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Parasitic and Enteric Bacterial Infections among Food Handlers in Tourist-area Restaurants and Educational-institution Cafeterias, Sai-Yok District, Kanchanaburi Province, Thailand

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Abstract

This study aimed to determine the health status of food handlers working in the cafeterias of educational institutions, and those working in the restaurants of a tourist area in Sai-Yok District, Kanchanaburi Province, Thailand. A total of 273 stool samples were collected: 29.3% (80/273) from food handlers in the educational institutions, and 70.7% (193/273) from food handlers in tourist-area restaurants. In all, 266 (97.4%) participants agreed to complete the study questionnaire. The stool samples collected were examined by direct smear and Kato-Katz modified thick-smear, and cultured for bacterial infections by agar plate method. The prevalence of intestinal parasites was 10.3% (28/273). Among these, hookworm was the most common (70.0%), followed by *Entamoeba coli* (10.0%), *Trichuris trichiura* (10.0%), *Blastocystis hominis* (3.3%), *Giardia lamblia* (3.3%), and *Endolimax nana* (3.3%). All stool cultures tested negative for enteropathogenic bacteria. Helminth infections were less prevalent among the food handlers from the educational institutions. A medical check-up program with health education could improve workers' health status.

Keywords: food handler, intestinal parasites, enteropathogenic bacteria, Kanchanaburi, Thailand

Introduction

Parasitic infections are a worldwide public health problem, particularly in developing countries [1]. One epidemiological survey showed that parasitic infections affect > 35% of the Thai population [2]. However, the prevalence of intestinal parasites varies from one area to another, depending on the level of personal and community hygiene [3]. Food handlers play an important role in the dissemination and transmission of enteropathogenic microorganisms, including intestinal parasites. Asymptomatic individuals who work as food handlers may become potential sources of contamination and dissemination of

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several enteric pathogens. A number of outbreaks of viral and bacterial infections have already been shown to have been initiated by infected food handlers [4,5]. Although such clear outbreaks have not been seen for intestinal parasitic infections, food handlers are still considered an important source of enteroparasitic infections. Their infection status continues to be monitored in many countries [6-8]. This study sought to determine the prevalence of intestinal parasites and pathogenic enteric bacteria among food handlers in tourist areas and cafeterias of educational institutions (in schools, and one university campus) in Sai-Yok District, Kanchanaburi Province, Thailand.

Materials and methods

This cross-sectional study was conducted from 2007-2008 among food handlers in Sai-Yok District, Kanchanaburi Province, Thailand, which is about 200 km west of Bangkok (Fig 1). Of the 273 stool samples collected, 29.3% (80/273) came from food handlers in the educational institutions, while 70.7% (193/273) came from restaurants in the tourist area. In all, 266 (97.4%) participants agreed to complete the questionnaire. Stools were examined for parasitic infections using direct smear and Katz's modified thick-smear techniques [9,10]. The common enteropathogenic pathogens–*Salmonella*, *Shigella*, *Yersinia* spp, and *Vibrio* spp–were cultured from stool samples by agar plate technique, and potential pathogens were identified by standard laboratory methods [11,12]. Information on health-risk behaviors was gathered by questionnaire and analyzed for risk of parasitic infection.

Results

The female : male ratio was 219 : 47, and the largest age group (60.3% of those questioned) was > 40-years. Analysis of educational status showed that most (94.4%; 202/214) were literate, while a majority (49.5%) had primary-school-level educations. Among 241 subjects, 151 (62.7%) were food handlers and 90 (37.3%) were their assistants (Table 1).

A number of intestinal parasitic infections

Fig 1 Sai-Yok District, Kanchanaburi Province, about 200 km west of Bangkok.

were found among the 273 food handlers. The overall positive rate was 10.3%, comprising 8.4% (23/273) intestinal helminthes, and 1.8% (5/273) protozoa. The most prevalent infection was hookworm (70.0%). Other infections were very low in number–*Trichuris trichiura* (10.0%), *Entamoeba coli* (10.0%), *Giardia lamblia* (3.3%), *Endolimax nana* (3.3%), and *Blastocystis hominis* (3.3%) (Table 2).

Intestinal parasitic infections were more common among the food handlers working in food shops in the tourist areas (25/28, 89.2%) than those working in the cafeterias of schools and the university (3/28, 10.8%). Risk assessment analysis for intestinal parasite infections revealed that the male assistants working in the tourist-area restaurants washed their hands more frequently than the others (P-values of 0.05, 0.03, 0.01, and 0.05) (Table 3).

Bacteria culture found only normal flora, such as non-pathogenic *E. coli*, *Klebsiella* sp, etc. No enteropathogenic bacteria were found in the specimens examined.

Discussion

Among the food handlers, the prevalence of parasitic infections was 10.3% (28/273), which was higher than that reported in a Thai hospital setting (6.3%) [13]. Hookworm was the most prevalent infection, followed by *T. trichiura*, *E. coli,* and *G. lamblia*. Other non-pathogenic protozoa were also found, including *B. hominis* and *E. nana*. Detection of these protozoa in the feces of infected people appears to increase in areas where sanitation and personal hygiene are inadequate [14]. *B. hominis* is an anaerobic enteric protozoan of humans, with indefinite affinities. Since *Blastocystis* is zoonotic, the route of infection to food handlers requires further investigation.

It was noted that the assistants to the food handlers had higher parasite infection rates than the food handlers themselves; most of the assistants were migrant workers. The results appear to support reports [15] that food-handler assistants might harbor infections as a result of inadequate personal hygiene. A high standard of cleanliness is essential for all food handlers, since it serves to protect

Table 1 Sociodemographic characteristics of food-handlers.

Characteristics	Frequency	Percentage
Age (year)		
< 20	10	3.80
20-40	97	37.20
> 40	154	59.00
Sex		
Male	48	18.05
Female	218	81.95
Educational status		
Illiterate	12	4.50
Grade 1-6	106	39.80
Grade 7-12	85	32.00
University	11	4.10
Working status		
Food handler	151	56.80
Assistant food handler	88	33.08

Table 2 Relative frequency of infection of food handlers with intestinal helminthes and Protozoa.

Parasite	Frequency	Percentage
Hookworm	21	7.69
T. trichiura	3	1.10
E. coli	3	1.10
E. nana	1	0.37
B. hominis	1	0.37
G. lamblia	1	0.37
Total	30	11.00
Total number of positive cases	28	10.26

Note: in this study, two cases were mixed infection (hookworm + *T. trichiura* and *E. coli* + *B. hominis*).

Table 3 Risk estimates of parasitic infections.

Risk estimates	Stool examination		P-value
	Positive	Negative	
Working status			
Food handler	13	138	0.05*
Assistant food handler	15	73	
Gender			
Male	9	38	0.03*
Female	19	200	
Work situation			
Food shop in tourist area	25	161	0.01*
Cafeteria in educational institution	3	77	
Wash hands before meal			
Yes	16	176	0.05*
No	12	61	
Wear shoes			
Yes	26	232	0.06
No	2	4	

* Statistically significant, at $p < 0.05$

customers from many illnesses, especially gastro-intestinal infections, and bacterial and parasitic diseases [16]. To prevent possible transmission, food handlers should undergo regular annual medical check-ups, to reduce the risk of parasitic agents' infecting food. Health education should also be given to targeted populations of food handlers.

This study was limited by its small sample size. It was thus unable to assess the associations between risk behaviors and disease transmission.

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