Prevalence of *Paragonimus westermani* in some Ulchín school children*

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Introduction

Since Moriyasu(1915) first reported on the discovery of *Paragonimus westermani* metacercariae from *Eriocheir sinensis* in Kangwha island of Korea, many investigators have made studies on the infestation rate for *Paragonimus* metacercariae in crayfish and crab intermediate hosts and on the prevalence of lung fluke among the residents.

As a result, the overall positive rate of *P. westermani* among the residents is estimated to be more than 4.0 per cent, and human paragonimiasis is recognized as a major public health problem in the endemic areas of Korea today. From their studies on the *P. westermani* in Ulchín county, Kyungpook Province, Joo et al.(1985) reported that 25.8 per cent of residents showed positive intradermal reactions with *Paragonimus* antigens, and that *Camaroides similis* caught in the mountain streams in this county were moderately infested with the cysts of *P. westermani*.

Hong et al.(1986) have recently studied the in-
festation status of *P. westermani* metacercariae in the second intermediate host in Ulchin county, and reported that 1.9-25.1 per cent of *C. similis* were infested with metacercariae of *P. westermani*, one of them having a maximum of 12 metacercariae. The sites of the metacercariae were mainly in the cephalothorax, the gills and the liver.

They also reported that endemic foci of *P. westermani* existed in Ulchin county on the basis of positive intradermal reactions of the residents examined and demonstration of the metacercariae from the crayfish intermediate host of *P. westermani*.

Fig 1. Surveyed schools in Ulchin county in Kyungpook Province, Korea.
However, no survey of *P. westermanni* among school children has been conducted in this county. This report deals with the prevalence of *P. westermanni* among school children of Ulchin county.

**Surveyed areas and Methods**

Surveyed areas: The survey of *P. westermanni* among school children in Ulchin county was carried out at 5 locations in the vicinity of the Namdae, Kwang, and Wanygip streams, shown in Figure 1, during 2 years from September in 1988.

Intradermal test: The prevalence of *P. westermanni* among the children was estimated by the intradermal test. The *Paragonimus* antigen, Lot No. 890417, made in the National Institute of Health, Tokyo, Japan was used in this survey.

Intradermal injections, approximately 0.02 ml of 1:10,000 *Paragonimus* antigen(VBS), were made on the volar surface of the forearm. The wheals obtained were measured immediately after the injections, and another measure was taken from 15 to 20 minutes later. Wheals which had increased an average of 5 mm or more were considered as positive reactions, 3 mm or less were negative while 4 mm were recorded as doubtful.

Sputum examination: Sputum specimens were mostly collected from children who showed a positive intradermal test for paragonimiasis. The sputum specimens, collected in sterilized bottles, were brought to the Department of Parasitology laboratory. They were dissolved in 5% sodium hydroxide for 2 hours or longer, and centrifuged for 5 minutes at 3,000 revolutions per minute.

The deposit was put under a cover glass on a slide, and examined microscopically for *Paragonimus* eggs.

Stool examination: Stool specimens were collected from children, and were forwarded to the Parasitology laboratory. The specimens were examined by the formalin-ether sedimentation technique(Ritchie, 1948).

**Results**

Table 1 shows the prevalence of *P. westermanni* among the five schools in Ulchin county, based on *Paragonimus* intradermal tests.

The overall positive rate for *P. westermanni* among the children was found to be 13.9 per cent. In the sex specific rate of infection, the rate was not significantly different in the positive reaction between boys and girls; 14.6 per cent in boys and 13.0 per cent in girls.

The positive rate of the lung fluke among the children in different schools varied markedly. In the two primary schools in the vicinity of the Namdae and Kwang streams, the positive intradermal reactions were relatively high. 22.2 per cent in Samdang primary school and 21.3 per cent in Sokwang primary school, respectively, while the positive rate of the Kugo school was lower.

However, in the Sangcheon and Sugok schools, the children tested were found to be negative.

The prevalence of *P. westermanni*, based on positive

<table>
<thead>
<tr>
<th>Primary school</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. tested</td>
<td>Percent positive</td>
<td>No. tested</td>
</tr>
<tr>
<td>Sam-dang</td>
<td>103</td>
<td>23.3</td>
<td>82</td>
</tr>
<tr>
<td>So-kwang</td>
<td>26</td>
<td>19.2</td>
<td>21</td>
</tr>
<tr>
<td>Ku-go</td>
<td>10</td>
<td>10.0</td>
<td>21</td>
</tr>
<tr>
<td>Sang-cheon</td>
<td>14</td>
<td>—</td>
<td>5</td>
</tr>
<tr>
<td>Su-gok</td>
<td>52</td>
<td>—</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>205</td>
<td>14.6</td>
<td>177</td>
</tr>
</tbody>
</table>

Table 1. Positive rate for *Paragonimus* antigen among school children in five different schools in Ulchin county(1989)
intradermal tests, among the children in Ulchin county by age groups is summarized in Table 2.

The rate for age groups varied considerably. It was found to be 4.3 per cent in the 6 year old group and 11.4 per cent in the 7 year old group. The rates increased and reached a maximum of 21.1 per cent in the 8 year old group.

It subsequently dropped to 16.2 per cent and 13.1 per cent in the 9 and 10 year old groups, after which it increased again to 15.6 per cent in the 11 year old group.

The number of specimens examined and the positive results of Paragonimus eggs determined by sputum and stool examinations are shown in Table 3.

Discussion

Since the first report on the demonstration of Paragonimus metacercariae from crayfish collected in the stream Keomoon, Chilgok county(Miyairi, 1916), epidemiological studies on P. westermani have been made by many investigators(Ichinomyia, 1924; Walton and Chyu, 1958; Park and Song, 1961; Kim et al., 1974; Kim and Choi, 1977; Shon and Choi, 1977; Lee and Choi, 1979; Choi and Hwang, 1980; Choi et al., 1981; Joo et al., 1985) in an attempt to estimate the prevalence among the residents of Kyungpook Province.

As a result, human paragonimiasis is found to be endemic in some counties of this Province and constitutes a major clinical and public health problem.

Little factual data can be found related to the epidemiology of P. westermani in Ulchin county because of its location in the mountainous districts of the northeast part of Kyungpook Province which was incorporated from Kangweon Province in 1963, and the lack of attention given to the problem of human paragonimiasis.

The first case of paragonimiasis was reported by a certain physician as the result of an excisional biopsy of a small mass in the transverse colon wall of a 43 year old man in Keonnam myun of Ulchin county (Kim, 1983).

Joo et al.(1985) first confirmed that Ulchin county

<table>
<thead>
<tr>
<th>Age (Y)</th>
<th>Male No. tested</th>
<th>Percent positive</th>
<th>Female No. tested</th>
<th>Percent positive</th>
<th>Total No. tested</th>
<th>Percent positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>22</td>
<td>4.5</td>
<td>24</td>
<td>4.2</td>
<td>46</td>
<td>4.3</td>
</tr>
<tr>
<td>7</td>
<td>21</td>
<td>14.3</td>
<td>23</td>
<td>8.7</td>
<td>44</td>
<td>11.4</td>
</tr>
<tr>
<td>8</td>
<td>24</td>
<td>20.8</td>
<td>14</td>
<td>21.4</td>
<td>38</td>
<td>21.1</td>
</tr>
<tr>
<td>9</td>
<td>34</td>
<td>14.7</td>
<td>40</td>
<td>17.5</td>
<td>74</td>
<td>16.2</td>
</tr>
<tr>
<td>10</td>
<td>44</td>
<td>13.6</td>
<td>40</td>
<td>12.5</td>
<td>84</td>
<td>13.1</td>
</tr>
<tr>
<td>11</td>
<td>60</td>
<td>16.7</td>
<td>36</td>
<td>13.9</td>
<td>96</td>
<td>15.6</td>
</tr>
<tr>
<td>Total</td>
<td>265</td>
<td>14.6</td>
<td>177</td>
<td>13.0</td>
<td>382</td>
<td>13.9</td>
</tr>
</tbody>
</table>

Table 3. The frequency of detection of Paragonimus eggs by sputum and stool examination(1989)

<table>
<thead>
<tr>
<th>Cutaneous reaction</th>
<th>Sputum test</th>
<th>Stool test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. examined</td>
<td>Percent positive</td>
</tr>
<tr>
<td>Positive</td>
<td>41</td>
<td>26.8</td>
</tr>
<tr>
<td>Negative</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
<td>15.7</td>
</tr>
</tbody>
</table>

The detection of Paragonimus eggs was 26.8 per cent of the sputa examined and 11.3 per cent of the stools. The cases where Paragonimus eggs were found only in stools, but not in sputum, occurred in 0.6 per cent.
is one of the endemic areas of paragonimiasis. They examined the 819 residents in the vicinity of the streams Namdae, Wanygi, and Kwang in Ulchín county, using skin reactions with Paragonimus antigen, and reported the prevalence rate of this lung fluke among the residents to be high, 25.8 per cent.

At the same time they also found the snail intermediate host, Semisulcospira libertina in the streams and demonstrated the existence of Paragonimus metacercariae from crayfish collected in surveyed areas. They obtained adult flukes by feeding dogs with metacercariae from crayfish.

In this study, five primary schools in Ulchín county were selected as surveyed areas because the residents of these localities were studied by Joo et al.(1985). The results presented in Table 4 indicate that of 382 children examined by Paragonimus intradermal, stool, and sputum tests, 13.9 per cent, 2.8 per cent, and 2.1 per cent were positive for P. westermanni, respectively.

### Table 4. Comparison of the methods used in laboratory diagnosis for paragonimiasis(1989)

<table>
<thead>
<tr>
<th>Method</th>
<th>No. positive</th>
<th>Percent positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intradermal</td>
<td>53</td>
<td>13.9</td>
</tr>
<tr>
<td>Sputum</td>
<td>11</td>
<td>2.8</td>
</tr>
<tr>
<td>Stool</td>
<td>8</td>
<td>2.1</td>
</tr>
<tr>
<td>Total No.</td>
<td>382</td>
<td></td>
</tr>
</tbody>
</table>

Actually, this is no indication of the true prevalence among the children in this county because the intradermal test is highly sensitive and one time fecal and sputum examinations are not sufficient to determine the true infection rate of paragonimiasis.

In earlier studies on P. westermanni among the children in Kyungpook Province, Park and Song(1961) reported that the prevalence of P. westermanni was very low in four valley areas surveyed along the river Nakdong and its tributaries, but there was a higher prevalence in such places as Dalseong, Yeongyang, Cheongsong, and Chilgok counties where mountain streams with crayfish were found and were heavily infected. From their survey on Paragonimus infections related to measles, it was found that of 2,385 measles cases examined, 692 cases or 22.8 per cent had ingested crayfish, and of that number 297 or 42.9 per cent became infected with paragonimiasis.

From a survey on P. westermanni in Kyungpook Province, Kim et al.(1974) reported that prevalence of this fluke among school children aged 7 to 12 years was found to be 5.2 per cent, and Choi et al. (1981) in a study of P. westermanni in some Wiseong school children reported a prevalence from 0.8 to 8.3 per cent, with an average of 3.6 per cent.


As shown in previous reports by many investigators, in some districts of Kyungpook Province the rate of positive reaction of the intradermal test for paragonimiasis among the children has been as high as around 10.0 per cent, and it may be surmised that P. westermanni infection is likely to be considerably more densely spread if estimated on the premise that one third of those positive of the intradermal test possess Paragonimus eggs within them. In the present study, the intradermal test with Paragonimus antigen detected 53 positive cases or 13.9 per cent. These results are similar to data reported by Lee and Choi(1979) in Chilgok county. However , this study shows a higher prevalence than those reported by Kim et al.(1974) in Yeong-cheon, Andong, Sangju, Yeonyang counties, by Choi et al.(1981) in Wiseong county, although Kim et al.(1974) reported much higher figures.

As Joo et al.(1985) indicated, the factor contributing to the higher prevalence among the children in this county than in other counties of Kyungpook Province were considered to be inadequate public health education and socioeconomic conditions because of its relative isolation and the lack of attention given to the problem of parasitic diseases.

According to local officials, the majority of the chil-
dren in the villages along the stream basin enjoy collecting crayfish and also consuming the uncooked crayfish, and are not concerned about infection with *P. westermani*.

The sex and age specific rates for *P. westermani* show the highest prevalence in the 8 year old group in both sexes, but was uniformly high for all ages over 9 years. This figure in general is similar to Lee and Choi(1979), though it is much higher than that reported by Kim et al.(1974) and Choi et al. (1981).

It was found in this study that the prevalence rate of *P. westermani* among school children in Ulchin county is relatively high, and the endemic focus of the fluke still exists in this county of Kyungpook Province, Korea.

**Summary**

In order to estimate the prevalence of *Paragonimus westermani* among the school children in Ulchin county, Kyungpook Province, five primary schools were selected for sampling.

The children were first examined using an intradermal test with *Paragonimus westermani*.

The sex specific rate of infection was a little higher in boys than in girls. The age specific rate of *Paragonimus* infections varied from age to age. *Paragonimus westermani* was most prevalent in the 8 year old group in both sexes and showed about the same proportion among boys and girls of each age group.

A comparison of the reliability for the detection of *Paragonimus* eggs form intradermal positive cases in this study showed that the sputum test was more sensitive than the stool test.

Summarizing the results, this study indicates that the prevalence for *Paragonimus westermani* is still high and the endemic foci of the fluke exists in Ulchin county, Kyungpook Province, Korea.

**Literature cited**


