonas vaginalis among the Out-Patients visited Dept. of Gynaecology, Severance Hospital (July 1, 1959~June 30, 1961)

Age	Number of Women Examined	Number of Positive	Incidence (%)
~ 10	2	0	—
11 ~ 20	24	6*	25.0
21 ~ 30	487	154	31.6
31 ~ 40	412	157	38.1
41 ~ 50	172	70	40.7
51 ~ 60	46	22	47.8
61 ~	3	1	—
Total	1,146	410	35.8

* The youngest patient was 14 years old.

Table 10. Examinations of Malaria Plasmodium by smear Method from Suspected Out-Patients of Severance Hospital (May 1, 1959~July 31, 1961)

Year		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1959	No.					5	14	14	9	20	5	8	9
	Posit.					2	—	—	—	1	2	—	1
1960	No.	8	7	1	3	4	4	3	6	5	1	1	1
	Posit.	—	—	—	—	—	—	—	—	—	—	1	—
1961	No.	1	1	2	0	1	3	4	Total		No.	140	
	Posit.	—	—	—	—	—	—	—			Posit.	7	

c) **Malaria parasite**: From May 1, 1959, to July 31, 1961, 140 blood smears were examined. Plasmodium vivax was found in 7 cases (Table 10).

DISCUSSION

Among the considerable number of reports which were cited in the introduction, the works by Choi (1926) and Hunter and co-workers (1949) are suitable for comparison with the present data, due to similar samples and method of examination. Choi (1926) took samples from out-patients and students at Severance Hospital and examined them by direct smear.

From the standpoint of geographical samplings and method of examination, the latter reports are more suitable for comparison with the results of the present survey, due to the fact that the samplings were from the civilian population in Seoul and the examinations were limited to one specimen per person by the same formalin-ether concentration technic (M.G. L. Method).

In view of possible chronological changes in incidence, a series of reports by several workers are reviewed (Table 4).

The source of material is different between the report of Hunter et al. and the present data; the former was from a random sample of Seoul residents and the latter from out-patients (most of them from the Departments of Internal Medicine and Pediatrics). The present data shows a small decrease of incidence compared with the former reports of Hunter et al. 1948. Nevertheless, complete elimination would not be expected due to the habits of disposal of night soil. The use of human manure as fertilizer for vegetable gardens spreads viable helminth ova on growing cabbages, radishes and other vegetables. Chyu (1957) counted the Ascaris eggs from each bundle of vegetables from the market, and found the average number to be 25. Soh and co-workers (1959) detected Ascaris eggs in 4 out of 10 samples of roadside soil in Seoul. Flies have an opportunity to feed on feces and contaminate foods.

Table 11. Review on Incidence of Intestinal Parasites which have been done by several Workers in the Seoul Area

Workers	Choi	Hunter et al.	Soh et al.
Year	1926	1949	1958—1961
No. of persons exam.	334	169	H*:14,682 P:10,320
Method of examination	Direct smear	M.G.L.	M.G.L.
No. of exam. (in each)	6	1	1
Incidence(%)			
Helminths			
A. lumbricoides	60.8	81.4	46.9
T. trichiurus	75.9	86.8	72.2
Hookworm	25.4	38.9	23.5
T. orientalis	8.4	35.3	22.6
Strongyloides stercoralis	0.8	—	—
E. vermicularis	—	—	0.07
C. sinensis	1.2	5.4	7.0
P. westermani	0.5	—	0.09
Taenia	0.3	1.2	0.5
D. latum	0.02	—	—
Protozoa			
E. histolytica	30.2	4.8	4.3
E. coli	26.4	26.4	11.1
E. nana	41.6	8.4	7.7
Iod. butschlii	16.4	—	0.5
Giardia lamblia	8.8	3.6	4.7
Tricho. hominis	4.4	—	—
Chil. mesnili	0.8	1.2	0.4
Dient. fragilis	(1 case)	—	—
Isospora hominis	—	—	(3 cases)

H*.....Helminths P.....Protozoa

Soil out of doors may be contaminated by promiscuous defecation by children, and such habit may lead to heavy infection of the population. Pak(1960) found helminths eggs and protozoan cysts from house flies, and Ahn (1959) from the soil of door yards.

For convenience, the discussion will be divided into two parts; Helminths and Protozoa.

Helminths:

Table 1 indicates that the mode of life influences somewhat the incidence of helminths. In general, parasites (Ascaris, T. trichiurus, Hookworm and T. orientalis) from vegetable sources are more prevalent in females than in males, in contrast to parasites from animal sources (Liver fluke, Taenia). Though all family members eat at the same table with the same menu, the female group has more opportunity to come in contact with raw vegetables, and the male group has more opportunity to consume raw meat and fish at restaurants. Such phenomena were recognized by Choi (1926), too.

The incidence of helminths seems to increase as the age goes up until the juvenile decade, and then continues at almost an equal level among those examined up to 60 or more years of age. One case of liver fluke infection in an 8-month-old infant was found, and 5 cases before the age of 5 years. The presumable source of infection might be due to the contaminated hands and breast of the mother. Mothers, while handling raw fish, may allow their babies

to nurse. It is reasonable that there is no significant seasonal fluctuation in the helminthic infection. Though the incidence of Hookworm infestation was higher (26.5%) in the warm season (April to September) than in the cold season (19.9%), it is presumed that the difference might be by chance.

In observing the number of species per person, it is noted that mixed infections of five species of helminths were found in 0.2% of 11,983 positive cases of infection, and double infection was most frequent. Among double infections, it is noteworthy that in the combinations of Clonorchis sinensis with the three kinds of helminths (Ascaris lumbricoides, T. trichiurus and Hookworm), Ascaris occurred less comparison with the rate of single infections among the three kinds of parasites; the incidence was, respectively, 0.2%, 2.4% and 0.2%. Lee (1956) observed that there was a close relationship between Clonorchis sinensis and Ascaris lumbricoides, from the fact that the growth of Clonorchis sinensis in rabbits was inhibited by Ascaris insertion. However, further surveys or experiments will be needed to reach a final conclusion.

Utilizing the skin test, Walton and Chyu (1959) estimated that about 1.5 million people among the 21 million South Koreans were infected with Paragonimus westermani. However the figure is not indicative of the actual data, because the reliability of the immunological reaction with Paragonimus westermani antigen is as yet in doubt (Ritchie et al., 1951); in addition, positive reactions appear even when infection is not present. At present, the determination of the exact status of paragonomiasis should rely on the detection of Paragonimus eggs in the sputum.

Among 1,050 cases of people who visited the Severance Hospital Chest Clinic under the suspicion of tuberculosis, it was noted that 7% showed Paragonimus on sputum examination. As Seoul is not an endemic area, these positive cases might come from various endemic areas and, it is also presumed, by consuming raw crabs which were transported from endemic areas.

From an epidemiological standpoint, it seems an important problem in the present era of transportation development. The high incidence in teenagers is understood to be due to the consuming of cray fish extract at the time of a big epidemic of measles in 1946. There still exists in Korea a superstition regarding the taking of cray fish extract, falsely supposing that it might improve the symptoms of measles (Yun, 1960).

Among laboratory findings of cestoda infection, only 80 cases were positive out of 14,682 stool samples examined. The fact that 32 out of 80 were H. nana confirms that the worms are spread chiefly among children. The remainder of the 80 were presumed mostly Taenia saginata in Korea. As the taenia eggs usually are not discharged with the stool, it is considered that the figure is not exact. Another survey which was undertaken in order to prove this assumption, showed that the incidence of Taenia was much higher than that indicated by the laboratory method; 3.6:0.05. As was previously noted, the higher incidence in the male group than in the female is due to the difference in eating habits between the sexes. Most of the Korean-style restaurants serve raw meat in mixed food, and the majority of customers are in the men's group.

Concerning the Pin worm survey, the data in Table 1 are apparently unreliable. Therefore, to represent the true incidence, the authors wish to introduce two former reports to show the present figure in Korea; Seo and Lim (1958) reported a 36% incidence among 2,273 of urban and rural children, and Chyu and Kim (1959) also found 19.7% among 1,529 rural children.

Protozoa:

The Protozoan incidence from the present data is very similar to the former one of Hunter et al. (1948), though it is far less than that of Choi's report (1926). The interpretation of the differences from the former report may be explained as due to the different method of examination, rather than to environmental improvement. Among intestinal protozoa found in the survey, E. histolytica and Giardia lamblia show some interesting data. Positive cases of E. histolytica in infants gave cause for alarm regarding on maternal public health.

Jung and Beaver (1951) grouped Trichocephaliasis from a clinical viewpoint; light, moderate and heavy. In light to moderate infestation, there were 169

cases with initial egg-counts below 100 eggs per smear. Nine (5.3%) of them were also infected with E. histolytica. In heavy infection, of the 51 individuals with egg-counts of 100 or more per smear, there were only 14 in which diarrhoea, dysentery or bloody stools were not recorded. Sixteen of the 37 patients (43.2%) for whom the above symptoms were recorded were also infested with E. histolytica. From the above report, it is evident that there might be a relationship between the infestation of T. trichiurus and E. histolytica.

The present survey also confirms the relationship between these two parasites. Figure 4 shows that Trichocephalus trichiurus is, among intestinal helminths, the most intimately associated with E. histolytica.

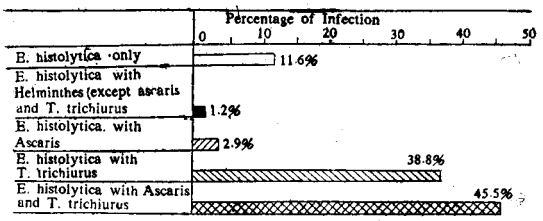

Fig. 4. Mixed Infection of E. histolytica with Other Helminths among the Out-Patients of Severance Hospital (July 1, 1959~June 30, 1961).

Giardia is more prevalent in children and decreases as the age increases. This fact indicates that the protozoa are more likely to infect the young.

The lack of significant manifestations of seasonal incidence suggests that protozoan infection by cysts is not influenced by weather, at least in Korea.

Shin (1957) found positive Trichomonas vaginalis cases in 42.02% of 1,066 out-patients. This compares with the incidence of 35.8% in the present series, but it is doubtful whether the difference is real or by chance. Although there was no improvement in sanitation, antibiotics have appeared during the intervening decades.

Seven positives for malaria parasites out of 140 suspected cases may give supplementary information to the present data of malaria in Korea. Paik(1961) reported that a total of 12,441 blood smears were received from 489 reporting units during January to September, 1961, and 4,948 or 39.8% were found to have P. vivax infections. According to such evidence, the malaria problem is still important in Korea.

Several other parasites which have been reported in Korea are not included in the present paper, because no studies for them were made in our laboratory. Among them, Wuchereria malayi (Seno et al., 1951), Dracunculus medinensis (Hashigura, 1926), Metagonimus yokogawai (Katsurada, 1917), Fasciola hepatica (Brookes, 1951), Hymenolepis diminuta (Ogura, et al., 1933), Trichomonas hominis (Choi, 1926), Dientoamoeba fragilis (Choi, 1926), etc. are noted. Filariasis is an endemic disease which is limited to the southern islands and along the Keum-Kang River (Moon, 1939) (Lee, 1961). The latter parasites are very rare (Choi, 1926) and may be ignored from the epidemiological viewpoint.

It might be doubted whether the present data represents the nation-wide incidence of parasites, though approximately half of the residents in Seoul come from other parts of Korea. Through the present survey, it is recognizable that the main source of parasitic infection in Korea is human excreta, feces and sputum, although blood also plays a role in malaria infestation.

In order to eliminate parasites from Korea, it might be suggested that adequate sterilization of human feces should be carried on to prevent dissemination of viable cysts and ova by insect vectors or other means, and so eliminate contamination of food and soil. This problem belongs to the public health administration and requires both an inquiry into the methods of disinfection without destroying the fertilizing value of the manure, and a general education of the people on the relation of feces disposal to disease.

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