

Kindergarten Teacher's Knowledge of Enterobiasis in Korea

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Abstract

Previous reports have suggested that the environment of day care centres is a crucial factor in the development of enterobiasis. There is a lack of data regarding a teacher's knowledge about enterobiasis although kindergarten teachers have the greatest influence on a child's habits because the child spends a lot of time with them and because they manage the child's physical environment. The focus of the present study was to evaluate the kindergarten teacher's level of knowledge regarding enterobiasis. The cross-sectional survey is with 287 kindergarten teachers from 36 kindergartens in Korea. The level of knowledge regarding *Enterobius vermicularis* infection was measured using questionnaires. The percentage of correct answers to questions testing knowledge of enterobiasis ranged from 23.7 percent to 99.3 percent. The average score for the section on knowledge of enterobiasis was 7.85 (possible range: 0 - 12). The question "enterobiasis occurs through contaminated water" had the least correct answer rate (23.7%). The findings of this study suggest the need for increasing the kindergarten teacher's knowledge regarding enterobiasis. Educational programs for kindergarten teachers will have a long-term impact on the prevalence of this infection.

Keywords

Enterobius vermicularis; Knowledge; Health Education; Kindergarten

1. Introduction

Enterobiasis is caused by infection with *Enterobius vermicularis*, commonly known as the human pinworm, and is one of the most common childhood parasitic worm infections in worldwide [1]. Forty percent of children were

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positive for *Enterobius vermicularis* eggs in Malaysia [2]. About 20% of children in Thailand had enterobiasis and the age group 4 - 6 years had the highest positive rate [3]. Remm [4] reported that the prevalence of pinworm infection was 24.4 percent in 954 nursery school children in southeast Estonia. In Korea, enterobiasis has been the most common parasitic infection among children, with prevalence ranging from 7.8 percent to 18.5 percent in both urban and rural areas [5]-[7]. Despite the Korean government's efforts to eradicate the infection during the past decade, the prevalence of this infection has not decreased.

Infection is usually caused by the ingestion or inhalation of pinworm eggs via contaminated fingers (anus-to-mouth transfer), contaminated food, and contaminated objects that the children touch [8]. Because children are often exposed to environments that are overcrowded, have inadequate sanitation, and engage in group activities more often than adults, this infection is more common in children [9] [10]. Currently, a number of young children are cared for at kindergartens or nurseries before they enter primary schools. Therefore, the majority of *E. vermicularis* infections in children probably occur in day care centers, because if a single child in a kindergarten is infected with pinworm eggs, then the infection is actively spread to other children and maintained progressively [7] [11].

The main symptom of enterobiasis is itching in and around the anus and around the perineum. Continuous itching causes tearing of skin and complications such as bacterial dermatitis, folliculitis, and acute pain. A significant proportion of children have insomnia, anorexia, weight loss, irritability, and urinary tract infection, along with mental distraction. Generally, the worms enter the vulva and vagina, where they remain for several days, and cause inflammation [12] [13]. Pinworms very rarely penetrate into the submucosa, but when they do, the results are often fatal [9]. Therefore, appropriate treatment and prevention are highly recommended.

Previous reports have suggested that the environment of day care centers, particularly hygienic practices such as hand washing and/or factors such as the cleanliness of the rooms in the kindergarten, is a crucial factor in the development of enterobiasis [2] [7] [14] [15]. School-aged children are old enough to take responsibility of their personal hygiene, but children younger than six years are less responsible than the older ones [16]. Kindergarten teachers have the greatest influence on a child's habits because the child spends a lot of time with them and because they manage the child's physical environment; therefore, evaluating the kindergarten teachers' knowledge regarding enterobiasis is important.

Because of the limited budgets of public health systems, prevention, treatment, and eradication of enterobiasis are difficult. Currently, researchers are aiming to determine whether educational programs that provide fundamental information about pinworm infection can change the rates of this infection by emphasizing the importance of prevention [16] [17]. At present, there is a lack of data regarding a teacher's knowledge about enterobiasis; this data is needed to develop programs for the prevention and control of pinworm infection, and thus to decrease its prevalence. The focus of the present study was to evaluate the kindergarten teacher's level of knowledge regarding enterobiasis.

2. Methods

2.1. Participants

Among the 176 kindergartens registered with the Ulsan Association of Kindergartens in Korea, 36 kindergartens in five districts of Ulsan agreed to participate in this study. Of the 294 teachers from 36 kindergartens who were invited to participate in this study, 288 (97.9 per cent) agreed to participate. One teacher for whom more than 10 per cent of the relevant survey data were not available was excluded from the study. Finally, the data from 287 teachers were collected and analysed.

2.2. Questionnaire Design

Because of the lack of a valid and reliable study instrument, a structured questionnaire was developed by our research team. Literature on parasite infection, including research papers and textbooks, was reviewed. Content validity of this questionnaire was evaluated by three kindergarten teachers who did not participate in the survey, one parasitologist, and two health educators. The participants were asked to evaluate the readability, comprehensibility, and overall quality of the questionnaire. The results and comments obtained after the above-mentioned evaluations were considered while developing the final version of the questionnaire. The questionnaire was used to obtain information regarding the participants' demographic and educational characteristics, their

experience of education about enterobiasis and necessity of education about enterobiasis, and their general knowledge of enterobiasis. Knowledge of enterobiasis was evaluated under six subcategories; these subcategories included questions regarding the lifespan of *E. vermicularis*, diagnosis of enterobiasis, symptoms and signs of enterobiasis, and the transmission, treatment, and prevention of infection. Answers to these questions were scored as correct (1) or incorrect (0), with a total score of 0 - 12.

2.3. Procedure

The study was performed after getting approval from the Ethical Review Committee of Pusan National University Hospital and informed consent was obtained from each participant before enrollment. The participants were conveniently recruited from kindergartens in Ulsan from September to October, 2012. The reason we obtained data from Ulsan was because the prevalence of enterobiasis among preschool children in Ulsan recently reported. The average infection rate was 7.8% which was higher than average rate of enterobiasis reported by Korean government [18]. Ulsan includes the city and agricultural land surrounding the city.

For recruitment, a letter containing information about the nature, significance, and objectives of the study; copies of the questionnaire; and a consent form were sent to the directors of the all kindergartens registered with the Ulsan Association of Kindergartens in Korea. Among 176 kindergartens, 36 kindergartens from all five administrative districts in Ulsan agreed to participate in this study. A researcher outlined the study to the directors and teachers of these kindergartens by using the consent form, letter of information, and questionnaire. All participants, regardless of their specialty, were instructed to complete all parts of the questionnaire. The completed questionnaires were sealed and returned by the participants.

2.4. Data Analysis

Data were analysed using SPSS for Windows, version 14 (SPSS, Chicago, IL). The participants' demographic and educational characteristics were expressed as percentages; and their general knowledge of enterobiasis was expressed as percentages and mean \pm standard deviation. Knowledge about *E. vermicularis* infection according to the characteristics of the participants was analysed for t-test and analysis of variance.

3. Results

The average age of the teachers who participated in this study was 27.4 years. Among the teachers, 98.3 percent were women, 91.6 percent had graduated college (Table 1). More than 90 percent had never received any education regarding enterobiasis. Among the teachers who had previously received education regarding enterobiasis, 58.0 percent had learned about the prevention of this infection, 41.7 percent knew the symptoms and signs of enterobiasis, and 37.5 percent had learned about the life span of *E. vermicularis*. Most teachers (92.6%) thought that education regarding enterobiasis was needed, and 83.5 percent were willing to attend any future educational program. Educational needs were highest in the case of prevention of the infection (83.5%), knowledge of the symptoms and signs of enterobiasis (69.8%), and the treatment of enterobiasis (40.5%) (Table 2).

Table 3 presents the overall proportion of teachers who gave accurate responses to questions testing knowledge regarding enterobiasis. The percentage of correct answers ranged from 23.7 percent to 99.3 percent. The average knowledge score was 7.85 (possible range: 0 - 12). The question "*E. vermicularis* infection also occurs through contaminated water" had the least correct answer rate (23.7%); other questions that had low correct answer rates were "Stool examination is the best way to diagnose *E. vermicularis* infection" (25.1%), "Group therapy is the most effective therapy for curing *E. vermicularis* infection" (42.5%), "Enterobiasis is usually caused by the ingestion of *E. vermicularis* eggs via contaminated hands" (49.8%) and "Aggressive behaviour in children can be caused by *E. vermicularis* infection" (53.3%). Among the characteristics of participants, age ($F = 2.90$, $p = 0.04$) and recent education of enterobiasis ($F = 3.26$, $p = 0.04$) were associated with the average knowledge score (Table 4).

4. Discussion

Although enterobiasis is one of the most common nematode infections among preschool children, there is no national program for prevention and control of this infection in Korea. Most teachers in this study had received college or university education, but only 8.7 percent of them had previously learned about enterobiasis. More-

Table 1. General characteristics of the participants (N = 287).

Variable	n (%)
Gender	
Male	5 (1.7)
Female	282 (98.3)
Subtotal	287
Age (years)	
≤25	143 (50.4)
26 - 30	85 (29.9)
31 - 35	26 (9.2)
≥36	30 (10.6)
Subtotal	284
Education	
College	263 (91.6)
University	24 (8.4)
Subtotal	287

Table 2. Past experiences and needs for enterobiasis education (N = 287).

Variable	n (%)
Recent education of enterobiasis	
≤12 month	9 (3.1)
>12 months	16 (5.6)
Never	262 (91.3)
Subtotal	287
Contents of education ^{*†}	
Life span of <i>E. vermicularis</i>	9 (37.5)
Symptoms & signs	10 (41.7)
Prevention of infection	14 (58.3)
Treatment	5 (20.8)
Subtotal	38
Necessity of education	
Yes	263 (92.6)
No	21 (7.4)
Subtotal	284
Willing to attend future education	
Yes	238 (83.5)
No	47 (18.5)
Subtotal	285
Contents of future education [†]	
Life span of <i>E. vermicularis</i>	50 (20.7)
Symptoms & signs	169 (69.8)
Prevention of infection	202 (83.5)
Treatment	98 (40.5)
Subtotal	519

^{*}Asked to people who had education of enterobiasis; [†]Multiple-answers.

over, most teachers thought that education regarding enterobiasis was necessary, and many of them were willing to attend educational programs regarding this infection. The participants thought that education regarding the prevention of enterobiasis and its symptoms and signs was highly necessary. Therefore, health professionals must work with governments to develop strategies, including effective educational programs that address the teachers' needs, and relevant educational methods.

An increase in knowledge does not always lead to a change in the behaviour, but there is a positive association between knowledge and changing behaviour [19]. Vundule and Mharakurwa [20] have reported that knowledge regarding malaria played a significant role in the adoption of preventive measures against that disease. Our findings show that the average score for the section on knowledge of enterobiasis (7.85) was just above the midpoint of the range. Moreover, in our study, the correct answer rates for questions regarding the di-

Table 3. Knowledge of the participants regarding *E. vermicularis* infection (N = 287).

Characteristics	Correct answer rate (%)
1 <i>Enterobius vermicularis</i> infection occurs more often in children than in adults.	71.8
2 Stool examination is the best way to diagnose <i>E. vermicularis</i> infection.	25.1
3 The adult worm of <i>E. vermicularis</i> migrates to the region around the anus to mate.	67.9
4 Some individuals of <i>E. vermicularis</i> can migrate to the female genital tract, thereby causing aberrant infection.	84.0
5 Aggressive behaviour in children can be caused by <i>E. vermicularis</i> infection.	53.3
6 Anal itching (pruritus ani) is one of the most common symptoms of enterobiasis.	96.9
7 Enterobiasis is usually caused by the ingestion of <i>E. vermicularis</i> eggs via contaminated hands.	49.8
8 <i>E. vermicularis</i> infection also occurs through contaminated water.	23.7
9 Group therapy is the most effective therapy for curing <i>E. vermicularis</i> infection.	42.5
10 <i>E. vermicularis</i> infection needs repeat treatment with anthelmintic medication after 2 weeks.	76.0
11 <i>E. vermicularis</i> infection is prevented by keeping clean and by drying the bedding in sunlight.	94.8
12 It is crucial to practice careful hand washing and to keep the nails short for preventing <i>E. vermicularis</i> infection.	99.3
Possible range	0 - 12

Table 4. Knowledge about *E. vermicularis* infection according to the characteristics of the participants (N = 287).

Variable	M ± SD	t or F (p)
Gender		
Male	7.60 ± 1.34	0.38 (0.71)
Female	7.86 ± 1.53	
Age (years)		
≤25	7.97 ± 1.52	2.90 (0.04)
26 - 30	7.96 ± 1.58	
31 - 35	7.62 ± 1.55	
≥36	7.13 ± 1.20	
Education		
College	8.00 ± 1.41	0.27 (0.79)
University	7.80 ± 1.51	
Recent education of enterobiasis		
≤12 month	9.11 ± 1.05	3.26 (0.04)
>12 months	7.88 ± 1.15	
Never	7.80 ± 1.54	
Necessity of education		
Yes	7.87 ± 1.53	0.44 (0.66)
No	7.71 ± 1.49	
Willing to attend future education		
Yes	7.86 ± 1.52	-0.06 (0.95)
No	7.87 ± 1.57	

agnosis of *E. vermicularis* infection, route of transmission of *E. vermicularis*, and treatment of this infection were comparatively lower than those for questions regarding hygienic practices followed by the teachers. In particular, among the knowledge questions, less than 50% of teachers knew contaminated hands spread the infection and just more than 50% reported correct answer to the question “Aggressive behaviour in children can be caused by *E. vermicularis* infection”. We believed that these two topics are the most important knowledge the teachers should know to prevent and detect of the enterobiasis in a kindergarten. Therefore, health educators should organize health programs that emphasize the diagnosis, transmission, and treatment of enterobiasis in

kindergartens; the trained teachers can then perform preventive actions such as periodic health screening and prevention of environmental contamination [19].

Anthelmintic therapy on a group basis is one of the most effective tools for the eradication of enterobiasis; however, half the teachers were unaware of this fact. Moreover, only five of the 287 teachers had learned about the treatment of enterobiasis. This unawareness is the reason for the lack of decrease in the prevalence of enterobiasis over the past decade, even though enterobiasis can be readily cured by anthelmintic medications [5] [7] [21]. Kim *et al.* [18] reported that a kindergarten in which all children, both infected and uninfected, and teachers take anthelmintics at the same time every six months has no cases of enterobiasis; however, other kindergartens with similar environments have higher-than-average rates of *E. vermicularis* infection. Additionally, the medication proved ineffective in eradicating enterobiasis when children took an anthelmintic medicine only once a year. This is because if each child takes an anthelmintic medicine on a different day of the year, then the child can be reinfected with *E. vermicularis* within one month after beginning the medication [18].

The group drug therapy issue points to a major failing by public health profession. Teachers may not be responsible for offering medical advice. However, all drug usage may have side effects and treating all children in kindergartens would bring a big financial burden. A previous study conducted by Nithikathkul *et al.* [16] showed a decrease in infections among school children who received supplementary education. Since teachers are responsible for caring and educating children at a kindergarten, they need to know health information regarding preschool children, to educate the children, and to offer parents about the health information. This is one of safe and effective strategies to reduce the prevalence of enterobiasis among children.

The present study was a preliminary study focused on kindergarten teachers' knowledge of enterobiasis. Further studies should evaluate differences in the pre-intervention and post-intervention knowledge and prevalence of the infection. Selection bias might have influenced our findings. Indeed, it is possible that the teachers who responded to the questionnaire might have had an increased interest in enterobiasis than those who did not to respond. On the other hand, our findings provide useful information regarding the kindergarten teacher's awareness of enterobiasis. This information can be used to develop educational programs for the prevention and control of enterobiasis.

5. Conclusion

Our findings suggest that there is a need for increasing the Korean kindergarten teacher's knowledge regarding enterobiasis. Educational programs directed at kindergarten teachers may aid this effort. Health educators can provide adequate information on the prevention, treatment, and eradication of enterobiasis; such efforts will have a long-term impact on the prevalence of this infection among children.

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