



2022년 유행지역 주민의 장내기생충 감염 조사

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초 록

질병관리청 매개체분석과에서는 매년 국내 기생충질환 감소를 위해 장내기생충 감염 유행지역 중심으로 감염현황 조사 및 치료지원 사업(Active Case Detection)을 수행하고 있다. 조사 방법은 참여 유행지역 주민 대상으로 대변검체를 수거하여 현미경으로 충란을 확인하는 검사법을 사용하였다. 이번 조사에서는 사업지역 내 읍·면·동 단위의 필수 지역을 포함하여 검사를 수행하였다. 장내기생충 감염률은 5.3%였으며, 기생충 종류별 감염률은 간흡충이 3.3%로 가장 높았으며, 다음으로 장흡충 1.7%, 편충 0.2% 순이었다. 2022년 참여 사업지역 중에서 장내기생충 감염률은 광양시가 12.9%로 가장 높았으며, 간흡충 감염률은 안동시가 9.7%로 가장 높았다. 장내기생충 감염률을 낮추기 위해서는 간흡충 유행지역을 중심으로 지속적인 검사와 교육, 치료 등의 사업이 전개되어야 한다.

주요 검색어: 장내기생충; 간흡충; 감염률

서 론

기생충은 전파방식에 따라 토양매개성, 패류매개성, 절족동물매개성, 식용동물매개성 및 접촉감염성으로 나뉜다. 국내에서 발생하는 장내기생충 대부분은 토양매개성 기생충과 식품 매개 기생충으로 볼 수 있으며, 국내 기생충 감염률은 전 국민을 대상으로 실시한 장내기생충 감염실태조사를 통해 확인해 볼 수 있다. 2012년 8차 장내기생충 감염실태조사에서 감염률은 2.6%로 전 국민의 80% 이상이 감염되었던 1차보다 감염률은 상당히 낮아졌다. 하지만 식품 매개 기생충 감염률은 1971년 제1차 장내기생충 감염실태조사에서 4.6%, 4

차 조사에서는 2.8%로 낮아졌지만 2012년 8차 조사에서는 2.16%로 전체 감염률(2.6%)의 73%를 차지하고 있었으며 4차 조사에 비해 크게 감소하지 않았다[1,2]. 퇴치 수준으로 감소한 토양매개성 기생충질환에 비해 식품 매개 기생충 감염은 민물고기 생식 습관으로 지속적으로 발생하고 있다고 본다. 이에 질병관리청 매개체분석과에서는 식품 매개 기생충 감염 유행지역을 중심으로 장내기생충 감시사업을 수행하고 있다. 이 글에서는 2022년 장내기생충 감시를 통해 확인된 기생충별 감염률 및 지역별 감염률을 분석하여 정보를 공유하고자 한다.

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KDCA
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핵심요약

① 이전에 알려진 내용은?

국내 발생 토양매개성 기생충질환은 퇴치 수준으로 유지되고 있다. 그러나 민물고기 생식으로 감염되는 간흡충 등 식품 매개 기생충 감염은 유행지역을 중심으로 지속적으로 발생하고 있다. 2005년부터 실시한 위험지역 주민 대상 장내 기생충 사업 결과 간흡충 감염률은 11.0%에서 2022년에는 5.3%로 소폭 감소하였지만 여전히 유행하고 있다.

② 새로이 알게 된 내용은?

유행지역의 주민을 대상으로 한 이번 조사 결과에서 장내 기생충 감염 중 간흡충 감염률이 3.3%로 2021년과 비슷한 상황이다. 또한 광양시 감염률이 12.9%로 이번 조사를 통해 새롭게 감염률이 높은 지역으로 확인되었다.

③ 시사점은?

유행지역의 간흡충 등 식품 매개 기생충 감염을 감소시키기 위해서는 감염이 높은 지역을 대상으로 식습관을 변화시킬 수 있도록 지속적인 교육과 치료를 병행한 검사가 필요할 것으로 보인다.

방 법

장내기생충 감시사업은 충청북도(괴산군, 영동군, 옥천군), 충청남도(공주시, 금산군), 전라북도(남원시, 진안군, 순창군, 임실군), 전라남도(구례군, 순천시, 나주시, 광양시, 담양군, 곡성군, 보성군, 화순군, 강진군, 해남군, 함평군), 경상북도(포항시, 안동시, 상주시, 청송군, 영천시, 예천군), 경상남도(진주시, 밀양시, 의령군, 함안군, 창녕군, 하동군, 산청군, 함양군, 거창군, 합천군)의 총 36개 지역의 검사 지원자를 대상으로 각 지역마다 최소 200명에서 최대 2,000명까지 검사를 수행하였다. 사업 진행은 질병관리청이 기획 및 관리, 치

료 확인 검사를 수행하였으며, 보건소는 검체 수거 및 감염예방을 위한 교육, 양성자 치료지원, 한국건강관리협회는 기생충 감염 진단 업무를 수행하였다. 사업지역 내 수집된 28,918건에 대해 장내기생충 11종 검사를 수행하였다[3]. 물-에테르 침전법을 이용하여 충란을 분리 후 현미경으로 관찰하여 충란 유무를 확인하였다. 간흡충 충란은 1 g당 충란수를 측정하여 감염 정도를 파악하였다.

결 과

2022년 장내기생충 감시사업의 대상 지역 주민 28,918명에 대한 검사 결과를 살펴보면 장내기생충별 감염률은 전년 대비 0.1% 증가하여 5.3%(1,529건)로 확인되었다. 기생충별 감염률은 간흡충 3.3%(951건)로 가장 높았으며, 다음으로 장흡충 1.7%(506건), 편충 0.2%(44건), 참굴큰입흡충 0.1%(26건), 극구흡충 0.003%(1건) 순이었으며, 새롭게 장모세선충 1건이 확인되었다(표 1). 성별 장내기생충 감염률은 남성(7.6%)이 여성(3.7%)보다 2배 이상 높았으며, 연령별로는 50대와 60대의 감염률이 6.7%로 동일하게 높았다. 그 다음으로 70대에서 4.8%, 80대에서 3.8%, 90대 이상에서 3.1%를 나타냈으며, 40대 이하는 3%대 이하를 나타냈다(그림 1). 20대 이하 양성자는 장흡충 감염 1명으로 구례군에 거주하는 남성이었는데 해당 지역은 장흡충 감염률이 높은 지역(구례 3.0%)으로 장흡충을 매개하는 은어 등의 민물고기를 날 것으로 섭취하여 감염된 것으로 추정된다. 지역별 장내기생충 감염률은 전라남도가 6.5%로 가장 높았으며 전년대비 1.3% 증가한 수치를 보였다. 이는 광양시가 시·군별 중 가장 높은 양성률(12.9%)을 보였으며, 순천시(9.8%), 화순군(8.4%)은 작

표 1. 장내기생충별 감염률

검사건수	장내기생충 건수 및 감염률(%)						
	전체	간흡충	장흡충	편충	참굴큰입흡충	극구흡충	장모세선충
28,918	1,529 (5.3)	951 (3.3)	506 (1.7)	44 (0.2)	26 (0.1)	1 (0.003)	1 (0.003)

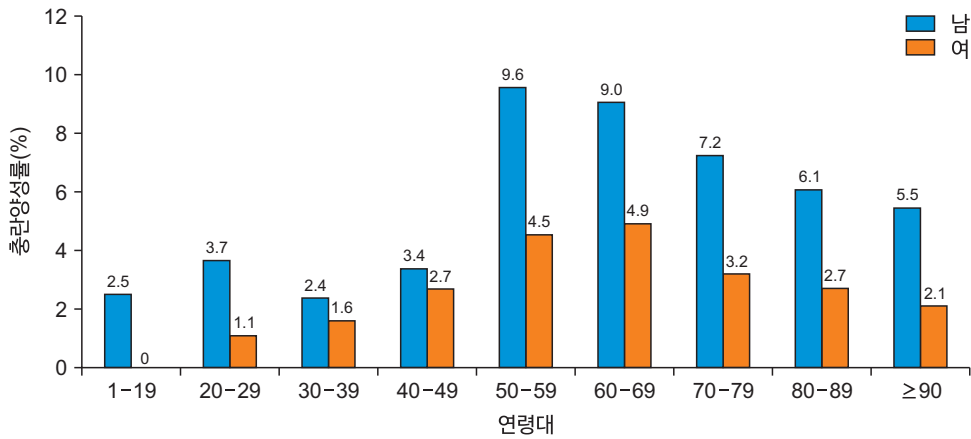


그림 1. 성별 및 연령별 장내기생충 감염률

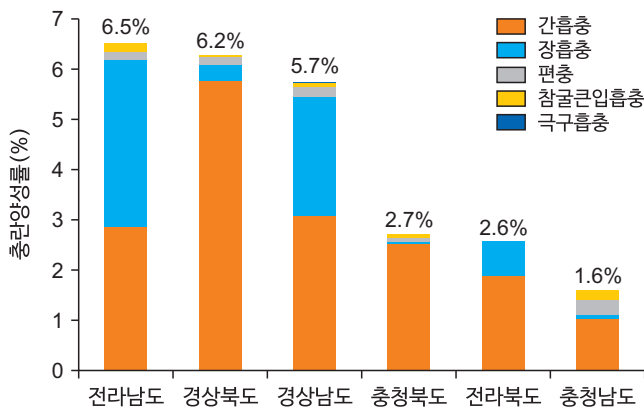


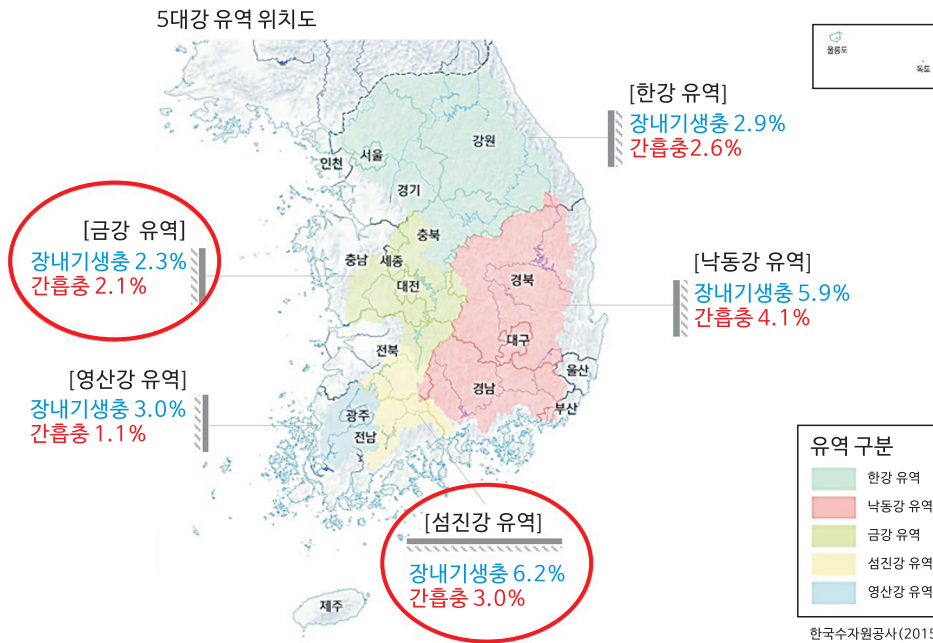
그림 2. 도별 장내기생충 감염률

년보다 2배 이상 감염률이 증가한 것이 주된 이유로 분석된다. 다음으로 높았던 경상북도는 6.2%로 작년(7.0%) 대비 양성률이 감소하였다(그림 2). 36개 사업지역의 시·군 장내기생충 감염률이 평균(5.3%)보다 높은 지역은 12개로 광양시가 12.9%로 가장 높았으며, 안동시(10.1%), 순천시(9.8%), 하동군(8.7%), 화순군(8.4%) 순으로 나타났다. 특히 광양시는 2019년부터 감염률이 계속 증가하였으며, 순천시(2021년 양성률 2.4%)와 화순군(2021년 양성률 3.1%)은 작년 대비 2배 이상 큰 폭으로 증가했다. 강 유역별 장내기생충 감염률은 섬진강 유역에서 6.2%로 가장 높게 나타났고, 그 이후로는 낙동강 5.9%, 영산강 3.0% 순으로 확인되었다. 금강 유역의 장내기생충 감염률은 2021년 영동군(10.0%)의 높은 감염률이 반

영되어 가장 높았지만 2022년은 영동군 감염률이 3.4%로 낮아져 금강 유역 감염률이 강 유역별 중 가장 낮았다(그림 3). 도별 간흡충 감염률에 따른 감염강도(eggs per gram, EPG)는 대체로 감염률이 높을수록 비례적으로 증가하는 양상을 보였다(그림 4). 특히 경북에서 EPG 5,001개 이상 확인된 양성자가 2명이고, EPG 1,001에서 5,000개까지가 16명이었다. 1,001개 이상의 양성자가 전체 28명이 확인되었으며 그중 18명(64.2%)이 경북에서 확인되어 다른 지역보다 감염 정도가 높은 것을 확인할 수 있었다.

논 의

장내기생충 조사사업은 2005년 8개 지역을 대상으로 시작되어 2022년에는 36개 지역으로 확대되었다. 2022년까지 1회 이상 참여한 지역은 총 86개로 검사 건수는 537,497건이었다. 2005년 장내기생충 감염률은 11.0%였으며 2022년에는 5.3%로 2배 이상 감소하였다. 그러나 2015년부터는 더 이상 감염률이 감소하지 않고 5%로 계속 유지되고 있다[3]. 특히 식품 매개 기생충인 간흡충은 전체 감염률에서 가장 높은 비중을 차지하고 있으며 강 유역을 중심으로 지속적인 감염을 보이고 있다. 이번 조사에서 감염 고위험군은 섬진강 및 낙동강 인근에 거주하는 50-60대로 50대 이상에서 생식 습



한국수자원공사(2015) 그림 3. 강별 장내기생충 감염률 비교

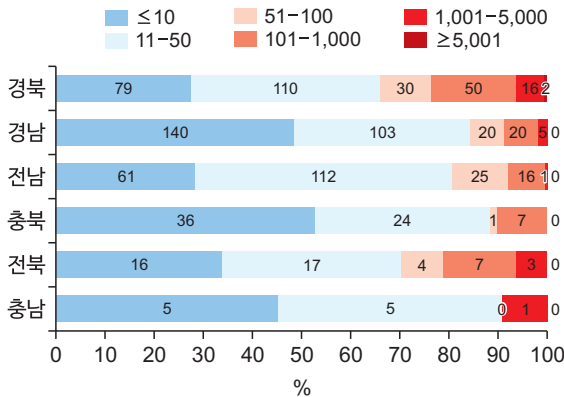


그림 4. 도별 간흡충 감염강도(eggs per gram) 비교

관이 여전히 유행하고 있다는 것을 보여준다[4]. 장내기생충 중 감염률이 가장 높은 간흡충은 전체 감염의 61.9%, 장흡충은 33.4%를 차지하여 장내기생충 감염률의 95%를 식품 매개 기생충이 차지하고 있다는 것이 확인되었다. 간흡충은 담도에 자리를 잡으면서 담도를 확장시키고 만성적인 염증을 일으킬 수 있으며 장기적으로는 담도암 등을 유발할 수 있다[5]. 36개 시·군 중 장내기생충 감염률은 광양시가 가장 높았지만 간흡충 감염률은 안동시(9.7%)가 가장 높았다. 작년에 이어 안동시 길안면에서 매우 높은 감염률을 보여주고 있어 안동시에 대한 집중조사가 필요하고 새롭게 조사된 임하면도 높

은 양성률(8.7%)을 나타내어 전체 안동시 지역에 대한 조사가 필요한 상황이다. 국내 장내기생충 감염률을 감소시키기 위해서는 간흡충 등 식품 매개 기생충에 대해 유행지역 주민을 대상으로 검사와 치료가 필요하다. 질병관리청 매개체분석과에서는 기존의 장내기생충 감시사업 지역에 대한 읍·면·동별로 세분화된 분석과 검사를 진행하고 신규 감시지역을 지속적으로 추가할 예정이며 퇴치인증 제도를 도입하여 장내기생충 감소를 위해 노력할 예정이다.

Declarations

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Author Contributions: Conceptualization: HIL. Data curation: JWJ. Methodology: SOB. Investigation: YJL. Writing—original draft: MRL. Writing—review & editing: HIL.

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Infection Status of Intestinal Helminths in 2022

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ABSTRACT

The Division of Vectors and Parasitic Diseases at the Korea Disease Control and Prevention Agency has been using Active Case Detection programs to investigate the infection status of intestinal parasites among residents of endemic areas and facilitate anthelmintics treatment. The survey used a test method that gathers stool samples from residents in the epidemic areas. In this survey, we investigated including essential areas divided into eup, myeon, dong. The overall positive rate of intestinal parasite eggs was 5.3%. The infection rate was the highest at 3.3% for *Clonorchis sinensis*, followed by 1.7% for heterophyid flukes and 0.2% for *Trichuris trichiura*. Geographically, the overall intestinal parasite infection rate was highest in Gwangyang-si (12.9%), while the infection rate of *C. sinensis* was highest in Andong-si (9.7%) among all participated areas. Continuous surveillance, education, and treatment are recommended to reduce the infection rate of intestinal parasites in endemic areas.

Key words: Intestinal parasites; *Clonorchis sinensis*; Infection rates

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Introduction

Parasitic worm transmission can occur through different routes, including transmission through soil, shellfish, arthropods, food, and direct contact. Most intestinal parasitic infections in the Republic of Korea are transmitted through the soil and food-borne routes. The rate of infection with parasites can be determined by conducting a nationwide survey assessing the prevalence of intestinal parasitic infections among the general population. According to the 8th National Survey of Intestinal Parasitic Infections conducted in the Republic of Korea in 2012, the overall rate of infection with intestinal parasites was

2.6%. The rate was decreased significantly compared to the first survey, which was over 80%. However, while the rate of infection with food-borne parasites decreased from 4.6% in the 1st survey (1971) to 2.8% in the 4th survey, it only slightly decreased to 2.16% in the 8th survey (2012), compared with that in the 4th survey. Furthermore, food-borne infections still accounted for 73% of the overall infection rate of 2.6% [1,2]. Unlike soil-borne parasitic infections, which have reached near-eradication levels, food-borne parasitic infections persist due to the widespread consumption of raw freshwater fish. The Division of Vectors and Parasitic Diseases at the Korea Disease Control and Prevention Agency (KDCA) has been conducting

Key messages

① What is known previously?

Soil-mediated parasitic diseases in the Republic of Korea are maintained at the level of eradication. However, infections by food-borne parasites, such as *Clonorchis sinensis* transmitted through freshwater fish, are predominant in endemic areas. The survey confirmed a minimal reduction in the rate of these infections from 11.0% to 5.3% in 2022.

② What new information is presented?

The overall positive rate of intestinal parasites egg was 5.3%. The infection rate of *C. sinensis* was 3.3%, which was highest and followed by 1.7% for heterophyid flukes, 0.2% for *Trichuris trichiura*.

③ What are implications?

To reduce the infection rate of intestinal parasites, continuous investigation, education and treatment should be carried out in the epidemic area.

a surveillance project on intestinal parasitic infections in high endemic area affected by food-borne trematodiasis. This paper presents an analysis of infection rates for various parasitic strains and regional infection rates based on a surveillance project conducted in 2022.

Methods

The surveillance project for intestinal parasitic infections included testing of 200 to 2,000 participants in the following 36 regions: Goesan-gun, Yeongdong-gun, and Okcheon-gun in Chungcheongbuk-do; Gongju-si and Geumsan-gun in Chungcheongnam-do; Namwon-si, Jinan-gun, Sunchang-gun, and Imsil-gun in Jeollabuk-do; Gurye-gun, Suncheon-si, Naju-si, Gwangyang-si, Damyang-gun, Gokseong-gun,

Boseong-gun, Hwasun-gun, Gangjin-gun, Haenam-gun, and Hampyeong-gun in Jeollanam-do; Pohang-si, Andong-si, Sangju-si, Cheongsong-gun, Yeongcheon-si, and Yecheon-gun in Gyeongsangbuk-do; Jinju-si, Miryang-si, Uiryeong-gun, Haman-gun, Changnyeong-gun, Hadong-gun, Sanchung-gun, Hamyang-gun, Geochang-gun, and Hapcheon-gun in Gyeongsangnam-do. The KDCA was responsible for planning, managing, and conducting screening tests as part of the surveillance project. Public health centers played a role in collecting samples, providing education on infection prevention, and supporting the treatment of infected individuals. The Korea Association of Health Promotion was responsible for performing diagnostic work specifically related to parasitic infections. A total of 28,918 collected samples were tested for 11 different types of intestinal parasitic infections [3]. Parasitic eggs were isolated using a sedimentation technique with water-ether and subsequently examined. The infection intensity of *Clonorchis sinensis* eggs was determined by calculating the egg count per 1 g of sample.

Results

According to the results obtained from the surveillance project on intestinal parasitic infections, the infection rate among the 28,918 residents in the target regions increased by 0.1% to 5.3% (n=1,529) compared with that in the previous year. *C. sinensis* had the highest infection rate (3.3%, n=951), followed by heterophyid flukes (1.7%, n=506), *Trichuris trichiura* (0.2%, n=44), *Gymnophalloides seoi* (0.1%, n=26), and *Echinostoma hortense* (0.003%, n=1). Additionally, one case of *Capillaria philippinensis* infection was reported (Table 1). Compared with the infection rate in female (3.7%), that in

Table 1. Egg positive rate of intestinal parasites

Investigation	Intestinal infection cases and rates (%)						
	Total	<i>Clonorchis sinensis</i>	Heterophyid flukes	<i>Trichuris trichiura</i>	<i>Gymnophalloides seoi</i>	<i>Echinostoma hortense</i>	<i>Capillaria philippinensis</i>
28,918	1,529 (5.3)	951 (3.3)	506 (1.7)	44 (0.2)	26 (0.1)	1 (0.003)	1 (0.003)

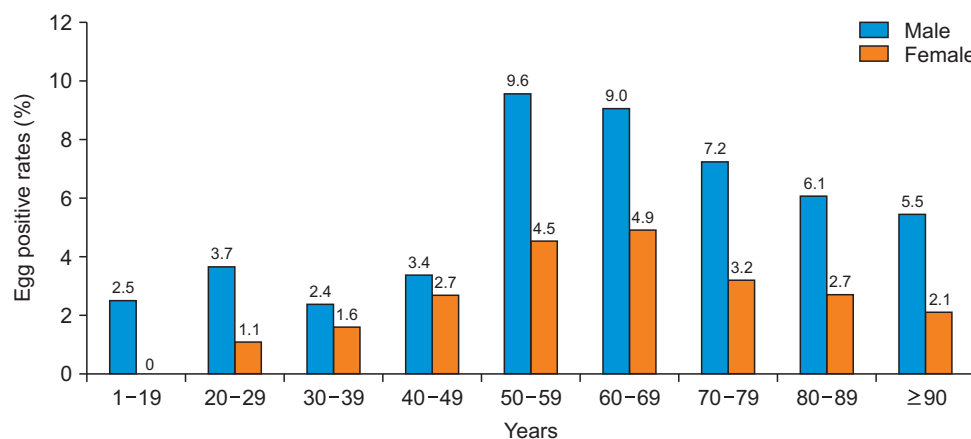


Figure 1. Comparison intestinal parasites infection rates by age and sex

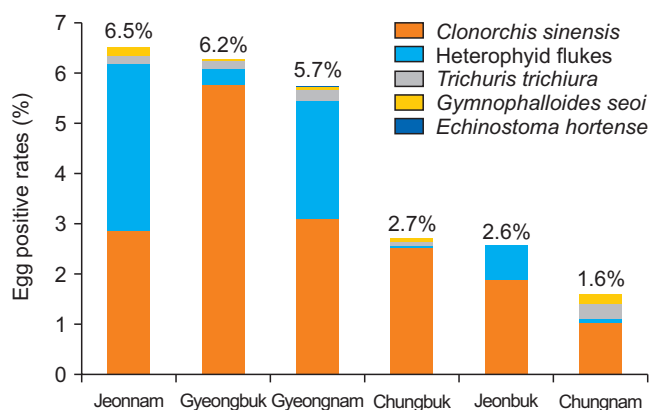


Figure 2. The infection rates by provinces (do)

male was twice as high (7.6%). Furthermore, the infection rate was the highest (6.7%) in individuals in their 50s and 60s, followed by individuals in their 70s (4.8%), 80s (3.8%), and 90s and older (3.1%). Those in their 40s or younger had infection rates of $\leq 3\%$ (Figure 1). Heterophyid flukes infection was identified in a male resident aged ≤ 20 years in Gurye-gun, a region with a high rate of heterophyid flukes infection (3.0%). It

is speculated that the infection may have transmitted through the consumption of raw freshwater fish, such as trout, which act as intermediate hosts for heterophyid flukes Jeollanam-do had the highest intestinal parasitic infection rate (6.5%), with a 1.3% increase from the previous year. This could be attributed to Gwangyang-si having the highest positivity rate (12.9%) among all cities and counties along with significant increases in infection rates in Suncheon-si (9.8%) and Hwasun-si (8.4%), which was more than double than that in the previous year. Gyeongsangbuk-do had the second-highest intestinal parasitic infection rate, 6.2%, which was lower than the rate in the previous year (7.0%) (Figure 2). Among the 36 surveilled regions, 12 had infection rates higher than the average infection rate of 5.3%. The infection rate was the highest, 12.9%, in Gwangyang-si, followed by Andong-si (10.1%), Suncheon-si (9.8%), Hadong-gun (8.7%), and Hwasun-gun (8.4%). Gwangyang-si has shown a consistent increase in the infection

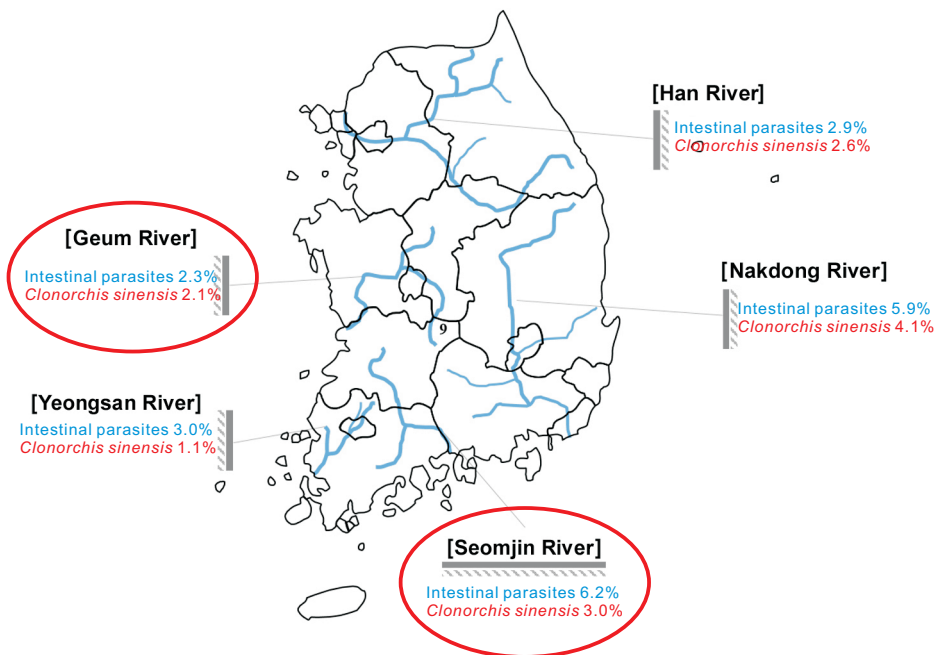


Figure 3. Comparison of intestinal parasite infection rates by river basin

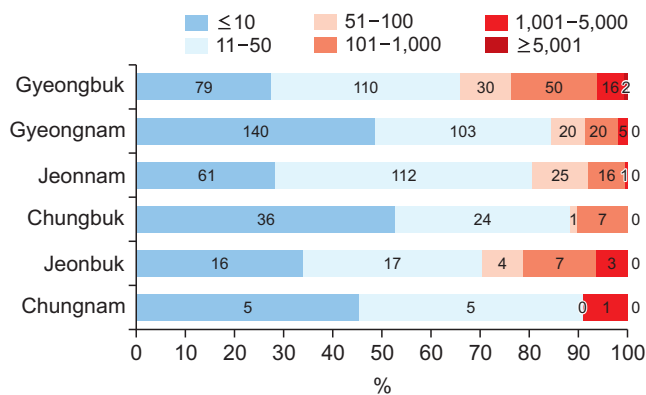


Figure 4. Comparison *Clonorchis sinensis* infection intensity (eggs per gram) by administrative district

rate since 2019. Additionally, in 2021, Suncheon-si had a 2.4% positivity rate, while Hwasun-gun had a positivity rate of 3.1%, both showing a more than two-fold increase in the infection rate over the previous year. With regard to the infection rates by river basins, the infection rate was the highest for the Seomjin River (6.2%), followed by the Nakdong River (5.9%) and the Yeongsan River (3.0%). Although the Geum River had the highest infection rate in 2021, owing to the high infection rate in Yeongdong-gun (10.0% in 2021), the infection rate for

the river was the lowest among all river basins in 2022 because the infection rate in Yeongdong-gun decreased to 3.4% (Figure 3). The intensity of *C. sinensis* infection, measured as eggs per gram (EPG), showed a proportional increase corresponding to the infection rate for each city (Figure 4). Two individuals in Gyeongsangbuk-do tested positive with an EPG value of 5,001 or higher, while 16 individuals had EPG values ranging from 1,001 to 5,000. A total of 28 individuals had an EPG value of 1,001 or higher. Among them, 18 (64.2%) were from Gyeongsangbuk-do, indicating that Gyeongsangbuk-do had a higher infection rate than those for the other regions.

Discussion

The intestinal parasitic infection surveillance project started in eight regions in 2005 and has since expanded to cover 36 regions as of 2022. A total of 86 regions have participated in the project at least once until 2022, with a cumulative total of 537,497 tests performed. Based on the survey results,

the intestinal parasitic infection rate was 11.0% in 2005. Over the years, it has decreased by over two-fold to 5.3% in 2022. However, the infection rate has remained relatively stable at 5% since 2015, with no significant decrease observed [3]. *C. sinensis*, which is transmitted through food, accounts for the majority of infection cases and has shown persistent prevalence in areas around river basins. The survey identified individuals in their 50s and 60s residing in areas around the Seomjin River and Nakdong River basins as high-risk groups, suggesting that people in this age range continue to maintain the habits of eating raw freshwater fish [4]. *C. sinensis*, having the highest infection rate among intestinal parasitic worms, accounted for 61.9% of all infections, while heterophyid flukes accounted for 33.4% of all infections. This indicates that food-borne parasites contribute to approximately 95% of all intestinal parasitic infections. *C. sinensis* settles in the bile ducts, causing dilation of the ducts and the progression of chronic inflammation. Over time, this can potentially lead to the development of bile duct cancer [5]. While Gwangyang-si had the highest overall intestinal parasitic infection rate among the 36 cities and counties surveyed, Andong-si had the highest infection rate specifically for *C. sinensis* (9.7%). Giran-myeon exhibited a consistently high infection rate for the second consecutive year, emphasizing the need for a more focused investigation in Andong-si. Additionally, Imha-myeon, a newly investigated area, showed a high positivity rate (8.7%), highlighting the necessity for investigations in all regions within Andong-si. Based on these results, it is necessary to implement testing and treatment measures specifically targeting *C. sinensis* to reduce the rates of intestinal parasitic infections in the Republic of Korea. The Division of Vectors and Parasitic Diseases at the KDCA plans

to continue conducting more detailed analyses and testing for each town in high endemic area, as well as adding new areas for monitoring. It also plans to introduce an eradication certification system to further the efforts toward reducing the prevalence of intestinal parasitic infections.

Declarations

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Conflict of Interest: The authors have no conflicts of interest to declare.

Author Contributions: Conceptualization: HIL. Data curation: JWJ. Methodology: SOB. Investigation: YJL. Writing—original draft: MRL. Writing—review & editing: HIL.

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