RESEARCH NOTE

PREVALENCE AND RISK FACTORS FOR PINWORM INFECTION IN THE KINDERGARTEN OF THAMMASAT UNIVERSITY, THAILAND

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Abstract. We studied the prevalence and risk factors for pinworm infection in children attending the kindergarten of Thammasat University, Pathum Thani, Thailand, using the Scotch-tape technique. Slides were examined by a standard light microscope; 20% of negative slides were reexamined for quality control. Symptoms and risk factor data were collected using a structured questionnaire. Three hundred thirty children age 3 to 6 years old were sampled (males=159). Sixty-five (19.7%) had symptoms consistent with pinworm infection. No pinworm eggs were detected. Most parents (73%) had a good socioeconomic status and 64% were university graduates. Pinworm infection may be uncommon in urban Thailand.

Key words: pinworm, Scotch-tape technique, socioeconomic status

INTRODUCTION

Enterobius vermicularis is an intestinal nematode that has been reported in different parts of Thailand. The infection rates in children from a slum area of Bangkok ranged from 53 to 85% (Vajarasthira and Harinasuta, 1960; Tepmongkol and Suntadwoot, 1980). Similar rates were found in preschool children in Khon Kaen, northeastern Thailand (50.9%) (Kaewkes *et al*, 1983), in preschool children in Chiang Mai (45.4%) (Tukaew *et al*, 2002) and in hilltribe children in rural Chiang Mai (41.6%) (Chaisalee *et al*, 2004). The prevalence rate in preschool age children in Karen hill tribes in Mae Hong Son, north western Thailand, was only 7% (Nithikathkul *et al*, 2003). Other surveys in school children of different ages found rates of under 22% in Bangkok (Changsap *et al*, 2002) and under 39% in Samut Prakan Province, Thailand (Nithikathkul *et al*, 2001).

Transmission of pinworm is limited because, unlike the soil transmitted helminths, its eggs cannot survive for long in the environment. The routes of infection

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are fecal-oral, such as by finger licking after anal scratching due to anal pruritus (Herrstrom *et al,* 1997); exposure to eggs from bed sheets, pyjamas or other fomites; inhalation of eggs in dust; and autoinfection where eggs hatch on the anal mucosa and the larvae migrate up into the bowel. Transmission occurs mostly in limited environments, such as amongs families, in nurseries or boarding schools.

Many cases of *E. vermicularis* infection are asymptomatic. The most common symptoms experienced include itching of the perianal and vaginal areas. These symptoms may be accompanied by mild nausea, vomiting, abdominal pain, irritability or difficulty sleeping. Anorexia and weight loss may be present and, in small children, poor gut absorption contributes to the development of malnutrition, reduced growth and development. Heavy infection may cause intestinal inflammation and abdominal pain with secondary bacterial infection and appendicitis (Babekir and Devi, 1990). The parasite can affect other organs, such as the vagina, uterus and gall bladder (Khan *et al,* 1981).

Personal hygiene is important for the prevention and control of pinworm; this includes hand washing before eating and keeping the nails short. Other useful measures are cleaning beds regularly and drying mattresses under sunlight in order to destroy the eggs.

The Scotch tape technique is an accepted method to detect eggs from the peri-anal region. It is convenient, quick, inexpensive, used widely and sensitive (Akagi, 1973; Cho and Kang, 1975; Kim *et al,* 2001; Cabello Rodriguez, 2003). There are no data on the prevalence of *Enterobius vermicularis* in children in Pathum Thani Province, therefore, a pilot study to examine its prevalence and risk factors was conducted in the kindergarten of Thammasat University.

MATERIALS AND METHODS

The kindergarten of Thammasat University, Pathum Thani, Thailand, is situated on the campus of Thammasat University. It admits children age 3 to 6 years old who are either the children of university employees or from the local area. The total number of children attending the kindergarten is 467.

The study took place in September 2006. Consent forms and questionnaires were sent to the parents of the 467 children. Those parents interested in the study were interviewed and the study procedures explained. Once written informed consent was obtained, parents were asked not to wash their child's bottom on the day of the Scotch tape test (Kim *et al,* 2001; Triteeraprapab, 2007). The questionnaire was also completed by the parents. The Scotch tape technique was used and all children were sampled once. After applying the Scotch tape to the anus, the tape was stuck to a slide and examined using a standard light microscope at x 40 magnification. This study was approved by the Faculty of Medicine, Thammasat University Ethics Committee.

The completed questionnaires were coded, double entered, validated and analysed using Epidata version 4 and Stata version 6 (Stata Corporation, USA). The significance of differences in categorical data was examined using chi-square test unless the expectation on the null hypothesis was <5, in which case the Fisher's exact test was used.

RESULTS

A total of 330 children age 3 to 6 years

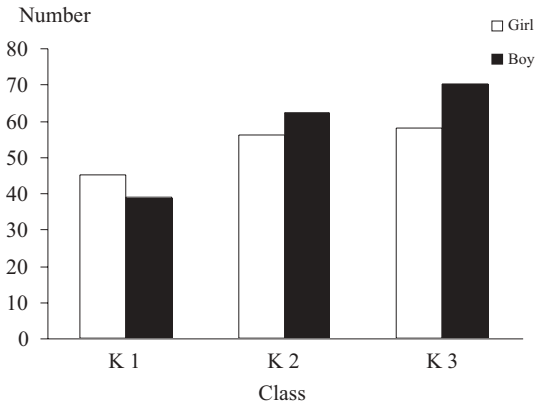

Fig 1–Distribution of children by sex and kindergarten class.

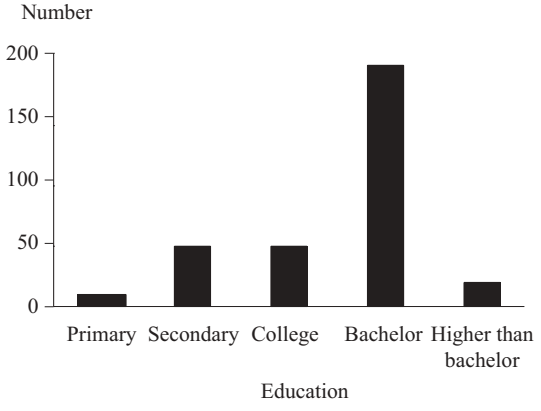

Fig 2–Parental educational level.

were sampled (males=159) (Fig 1). Most children were in age 5-6 years old (Table 1). Most parents (242/330, 73%) were professionals with high income (Table 2) and (212/330, 64%) were university graduates (Fig 2). The reported symptoms during the previous month are shown in Table 3. Eighty-eight households (27%) had domestic pets; dogs were the most common pets, followed by cats. No pinworm eggs were detected in any of the examined children.

Table 1
Distribution of children by age.

Age (year)	Number	%
3	59	17.88
4	100	30.30
5	117	35.46
≥6	54	16.36
Total	330	100

Table 2
Parental income in Thai baht (USD 1 = THB 34).

Income (Thai baht)	Number	%
Less than 5,000	1	0.3
5,000-7,000	11	3
7,001-9,000	11	3
9,001-11,000	19	6
11,001-13,000	46	14
More than 13,001	242	73
Total	330	100

Table 3
Proportions of children reporting symptoms in the month prior to the Scotch tape examination.

Symptoms	*N*=330	%
Anal itching	65	20
Diarrhea	50	15
Anorexia	100	30
Fever	202	61

DISCUSSION

In this study, we did not find the eggs of *Enterobius vermicularis* in any of the 330 kindergarten children. The children were in a high risk group, as has been shown in Thailand and in many other studies from developed and developing countries

(Tepmongkol and Suntadwoot, 1980; Kaewkes *et al*, 1983; Mercado and Garcia, 1996; Saksirisampant *et al*, 2004; de Carvalho *et al*, 2006; Ozgumus and Karaoglu, 2007; Requena *et al*, 2007; Triteeraprapab, 2007).

There are several reasons which could explain these negative results. We used the Scotch tape technique because it is well established, safe and fairly sensitive (Akagi, 1973; Cho and Kang, 1975; Kim *et al*, 2001; Cabello Rodriguez, 2003). Sampling was done in the morning, consistent with other studies, but was done at the kindergarten and not in the early morning at the patients' homes. The optimal time to sample a child is in the morning after the child wakes up, before they wash. We asked the parents not to wash their children s' bottoms on the day we collected the samples but this may not have been done in all cases. It would have been better to teach the parents how to sample their children. We only did one test per child; several studies have shown that sensitivity increases with increased number of sampling times (Gilman *et al*, 1991; Yoon *et al*, 2000).

The majority of our children came from high income, educated families, so it is possible the prevalence in such children is low because of awareness of personal hygiene. Our sample size and one Scotch tape test may have been inadequate to detected pinworms if the true prevalence were very low. Larger studies than ours have detected low rates of pinworms, *eg* 0.09% (n=1,010) in India and 0.3% in Nigeria (n=1,059) (Singh *et al*, 2004; Agbolade *et al*, 2007).

Although no pinworms were detected in this study, we were able to educate children, parents and teachers about the transmission, prevention and control of this parasite.

We studied only one group of children from relatively well off backgrounds in a small geographical location. This was intended as a pilot study to determine the prevalence of pinworm infection in the community; we are planning a larger cross-sectional survey.

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