

Negligible Egg Positive Rate of *Enterobius vermicularis* and No Detection of Head Lice among Orphanage Children in Busan and Ulsan, Korea (2014)

Dong-Hee Kim¹, Hyun-Mi Son¹, Sang Hwa Lee¹, Mi Kyung Park^{2,3}, Shin Ae Kang^{2,3}, Sang Kyun Park^{2,3}, Jun-Ho Choi^{2,3}, Jung Ha Park⁴, Hak-Sun Yu^{2,3,*}

¹Department of Nursing, College of Nursing, ²Department of Parasitology, School of Medicine, Pusan National University, Yangsan 626-870, Korea; ³Immunoregulatory Therapeutics Group in Brain Busan 21 Project, Yangsan 626-870, Korea; ⁴Department of Nursing, Dongseo University, Busan 617-716, Korea

Abstract: To determine whether pinworm infections and head lice infestations spread among children in orphanages, 117 children from 4 orphanages in Busan-si and Ulsan-si, Korea, were examined for enterobiasis and head lice infestation between January and February 2014. The overall rate of *Enterobius vermicularis* egg positivity was 0.85%, whereas none of the children had head lice infestations. The rate of pinworm infection was much lower among the orphanage children compared to the rates observed in previous studies among kindergarten and primary school students. Moreover, the risk factors for enterobiasis were less frequent among these subjects than previously reported. The personal hygiene and health of the orphanage children were supervised by a regular, employed nurse through a health education program. In conclusion, pinworm infection was efficiently controlled among the children in orphanages, and this might be related to good personal hygiene practices in Korea.

Key words: Enterobiasis, orphanage, head louse, risk factor, Busan, Ulsan

During the 1970s and 1980s, *Enterobius vermicularis* egg positive rates were generally higher among orphanage children than children living in their own houses in South Korea [1-5]. At that time, most orphanage children (78.4-87.8%) were found to be infected with *E. vermicularis*, whereas the infection rates among children living in their own houses ranged from 13.8% to 55.6% [1-5]. Thus, orphanage children might have been important epidemiological carriers of epidemic enterobiasis infections during those periods [1-5]. In addition, orphanage facilities had poorer hygiene conditions, wherein many children were living together in small spaces, with only a few supervisors and helpers available to maintain the children's health.

Currently, Korean orphanages have very high levels of hygiene, and each facility has an appropriate number of residents. Furthermore, they have several advisers, including nurs-

es and volunteers. However, data on *E. vermicularis* infection rates in orphanages in South Korea after 1991 are scarce. Therefore, in this study, we determined the rates of enterobiasis in orphanage children and determined the role of orphanages in the development of enterobiasis in Korea. Additionally, we determined the rates of head lice infestation as a measure of hygiene levels in orphanages.

Total 48 orphanages are registered in Busan-si, Ulsan-si, and Gyeongsangnam-do, Korea. After receiving IRB approval (1311-020-022), we contacted the directors of these orphanages to request for their help in recruitment and to provide information about the nature, significance, objectives, and methods of the study. Four orphanages (3 in Busan-si and 1 in Ulsan-si) agreed to participate. In total, 117 children aged 4-13 years from the 4 orphanages were included in this study. Children were asked to complete questionnaires on general and personal hygiene. The presence of *E. vermicularis* infection was determined by using a cellotape anal swab, and the presence of head lice infestation was determined by using a louse comb. The entire scalp of each child was combed thoroughly with a louse comb, and the teeth of the comb were examined for the presence of lice after each passage of the comb through the

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*Corresponding author (hsyu@pusan.ac.kr)

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Table 1. General and personal hygiene characteristics of the children (n = 117)

Characteristics		No. (%)
Age (year)	≤ 5	20 (19.1)
	6-7	27 (23.1)
	8-9	25 (21.3)
	10-11	29 (24.9)
	12-13	16 (13.6)
Gender	Boys	66 (56.4)
	Girls	51 (43.6)
Number of room-mate	2	6 (5.1)
	3	22 (18.8)
	4	6 (13.7)
	5	14 (12.0)
	≥ 6	59 (50.4)
Parasites infection history	Yes	7 (6.0)
	No	110 (94.0)
Type of parasite infection	<i>Enterobius</i>	3 (42.8)
	No idea	4 (58.2)
Pediculosis history	Yes	24 (20.5)
	No	963 (79.5)
Room cleaning	Every day	96 (82.1)
	Every two days	11 (9.4)
	2-3 times per week	10 (8.5)
Showering	Every day	77 (65.8)
	Every two days	26 (22.2)
	2-3 times per week	14 (12.0)
Fingernail trimming	≥ 1/week	91 (77.8)
	≤ 1/two weeks	26 (22.2)
Thumb sucking	Yes	19 (16.2)
	No	98 (83.8)
Washing hair	Every day	88 (75.2)
	Every two days	23 (19.7)
	2-3 times per week	6 (5.1)
Hand washing	Always	52 (44.4)
	Sometimes	53 (45.3)
	Never	12 (10.3)
Anal-scratching	Always	10 (8.5)
	Sometimes	29 (24.8)
	Never	78 (66.7)
Itching on the head	Always	11 (9.4)
	Sometimes	43 (36.8)
	Never	63 (53.8)
Anxious	Yes	43 (36.8)
	No	74 (63.2)
Premedication of anthelmintics experience	Yes	83 (70.9)
	No	34 (29.1)

hair. In addition, we collected fallen hair in a specimen cup using a vacuum, and the hair was examined for the presence of nits under a microscope. The healthcare providers of the orphanages were asked to complete a questionnaire regarding the maintenance of the children's health and health-related environments. Some of the items included on the questionnaire were related to checking for risk factors for enterobiasis and head lice infestation as well as infection control-related

education.

The overall *E. vermicularis* egg positivity rate was 0.85%, and none of the children had head lice (Table 1). Although the personal hygiene levels observed in this study were similar to those observed in our previous studies, the rate of *E. vermicularis* egg positivity was much lower in this study than in our previous studies [6-8]. All facilities that participated in this study had well-organized health education systems with regular employed nurses (they engage in conversation with the orphanage children). Children in orphanages were periodically educated about personal healthcare and were provided with information on infection. They also regularly received pre-medication with anthelmintics (Table 2).

To understand the present situation of parasitic infections in orphanages, we also assessed the presence of head lice infestations. However, we did not find adult worms or nits on any of the children. We expected a high rate of head lice infestation in the present study, based on previous studies; head lice infestation rates of 5.8% and 12.8% were reported for kindergarten and primary school children in 2003 [9] and 2000 [10], respectively. Although the children in this study were not educated about head lice infestation, none of them had lice (Table 2). This suggests that regular and comprehensive health and hygiene education programs in orphanages might help improve personal hygiene and prevent the spread of infectious agents, including head lice and pinworms, in orphanages.

In conclusion, the residents of orphanages had efficiently controlled pinworm infections and head lice infestations, and this might be related to good personal hygiene practices.

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CONFLICT OF INTEREST

We have no conflict of interest related to this work.

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Table 2. Characteristics of the health environments of orphanages in this study (n = 3)

Characteristics		No. (%)
Experience of checking for <i>Enterobius</i>	Yes	1 (33.3)
	No	2 (66.6)
Experience of checking for head lice	Yes	0 (0.0)
	No	3 (100.0)
Experience of premedication of anthelmintics in group	Yes	3 (100.0)
	No	0 (0.0)
Recent premedication of anthelmintics (n=3)	Within 3 months	1 (33.3)
	4 months ago	1 (33.3)
	8 months ago	1 (33.3)
Healthcare provider's experience of education about infection within last 5 years	Yes	1 (33.3)
	No	2 (66.6)
Education of infection for children	Yes	3 (100.0)
	No	0 (0.0)
Period of education (months)	1	1 (33.3)
	6	2 (66.7)
Contents of education ^a	Infectious diseases	0 (0.0)
	General symptoms of infectious diseases	0 (0.0)
	Way to wash hands	3 (100.0)
	Way to brush teeth	3 (100.0)
	Way to the bath	3 (100.0)
	Way to cough and sneeze	0 (0.0)

^aMultiple answers.

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