

ENTEROBIASIS IN PRIMARY SCHOOLS IN BANG KHUN THIAN DISTRICT, BANGKOK, THAILAND

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Abstract. A study of enterobiasis and its correlation with various factors that could potentially influence the rate of infection was conducted among 3,621 primary school children (five to ten years old), drawn from sixteen schools in Bang Khun Thian District, Bangkok. Diagnosis was by the transparent tape swab technique, which was used to recover *Enterobius vermicularis* eggs from the perianal region. The transparent tape swabs were then placed on slides for examination by light microscopy. The average rate of infection for the group was 21.57%. No statistically significant differences were found between the male and female children. The younger children had a higher rate of infection. Subjects from schools located in industrial and metropolitan areas showed slightly higher rates of infection than those from agricultural areas. Data from the questionnaires in the study indicated that factors such as parental socio-economic status (occupational, income and education) and the children's personal hygiene contributed to the varying rates of infection.

INTRODUCTION

Enterobiasis is one of the most common worldwide parasitic infections of humans. Studies in America indicate that 30% of the children studied had enterobiasis (Smith and Gutierrez, 1984). In Thailand, surveys have shown a rate of 53 to 65% in slum areas in Bangkok (Tepmongkol *et al*, 1980; Teopipiporn *et al*, 1981) and 50.9% among students in Khon Kaen Province (Kaewkes *et al*, 1983). A survey of pre-school children (three to five years old), drawn from five schools in Nakhon Pathom Province, showed a prevalence rate of 38.32% (Wahah and Ratanaponglakh, 1992). Moreover, a study of pre-school children at a child development center in Bang Phli District, Samut Prakan Province, revealed a prevalence rate of 21.3% (Sanghirun *et al*, 1999). Furthermore, a survey of primary school students in Chiang Mai Province, found that the rate of infection was 16.8% (Piangjai *et al*, 1992).

A survey of the prevalence of enterobiasis was conducted in Thailand with results indicating that the highest rate of infection occurred in children between five and nine years of age (Jongsuksantikul *et al*, 1992). Research further indicated that the prevalence of enterobiasis did not correlate with the sex of the infected children (Vajrasthira and Harinasuta, 1960)

but was related more to environmental conditions and the children's hygiene practices (Mameechai *et al*, 1992). The spread of enterobiasis did correlate to factors such as areas of high residential density, for example in slum areas (Tepmongkol *et al*, 1980; Teopipiporn *et al*, 1981), nurseries and schools (Wahad and Ratanaponglakh, 1992; Mameechai *et al*, 1992). Individual hygiene and health practices were the most important factors influencing research results. Children who have poor hygiene and health practices, such as not washing their hands before meals, poorly groomed fingernails, sucking their fingers, and not wearing clean clothes, have a higher risk of enterobiasis. The research group was therefore interested in analyzing the hygiene and health practices of elementary students in order to determine the behaviors influencing enterobiasis. Factors examined in this study include the child's age, sex, school environment, and parental socio-economic status, which determined the time available for child care. Such information might prove beneficial in controlling the spread of enterobiasis.

MATERIALS AND METHODS

Diagnosis was by the transparent tape swab technique, which was used to recover *Enterobius vermicularis* eggs from the perianal regions of the children participating in the study. The transparent tape swabs were then placed on slides for examination under a light microscope. The study was conducted among 3,621 primary school children, aged between five to ten years old, drawn from sixteen primary schools in Bang Khun Thian district, Bangkok during

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Table 1
Prevalence of enterobiasis by age and sex.

Age (years)	Infected cases (%) Examined cases					
	Male		Female		Total	
5	<u>38</u> 223	(16.31)	<u>62</u> 223	(27.80)	<u>100</u> 446	(21.93)
6	<u>77</u> 324	(23.77)	<u>78</u> 369	(21.14)	<u>155</u> 693	(22.37)
7	<u>114</u> 383	(29.77)	<u>99</u> 391	(25.32)	<u>213</u> 774	(27.52)
8	<u>52</u> 268	(19.40)	<u>87</u> 407	(21.38)	<u>139</u> 675	(20.59)
9	<u>54</u> 279	(19.35)	<u>57</u> 326	(17.48)	<u>111</u> 605	(18.35)
10	<u>25</u> 190	(13.16)	<u>38</u> 228	(16.67)	<u>63</u> 418	(15.07)
Total	<u>360</u> 1,677	(21.47)	<u>421</u> 1,944	(21.66)	<u>781</u> 3,621	(21.57)

February and March 2001. There were 1,677 male and 1,944 female students. The students had to carry the questionnaire to their parents to be filled out. They were asked about the student personal information, parental socio-economic status (occupation, income and education), and the individual hygiene and health practices of the students. The schools' geographic areas were inspected and the school staff were questioned concerning environmental conditions in the neighborhood. Diagnostic and the questionnaire data were analyzed by the chi-square testing in order to find any relationships between the rate of infection and the factors mentioned above. A p-value of 0.05 was considered as significance.

RESULTS

We found that the average rate of infection among the students of Bang Khun Thian district, Bangkok, was 21.57%. No statistically significant differences were found between the male and female children ($p > 0.05$). However, the age of the student influenced the rate of infection ($p < 0.05$). The younger children tended to have a higher infection rate than the older children. The highest infection rate was found in seven-year-old children (Table 1).

The school groups were differentiated by area

Table 2
The prevalence of enterobiasis by school area.

School area	Infected cases (%) Examined cases	
Agricultural area	<u>105</u> 664	(15.81)
Industrial area	<u>383</u> 1,582	(24.21)
Metropolitan area	<u>293</u> 1,375	(21.31)
Total	<u>781</u> 3,621	(21.57)

(locality) and environment: subjects from schools located in industrial areas showed the highest rate of infection (24.21%), then metropolitan areas (21.31%) and agricultural areas (15.81%) (Table 2).

The study of the students' parental socio-economic status (occupation, income and education) showed that these factors were significantly related to the infection rate ($p < 0.05$). The students whose parents fell into the higher socio-economic status categories had a lower infection rate than those whose parents fell into the

Table 3
The prevalence of enterobiasis by parental occupation and income.

Parental occupation	<u>Infected cases</u> (%) Examined cases	Parental income (Baht/Month)	<u>Infected cases</u> (%) Examined cases
Merchant or businessman	<u>86</u> (17.77) 484	<5000	<u>340</u> (23.42) 1,452
Agricultural worker	<u>12</u> (27.27) 44	5,001 - 10,000	<u>207</u> (20.25) 1,022
Government employee	<u>24</u> (13.87) 173	10,001 - 20,000	<u>56</u> (18.00) 311
Business employee	<u>481</u> (23.09) 2,083	20,001 - 40,000	<u>15</u> (13.76) 109
Housewife	<u>34</u> (24.64) 138	> 40,000	<u>10</u> (17.24) 58

Table 4
The prevalence of enterobiasis by parental education.

Parental education	<u>Infected cases</u> (%) Examined cases
Less than Primary School	<u>20</u> (26.32) 76
Primary School	<u>418</u> (22.95) 1,821
Secondary school	<u>146</u> (18.77) 778
Less than Bachelor's Degree	<u>30</u> (16.04) 187
Bachelor's Degree and higher	<u>22</u> (16.67) 132

lower categories (Tables 3 and 4); moreover, the study of individual hygiene and health practices showed that the frequency of bathing and the changing and washing of clothing and bedding were significantly correlated to the rate of infection ($p < 0.05$). In contrast, behaviors such as finger sucking or chewing on toys, playing in the dirt, and proper hand washing before meals and after using the restroom did not appear to be related to the rate of infection ($p > 0.05$).

DISCUSSION

In this study, enterobiasis was found in primary school children in Bang Khun Thian District at an average rate of infection of 21.57%, which was lower than that cited in past studies (Teopipiporn *et al*, 1981; Wahah and Ratanaponglakh, 1992; Mameechai *et al*,

1992). Currently, the general public has been exposed to accurate information provided by the modern media: this exposure has enhanced parental knowledge of public health issues and has enabled parents to provide more effective care for their children. We feel that this is the reason why the infection rate was lower than in past studies.

Results from each school and geographic and economic area showed that a school's geography affected its infection rate. The highest infection rate occurred in children from schools located in industrial areas (24.21%), followed by that of schools in metropolitan areas (21.31%), and agricultural areas (15.81%). The results of this study conformed with those of previous studies, in which the environment influenced the rate of infection (Mameechai *et al*, 1992). However, a previous study has reported that the rate of infection was higher in agricultural areas than in metropolitan areas (Wahah and Ratanaponglakh, 1992). This study's findings are at variance with those of the previous analysis of the influence of the type of geographic area. However, the geography of the agricultural areas of Bang Khun Thian District, was different to that of the other provinces studied. Most of the agricultural areas that were mentioned in the previous studies, such as shrimp farms and fruit gardens, had salt or brackish water in their adjacent canals. This may have created a less conducive environment for the spread of enterobiasis. In addition, our study found that classrooms in agricultural area schools were not as crowded as those in industrial and metropolitan area schools, which had higher student densities. Classroom crowding was one factor that influenced the lower infection rate in the agricultural areas as opposed to that found in industrial

and metropolitan areas.

Results showed that the infection rates were similar and no statistically significant differences were found between male and female children ($p < 0.05$), which conformed with the findings of previous studies (Tepmongkol *et al*, 1980; Teopiporn *et al*, 1981; Wahad and Ratanaponglakh, 1992; Vajrasthira and Harinasuta, 1960). In terms of children's ages, this study found that the ages of the children affected the rates of infection ($p < 0.05$). The highest rate of infection occurred in children of seven years of age (27.52%); younger children tended to have a higher rate of infection than older children. Considering these results, it is probable that the younger children do not have the ability to follow good hygiene and health practices as well as the older children, who are able to care for themselves. This finding agrees with that of a previous study (Teopiporn *et al*, 1981).

The results of this study suggest that parental economic and social status are associated with the infection rate ($p < 0.05$). Parents who have higher-level occupations and income, had children who tended to have a lower infection rate than the children of parents falling in the lower levels. This suggests that the parents who had better economic and social conditions would have more available time to care for their children.

Enterobius vermicularis eggs remain in children's clothes and thus in contact with the body, causing recurrence of infection. This makes it unlikely that children will be permanently cured. This conforms to the past studies that indicate the individual hygiene and health practices are important to the rate of infection (Mameechai *et al*, 1992). Further studies of individual hygiene and health practices and their relationships to rates of infection should be conducted.

ACKNOWLEDGEMENTS

This study cannot be completed without help and advice from Dr Pramote Thongkrajai, Dr Nivat Kriausakul, Dr Siripong Sripipat and the administrators and teaching staff of all sixteen primary schools in Bang Khun Thian District, Bangkok. We would like to express our appreciation to Huachiew Chalermprakiet University for its generous funding of this study.

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