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Impact of health education on the prevalence of enterobiasis in Korean preschool students

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ABSTRACT

Health education has been shown to be effective in slowing the spread of the disease, infectious disease in particular. To evaluate the impact of health education on the prevalence and pattern of new infection of enterobiasis, children from 6 kindergartens in Ulsan city, South Korea, were recruited after undergoing a screening for enterobiasis, and then divided into three groups, including group medication (GM), education (Edu), and control group. All children in GM group received medical treatment with 500 mg albendazole twice, with 15 days interval. In the Edu group, only children diagnosed positive for *Enterobius vermicularis* eggs received medical treatment with 500 mg albendazole twice, with 15 days interval and all parents in the group received brochures providing information about enterobiasis. In the control group, only children diagnosed positive for *E. vermicularis* eggs received medical treatment with 500 mg albendazole twice, with 15 days interval, and no information about enterobiasis was provided to parents. Two post-treatment examinations were performed at three and six months after treatment. The infection rate in the GM group was dramatically decreased at 3 months, and this rate was almost the same as at 6 months after treatment. Infection rate of children in the Edu group was shown to drop from 9.9% to 3.0% at 3 months, and to 2.7% at 6 months after treatment; however, the infection rate in the control group continued to be higher than in the other two groups at both 3 and 6 months, with smaller change at 3 months compared to the other two groups. In addition, both new infection and re-infection cases in the Edu group were fewer, compared to those in the control group. In conclusion, although GM is the best method for eradication of enterobiasis, providing health information about enterobiasis to parents could reduce the prevalence, as well as the rate of new infection or re-infection with *E. vermicularis* in their children.

1. Introduction

Enterobius vermicularis (pinworm) has infected *Homo sapiens* since the time of our species origin in Africa, and pinworm infection is a common helminth infection occurring worldwide (Hopkins, 1992; Kliks, 1990). Although the infection rates were different according to geographic location, infections may occur in almost all countries at this time. In Thailand, about 21.6% primary school children were infected with this parasite, 8.2% were infected in Turkey and 10.7% in South Korea (Changsap et al., 2002; Degerli et al., 2009; Kim et al., 2010). Although the parasite is highly present in preschool children, practically nothing has been done in most of the countries to eliminate infections. One of the reasons was that the symptoms of enterobiasis are not fatal, and most of the people believe that pinworm infection could be easily eradicated by one time medical treatment, even though that is not enough to kill eggs and larva.

During 1970–2000, the government and parasitologists of Korea have struggled to eradicate many human parasite infections; thus, intestinal parasite egg positive rates have been dramatically decreased (from 84.3% in 1971 to 2.4% in 1997) by their efforts (Ministry of Health and Welfare and Korea Association of Health, 2004). Nevertheless, a relatively high egg-positive rate of *E. vermicularis*, ranging from 7.8% to 18.5%, has been reported in Korean children during the last decade (Kang et al., 2006; Kim et al., 2010; Lee et al., 2000; Park et al., 2005; Song et al., 2003). Two major reasons for not eradicating enterobiasis in preschool children might be the

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increasing number of young children being cared for in kindergartens and either the lack information or mis-information of their care givers, including parents, about *E. vermicularis* infection (Kim et al., 2010; Song et al., 2003).

Many studies have investigated the factors that affect enterobiasis rates in children. Inadequate sanitation, poor level of parental care, no experience of taking an antihelminthic medicine and poor knowledge regarding enterobiasis, including transmission, prevention and how to take antihelminthic treatment have been associated with high prevalence of enterobiasis (Kang et al., 2006; Muge et al., 2008; Song et al., 2003). Comparatively, little emphasis has been put on the impact of health educational intervention on the prevalence of enterobiasis, although increasing health awareness, knowledge about disease and prevention management have all successfully improved many different health outcomes. Nithikathkul et al. (2005) recently evaluated the effect of health educational programs on the prevalence of enterobiasis in school children in Thailand. Educational interventions promoting knowledge of enterobiasis have also proven cost-effective in decreasing re-infection rates in school children (Nithikathkul et al., 2005).

To the best of our knowledge, no study has looked at the impact of educational intervention among preschool children. School aged children are old enough to begin taking responsibility for their own personal hygiene, whereas children younger than six years old are still less responsible than older children. Since parents are in charge for their child's personal hygiene and premedication with antihelminthic drugs, the focus of this study was to give brochures on prevention, transmission and treatment of enterobiasis to parents and to examine the effect on the prevalence of enterobiasis among kindergarten children in Korea.

2. Material and methods

2.1. Subject recruitment and screening evaluation

The study protocol was approved by the Ethical Review Committee of Pusan National University Hospital and informed consent was obtained from each participant before enrollment. For recruitment, the letter containing information about the nature, significance, and objectives of the study, copies of a questionnaire, a guide for swab examination and a consent form, were sent to directors of kindergartens registered in the Ulsan Association of Kindergartens. Investigators met with the directors who agreed to participate in this study and described the details of the study. The directors sent a consent form, a letter of information and a questionnaire to the parents of each child. Three thousand nine hundred and forty one children from thirty-six kindergartens underwent a screening for enterobiasis via the cellotape anal swab technique. Kindergartens that had at least 6% of positive egg rates were potentially eligible for this intervention study. On the basis of a combination of egg positive rates and geographic location, eight kindergartens were finally chosen for this intervention study.

2.2. Group design

To evaluate the effect of education on the prevalence of enterobiasis, we selected 6 kindergartens and divided the children into three groups, including group medication (GM), education (Edu), and control group. *E. vermicularis* infection rate and the location of the kindergarten were taken into account to determine the grouping. Table 1 shows several characteristics of study participants. After grouping, we compared several characteristics, and most of them were similar in the three groups. The small difference observed between the groups was not statistically significant.

2.3. Parent education and medication of children in the selective groups

After finishing baseline evaluations, the kindergartens were assigned by a research assistant to GM, Edu, and control groups. Entire classrooms in each kindergarten were tested and a total of 436 children (233 boys and 203 girls) were examined at baseline. At the first post-treatment examination, 405 children were examined, and 380 children participated at the second post-treatment examination. Of 436 parents provided with the pre-treatment questionnaire, 263 parents responded to the follow-up questionnaire and 21 parents did not fully complete their questionnaires. The director of each kindergarten and participants were blinded to the exposure status of participants.

Easy-to-understand pictorial brochures were used to convey five messages, including lifespan of *E. vermicularis*, examination for enterobiasis, symptoms and signs, infection and transmission, and treatment and prevention of enterobiasis. The director of each kindergarten sent these brochures to parents and double checked by phone calls.

In the GM group, all children in the kindergarten received medical treatment with 500 mg albendazole twice, with 15 days interval. In the Edu group, only children diagnosed positive for *E. vermicularis* eggs received medical treatment with 500 mg albendazole twice, with 15 days interval, and all parents in the group received the brochures. In the control group, only children diagnosed positive for *E. vermicularis* eggs received medical treatment with 500 mg albendazole twice, with 15 days interval (i.e. the usual community-based control method for enterobiasis in Korea) and no information material was sent to parents.

After the study, all participating children were treated with 500 mg albendazole twice, with 15 days interval.

2.4. Study outcome

The study outcomes in each study group were the *E. vermicularis* eggs positive rate and the re-infection rate at three months and six months after enrollment. *E. vermicularis* infection was evaluated with the cellotape anal swab technique, before and after treatment. The pre-treatment structured questionnaire was provided to the parents of each child, asking about demographics and socioeconomic status and general knowledge of enterobiasis. Knowledge regarding enterobiasis was assessed six months after enrollment using a follow-up questionnaire.

2.5. Statistical analysis

Statistical analysis was performed using PASW software (SPSS, Chicago, IL, USA). Baseline characteristics of study participants were compared using proportions. The prevalence of egg positive rate of *E. vermicularis* at baseline and after treatment was compared using proportions. Comparison of knowledge regarding enterobiasis between baseline and after treatment was performed by the paired *t*-test.

3. Results

The infection rate in the GM group was dramatically decreased at 3 months from 17.8% to 0.7%, and this rate was almost the same at 6 months after treatment (Table 2). Although the rates in the Edu and control groups were also decreased at the same time points, they were higher than in the GM group. The infection rate in children in the Edu group was shown to decrease from 9.9% to 2.7% at six months after treatment. Both at 3 months and 6 months after treatment, children in the control group had the highest *E. vermicularis* infection rate, i.e. 7.7% at 3 months and 7.9% at 6 months