

Epidemiological study on schistosomiasis japonica among schoolchildren in an endemic area of Yamanashi Prefecture

TOSHIHIKO IJIMA AND YOUICHI ITO

Yamanashi Prefectural Hygiene Laboratory, Kofu, Japan

TATSUSHI ISHIZAKI

Department of Parasitology, National Institute of Health, Tokyo, Japan

(Received for publication ; October 21, 1968)

Introduction

It is generally believed that a considerable reduction of human schistosomiasis in Japan has been brought about by the use of molluscicides, modification of snail habitat by cementing ditches, rapid development in agricultural method, and industrization of the endemic areas. According to reports of prefectural governments, 39 patients of schistosomiasis were found in Hiroshima Prefecture in 1963, one of the notorious endemic areas in Japan and 0.23% of 39,832 inhabitants in endemic areas of Yamanashi Prefecture were positive for *Schistosoma japonicum* eggs in 1961. These reports were based on data mostly the direct fecal smear technique which is not highly reliable in egg detection. It is, therefore, likely that these positive rates do not show the true prevalence of the infection.

Iijima *et al.* (1962) reported the results of comparison between direct smear and MIFC (merthiolate - iodine - formaldehyde concentration (Blagg *et al.*, 1955) methods and came to the conclusion that MIFC method by which five specimens collected separately from a person are examined, is more reliable to detect *Schistosoma* eggs. Present paper deals with the results of survey for human schistosome infection by

the MIFC method and skin test on the primary and junior high schoolchildren in Futaba-cho of Yamanashi prefecture and with relation between the prevalence of the infection and geographical distribution of *Oncomelania nosophora* in the town.

Materials and Methods

Surveys were carried out in 1962 and 1964 on a total of 1,515 school children in Futaba-cho, a small town in northwest part of Yamanashi prefecture with a population of 4,911. The schoolchildren examined were consisted of junior high schoolchildren (JHS) aged 13-15 years and 392 primary schoolchildren (PS) aged 7-12 years in 1962, and 351 and 371 respectively in 1964. Skin test, fecal examination, and snail survey were conducted in the manner described below.

Skin test: Antigen used is an acid-soluble fraction of adult schistosomes containing 30 μ g of protein nitrogen per ml, prepared according to Melcher's method (1943) and kindly supplied by the 406th Medical General Laboratory of the U. S. Army in Japan. On the forearm of a child 0.02 ml of the antigen was intradermally injected by means of Tuberculin syringe (0.5 ml) with 27-gauge needle. The reaction was recorded 15 minutes after injection as each

average of two rectangularly crossed diameters of both erythema and wheal. The case showing 9 mm or more in wheal diameter and/or 20 mm or more in erythema was regarded as the positive (Ishizaki *et al.*, 1964).

Fecal examination: Based on Ota's observation (1958) that nearly all (95%) of the cases with eggs in feces were positive for skin test, fecal examinations were carried out on each 1.0 g of fecal specimens collected from skin test positive cases, by modified MIFC method (Ota *et al.*, 1957). Based on the preceding paper (Iijima *et al.*, 1962), five successive fecal examinations were performed on individuals at intervals of 7 to 10 days.

Egg-positive cases surveyed in 1962 were treated with sodium antimony tartarate (Stibunal), 1.2 g in total by intravenous injections starting just after the survey.

Snail survey: Data on snail distribution indicated in the present paper are a part of those from the work done by co-operation with the 406th Medical General Laboratory in 1963. Survey was made in every farming and housing lot, covering 4,757 acres in total. One square meter in farming lots near the inlet of irrigation of ditches, low dykes between the lots, and adjacent irrigation ditches were carefully observed for the detection of snails.

Results and Discussions

1. Prevalence of *Schistosoma japonicum* infection among schoolchildren

The results obtained by the skin test and fecal examination for *Schistosoma* infection among schoolchildren in 1962 and 1964 are shown in Table 1. JHS were those from families scattering all over the town while PS were from those located in the western half of the town. Therefore the data obtained in each school of children in the same year should be analysed separately. As seen in the table in 1962, 37% of 401 JHS and 13% of 392 PS were positive for skin test while 15% of the former and

Table 1 Prevalence of *Schistosoma japonicum* infection by skin test and fecal examination in the primary and junior high school children in Futaba-cho, Yamanashi Prefecture

Name of school	Survey in 1964									
	Survey in 1962					Survey in 1964				
	Total No. of children	No. examined	Skin test No. positive	Per cent positive	Fecal exam. No. positive	Total No. of children	No. examined	Skin test No. positive	Per cent positive	Fecal exam. No. positive
Junior High School (JHS)	404	401*	148	37	61	354	351	97	38	30
Primary School (PS)	399	392	52	13	30	371	371	33	9	10

* Ten examinations at 10-day intervals were carried out on one case

Table 2 Skin test and fecal examination in 1962 of the children positive for the test and examination in 1964

Name of school	Skin test			Fecal examination		
	No. positive	No. positive	(a)-(b)	No. positive	No. positive	(A)-(B)
	in 1964 (a)	in 1962 (b)		in 1964 (A)	in 1962 (B)	
Junior High School (JHS)	79	64	15	19	12	7
Primary School (PS)	26	14	12	7	4	3

8% of the latter were positive for *Schistosoma* eggs. In 1964, 28% of 351 JHS and 9% of 371 PS were positive for the skin test while 9% and 3% were positive for the eggs, respectively. The positive rates in 1962 are significantly ($P=0.05$) higher than those in 1964 in both of the skin test and fecal examination.

In order to know possible occurrence of new *Schistosoma* infection during the years 1962-1964 in this area, skin test-positive (STP) or egg-positive (EP) cases in 1964 survey who were also examined in 1962 survey were selected and shown in Table 2. As shown in the Table, 15 of 79 STP- and 7 of 19 EP-cases of JHS in 1964 were negative for the skin test and for the eggs respectively in 1962 while 12 of 26 and 3 of 7 cases of PS, respectively. This fact

suggests possible occurrence of new infection of *Schistosoma* among the children 1962-1964 in this area.

a) Age-distribution: Age distributions of STP and EP cases of the PS and those of the JHS are shown in Table 3 and Fig. 1. JHS in the table and figure were selected from those who graduated from the primary school which was located in the western half area of the town. The result from the skin test in 1962 shows an increase of the positive rate with age. An increase of egg positive rate with age is not clearly observed as seen in the case of skin test. In an attempt to elucidate epidemiological implication, analyses were made principally on the results obtained in 1962. The 1964 survey results were not employed for the present analytical study since the data do not indicate the natural state of the infection due to some derangement by the presence of treated persons who were found as positive for *Schistosoma* eggs in 1962 surveyed. All of the 61 children aged 7 years except a child, were negative for skin test. This fact may suggest that *Schistosoma* infection scarcely occur among the children with pre-school age. A certain similarity between EP and STP rates in younger age groups may suggest that the sensitization (positive reaction by skin test) reflect the establishment of the infection. On the contrary, marked dissimilarity between both rates in higher age group may be also explained that STP reaction is due

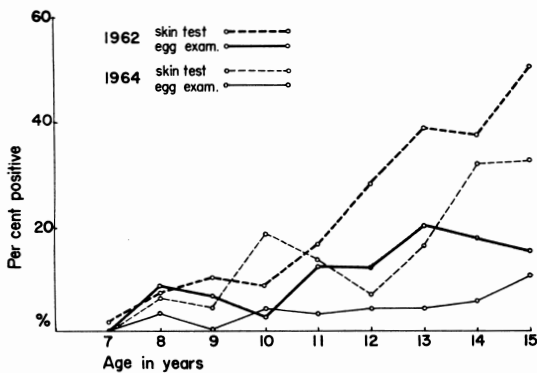


Fig. 1 Age distribution of skin test-positive and egg-positive cases in 1962 and 1964 on the same subject.

children were positive for the skin test while 15% of the former and 8% of the latter were positive for *Schistosoma* eggs. In 1964 28% of 451 junior high school children and 9% of 371 primary school children were positive for skin test while 9% of the former and 3% of the latter were positive for eggs. The both rates in 1964 are significantly lower than those in 1962.

2) Analysis of the results from 1964 survey gives a conclusive evidence for the occurrence of new *Schistosoma* infection among the children in the area during the years 1962-1964.

3) Inspection for age-distribution in both skin test and egg positive rates on the children in the same area revealed an increase in skin test positive rate with age but not in egg positive rate in higher age groups. There are very few children infected with schistosomes in 7-year-old group, suggesting no occurrence of the infection in pre-school children.

4) A close correlation between the incidence of infection with schistosomes among children in community and the distribution of *O. nosophora* in the town was observed. Higher incidences were observed among children in the inclined north area

where the snails were densely found and lower in the plane south area and in the hilly east area where the snails are sparsely found.

References

1. Blagg, W., Schlaegel, E. I., Mansour, W. S. and Khalaf, G. I. (1955): A new concentration technic for the demonstration of protozoa and helminth eggs in feces. *Amer. J. Trop. Med. & Hyg.* 4, 23-28.
2. Iijima, T., Ito, Y., Nakayama, S, and Ishizaki, T. (1962): Studies on diagnosis of schistosomiasis. I. Statistical studies on recovering schistosome eggs in human feces with repeated MIFC technique. *Jap. J. Parasit.*, 11, 483-487.
3. Ishizaki, T., Iijima, T. and Ito, Y. (1964): Studies on diagnosis of schistosomiasis. II. A new criterion of the positive intradermal reaction by the antigen of *Schistosoma japonicum*. *Jap. J. Parasit.*, 13, 387-396.
4. Melcher, L. P. (1957): An antigenic analysis of *Trichinella spiralis*. *J. Infect. Dis.*, 73, 31-39.
5. Ota, S. and Sato, S. (1957): Studies on several techniques for detecting the eggs of human parasite. *J. Kitakanto Igaku*, 7, 68-71.
6. Ota, S. (1958): Studies on skin test with adult antigen of *Schistosoma japonicum*. *J. of Yamanashi Prefectural Hygiene Laboratory*, 2, 71-72.

山梨県下日本住血吸虫症一流行地における学童の同症感染状況調査

飯島利彦 伊藤洋一

(山梨県立衛生研究所)

石崎 達

(国立予防衛生研究所寄生虫部)

山梨県における日本住血吸虫症の淫浸状況を知るため、山梨県双葉町小・中学校児童生徒を対象に Melcher 抗原による皮内反応及び MIF による繰返し 5 回の糞便検査を実施した。検査は 1962 年、1964 年の 2 回行なった。また、1963 年に同町内のミヤイリガイ棲息状況を全域にわたり調査し、ミヤイリガイの分布と生徒の感染率の関係につき比較した。その結果は次の如くである。

1. 1962 年における皮内反応陽性率は小学校 13%、中学校 39%、虫卵陽性率はそれぞれ 8% 及び 15% であった。また 1964 年は皮内反応陽性率小学校 9%、中学校 28%、虫卵陽性率はそれぞれ 3% 及び 9% であった。

2. 1964 年に皮内反応陽性であった者 79 名中 15 名

及び虫卵陽性であった者 19 名中 7 名は 1962 年の検査で陰性であった。このことより、この地区で 2 年間に新感染のあったことが認められる。

3. 小学校 1 年の学童では皮内反応陽性者が 1 名であったことより 7 才以前の者では同症の感染を受ける機会のほとんどないことが推定される。

4. ミヤイリガイの棲息は北部傾斜地に多く、南部平坦地は一部を除いて棲息が認められなかった。また、東部丘陵地にはその棲息密度が非常に低かった。

5. 貝の分布と小・中学生における感染率の強い相関が認められた。すなわち、ミヤイリガイが広く分布し、棲息密度の高い北部傾斜地では感染率が高く、また 2 年間に感染率の減少が認められなかった。