THE PREVALENCE OF ENTEROBIASIS IN CHILDREN ATTENDING MOBILE HEALTH CLINIC OF HUACHIEW CHALERMPRAKIET UNIVERSITY

C Nithikathkul[1], B Changsap[2], S Wannapinyosheep[2], C Poister[3] and P Boontan[2]

[1] Department of Biology, Faculty of Science and Technology;
[2] Department of Basic Medical Science, Faculty of Science and Technology;
[3] Department of English, Faculty of Liberal Arts, Huachiew Chalermprakiet University, Samut Prakan Province, Thailand

Abstract. A cross sectional survey of *Enterobius vermicularis* was carried out in 808 children in the Bangkok metropolis and nearby provinces. This was accomplished in a mobile health clinic from Huachiew Chalermprakiet University provided for communities in the areas during April 1999 to May 2000. Children 5-10 years of age were investigated for infestation of *Enterobius vermicularis.* Diagnosis was done by means of the transparent tape swab technique to recover eggs in the perianal region for examination under a light microscope.

The average infection rate in children was 21.91% . The highest infection rate (38.59 %) was found in Ang Thong Province, while the lowest one (11.66 %) was found in Chonburi Province. The rate of infection seemed to relate to household environmental factors. The infection rate was significantly higher ($p<0.05$) in agricultural areas and areas farthest from urban Bangkok. Industrial and urban areas had the lower rates of infection. There was no significant difference ($p>0.05$) in the incidence of infection between males and females.

INTRODUCTION

The pinworm, *Enterobius vermicularis,* is one of the most common parasites infecting *Homo sapiens* worldwide. The archeological history shows this association to go back to the earliest origins of mankind. It is a species of Oxyurdia belonging to the phylum of nematodes, or roundworms. Pinworm infestation commonly causes irritation in its victims, however severe infestations can result in pathogenesis in various organs including the lung (Bever *et al*, 1973), liver (Daly and Baker, 1984; Slais, 1963), appendix (Cerva *et al*, 1991), and female genitals and reproductive organs (Mayayo *et al*, 1986; Beckman and Holland, 1981; Kogan *et al*, 1981; McMohan *et al*, 1984). Pinworms are prevalent in both the tropics and temperate regions of the world.

Enterobius vermicularis is particularly widespread among school-aged children. Research done in the United States of America reported an average prevalence rate in children of around 30% (Smith and Gutierrez, 1984). Studies done in urban slum areas in Bangkok, Thailand showed a rate of infection varying from 53% to around 65% (Tepmongkol *et al*, 1978; Teopipiporn *et al*, 1981). Studies of preschool aged children in Khon Kaen Province in the northeastern region of Thailand indicated a prevalence of around 50.9% (Kaewkes *et al*, 1983). Research in Nakhon Pathom Province, an urban area adjacent to Bangkok, exhibited a prevalence rate of 38.2%. (Wahah and Ratanaponglakh, 1992).

Various studies have been done to determine the prevalence of helminth infection in Thailand. Different methods of diagnosis were utilized, including the preparation of feces for examination by Kato's thick smear technique. The rate of enterobiasis thus determined, varied according to the geographical region. The rate of infection in Northern Thailand was 0.58%, 0.28% in the southern region, 0.27% in the central region, and 0.20% in the northeast. The highest prevalence of infection was found in children five to nine years of age (Preuksaraj *et al*, 1982; Jongsuksantigul *et al*, 1992). There was no significant relationship between the sex of the subjects and the rate of infection (Vajarasthira and Harinasuta, 1960). Population density and personal hygiene were significant factors in the distribution and prevalence of infection, however. This could explain consistently higher prevalences found in overcrowded areas such as slums (Tepmongkol *et al*, 1980; Teopipitporn *et al*, 1981), as well as in orphanages and schools (Mameechai *et al*, 1992; Wahah and Ratanaponglakh, 1992) where large numbers of young children are in close proximity. At present, we lack extensive data concerning the rates of infection in various areas and among different populations. It would be of interest to examine difference in urban residential, industrial, and rural agricultural areas.

We chose to investigate the prevalence of enterobiasis in the Bangkok metropolitan area and the surrounding regions. We felt the data from an investigation of this area would assist us in developing

more effective prevention and control programs with an emphasis on public health services and educational programs.

The objective of this research study was to determine the prevalence of enterobiasis in children attending Huachiew Chalermprakiet University's mobile health clinic. This knowledge would help us have a better understanding of the prevalence of enterobiasis in school aged children in Bangkok and surrounding areas. We also endeavored to analyze the relationship between the environment and prevalence of infection, and to determine if the sex of the subject were a factor in rate of infection.

MATERIALS AND METHODS

The sample group was drawn from children between the ages of five and ten years who attended the Huachiew Chalermprakiet University's mobile health clinic. There were twelve sessions between April 1999 and May of 2000. A total of 808 children were included in the study. Almost all of the children resided in the surrounding area serviced by the mobile health clinic during each session.

Collection and diagnosis

Each child, upon entering the mobile clinic, was registered and given the questionnaire. The questionnaire asked for personal data such as name, age, sex, etc. Each questionnaire was numbered to correspond to a labeled and numbered slide used in the diagnosis.

The children were examined by use of the transparent tape perianal swab technique. A 2 x 6 cm rectangle of transparent tape is placed firmly on the perianal skin and then placed on the labeled slide. Diagnosis is then accomplished by examination of the slide under a light microscope. The child is positive for infection if the distinctive D-shaped *Enterobius vermicularis* eggs are found on the slide. Children with a positive result are then referred to a doctor for treatment.

RESULTS

Eight hundred and eight children attended the Huachiew Chalermprakiet University mobile health clinic during twelve monthly sesssions in twelve different areas in the Bangkok region. There were 380 males and 428 females between the ages of five and ten years. Approximately 70 to 80% of the children were accompanied by a parent. The highest infection rate was 38.59 %, found at Samgo district, Ang Thong Province. The lowest, 11.66 %, was in Muang district, Chonburi Province (Table 1).

The comparison of the prevalence of *Enterobius vermicularis* infection in each area studied exhibited statistically significant differences ($p<0.05$). The relationship between the prevalence of infection and sex showed no statistically significant difference ($p>0.05$).

DISCUSSION

Our findings had similarities to the results found in other recent surveys done in Thailand. One example of this similarity is the lack of any statistically significant differences between the prevalences of infection found in male and female subjects (Vajarasthira and Harinasuta, 1960). Like previous studies, we also found statistically significant differences in the prevalence of infection in areas with different environmental and social factors (Mameechai *et al*, 1992).

We found the highest prevalence of infection in geographic areas involved in agriculture. Mixed agricultural-industrial areas exhibited an intermediate level of prevalence. The lowest prevalence was found in private commercial and fisheries areas. The average rate of prevalence including all three geographic groups was 21.91%. This result was lower than that found in recent research, such as the prevalence of infection found in children in five slum areas in metropolitan Bangkok (53-65%) (Preuksaraj *et al*, 1982; Teopipiporn *et al*, 1981), the prevalence found in pre-school children at Khon Kaen Province (50.9%) (Kaewkes *et al*, 1983), and the prevalence found in children in Nakhon Pathom Province (38.32%) (Wahah and Ratanaponglakh, 1992).

When we analyzed the results of the study, we were able to differentiate the rates of the prevalence of infection into three categories, high, intermediate, and low. High prevalence was designated as more than 27%. The areas falling into this category are Samko district (38.59%) and Tha Maka district (27.77%). Both of these areas were classified as agricultural areas. (Table 1). Most residents of these areas have occupations in agriculture and are self employed or employed by private businesses or individuals. The economic status in these two areas was rated as poor to moderate. Because of the economic conditions, parents usually work long hours and have less time and energy for the care of their children, thus causing a lower level of personal hygiene and a higher prevalence of infection.

Table 1
The prevalence of enterobiasis in children attending Huachiew Chalermprakiet University's mobile health clinic from April 1999 to May 2000 (twelve sessions).

Mobile clinic area	Type of area	Positive cases / Total cases (%)		
		Female	Male	Total
High incidence (>27%)				
Samko district, Ang Thong Province	1	10/27 (37.03)	12/30 (40.00)	22/57 (38.59)
Tha Maka district, Kanchanaburi Province	1	10/31 (32.25)	10/41 (24.39)	20/72 (27.77)
Intermediate incidence (20-27%)				
Bang Bo district, Samut Prakan Province	2	12/44 (27.27)	6/25 (24.00)	18/69 (26.08)
Lad Krabang district, Bangkok	2	7/25 (28.00)	4/18 (22.22)	11/43 (25.58)
Plengyao district, Chachoengsao Province	2	4/25 (16.00)	5/12 (41.66)	9/37 (24.32)
Photharam district, Ratchaburi Province	1	6/26 (23.07)	4/19 (21.05)	10/45 (22.22)
Ban Paew, district, Samut Sakhon Province	1	2/19 (10.52)	7/22 (31.81)	9/41 (21.95)
North Samlong district, Samut Prakan Province	3	9/43 (20.93)	9/40 (22.50)	18/83 (21.68)
Muang district, Samut Prakan Province	3	17/76 (22.36)	14/72 (19.44)	31/148 (20.94)
Low incidence (<20%)				
Ang Sila district, Chon Buri Province	4	2/26 (7.69)	5/13 (38.46)	7/39 (17.95)
Phra Pradaeng district, Samut Prakan Province	3	5/27 (18.51)	3/27 (11.11)	8/54 (14.81)
Muang district, Chon Buri Province	4	6/59 (10.16)	8/61 (13.11)	14/120 (11.66)
Total		90/428 (21.02)	87/380 (22.89)	177/808 (21.91)

Area characteristics: 1 = Agricultural area; 2 = Mixed agricultural and industrial area; 3 = Mixed residential and industrial area; 4 = Mixed private commercial and fisheries.

An intermediate level of prevalence was designated as those areas having a rate of infection between 20% and 27%. Geographical locations falling into this category include Bangpu (26.08%), Lat Krabang (25.58%), Phlengyao (24.32%), Photharam (22.22%), Ban Paew (21.95%), North Samlong (21.68%), and Muang (20.94 %). Three of these communities are in Samut Prakan Province and are mixed agricultural and industrial areas. Two communities, North Samlong and Muang districts are only three to four kilometers apart and have nearly identical rates of infection. Lat Krabang district is adjacent to Samut Pratkan Province and is very similar in living conditions. Ratchaburi is another Bangkok suburb and is also similar, as is Chachoengsao and Ban Peaw district in Samut Sakon. These areas are characterized by mixed residential and manufacturing neighborhoods and a large number of middle class families. Poorer families in these neighborhoods tend to live in open areas with gardens and open ground as opposed to the crowded conditions in the inner city.

Areas of low prevalence are classified as those with less than a 20% rate of infection. Two of these are in

Chon Buri Province (Ang Sila 17.95% and Muang 11.66%). Fisheries and private commercial businesses make up the economy in Chon Buri Province. The economy is relatively well developed, family incomes are stable and relatively high, and the neighborhoods are uncrowded. However, the third is in Samut Prakan (Phra Pradaeng district, 14.81%) and is classified as a mixed residential and manufacturing area. Other factors, such as parental education and the season of the year, might be investigated in future studies to determine what factors influenced this anomaly in the results.

The majority of the children in this survey were accompanied by a parent. This is an indication of parental concern and care for the health and personal hygiene of the children. A higher level of parental concern would serve to influence the results of this study through a concomitant increase in the level of parental care and personal hygiene among the children in this particular study. Thus it may have been a factor resulting in the lower prevalence of infection than that seen in other recent research. Other mitigating factors influencing the lower rates of infection found in this study would include population density, as higher levels of infection were exhibited in institutional settings such as schools and in areas with crowded living conditions such as slums.

The environment, socio-economic status and society in general have produced important changes in current Thai society. Education has improved nationwide. Public health and informational programs have been expanded and improved. All of these have increased awareness of, and knowledge about parasite infection and its prevention.

We found the rate of the prevalence of infection in this study related to environmental and economic factors. Agricultural areas exhibited the highest prevalence. Mixed agricultural and industrial areas had the lowest prevalence. We found no correlation between prevalence and sex, as there was no significant difference in this data. Further research should study these and other factors. It is hoped that this and future research will assist public efforts in the prevention and treatment of parasitic infection.

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