Intestinal Parasitic Infestations Among Children in an Orphanage in Pathum Thani Province

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Abstract

Infection caused by intestinal parasites is still a common health problem especially in children from developing countries. Orphans are a group of underprivileged population in society. To evaluate the intestinal parasitic infections in children in an orphanage in Pathum Thani province, Thailand, stool samples were collected during a cross-sectional study in April 2001. Examination for intestinal parasites were performed by using simple smear, formalin-ether concentration, Boeck and Drbohlav's Locke-Egg-Serum (LES) medium culture and special staining (modified acid-fast and modified trichrome) techniques. A total of 106 pre-school orphans (60 males and 46 females), aged 10.0-82.0 months, were recruited for the study. There were 86 individuals (81.1%), 45 males and 41 females, infected with at least one parasite. Interestingly, most of the parasites identified were protozoa. *Blastocystis hominis* was found at the highest prevalence (45.2%). The infections caused by *Giardia lamblia* was 37.7 per cent and *Entamoeba histolytica* was 3.7 per cent. Other non-pathogenic protozoa found were *Trichomonas hominis* (39.6%), *Entamoeba coli* (18.8%), and *Endolimax nana* (3.7%). The only one case of helminth parasite detected was *Strongyloides stercoralis* (0.9%). The sensitivity for detection of *B. hominis* and *T. hominis* was increased by the LES culture technique. No history of diarrhea symptoms were recorded among these orphans. However, during the investigation, stools of all infected cases were noted for six characteristics including formed, soft, loose, mucous, loose-watery and watery.

The present study emphasized the problems of protozoan infections among these orphans. Health educations as well as routine surveillance is necessary in order to control the infections.

Key word : Intestinal Parasite, Orphanange Children, Orphanage

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Presently, many of the health issues among children living in orphanages in developing countries have been raised[1]. With about 62 million people and a quarter of a million births each year in Thailand, there are common health issues that children face daily, whether in or out of orphanages. Obviously, limited financial resources is the major cause of children being abandoned in Thailand. Orphans are a group of underprivileged children in the society. Medical problems are generally compounded in orphanages because children are often abandoned when they are very young and do not have access to appropriate medical facilities[1,2]. Failure to diagnose parasitic infections can contribute to continued malabsorption and failure to thrive[3].

Among these parasites, protozoan infections (eg. giardiasis) frequently affect children. The infections are often found in asymptomatic individuals[4]. However, the symptoms can range from mild diarrhea, flatulence, anorexia, crampy abdominal pains, and epigastric tenderness, to steatorrhea and full-blown malabsorption syndrome. In addition, *Blastocystis hominis* which has received much attention in the past two decades, has been detected widespread from stool samples of a variety of populations of immunocompetent persons, with or without gastrointestinal symptoms[4,5]. These protozoan infections were substantially detected in Thai orphans, and children in day care centers of many other countries[5-7]. Here, the authors report the high prevalence of intestinal protozoa among children in an orphanage in Pathum Thani provice, Thailand. The present findings reflect the necessity for appropriate health care and education as public health strategies for the staff working with this group of children.

MATERIAL AND METHOD

Study area and participants

On the occasion of the 84 the anniversary of the founding of Chulalongkorn University, the authors visited a government orphanage during April, 2001 in Pathum Thani province, Thailand. Its location is about 50 km from Bangkok, the capital of Thailand. This center is under the control of the Prevention and Resolution of Woman and Child Trafficking Division, Department of Social Development and Welfare, Ministry of Social Development and Human Security and responsible for the care of preschool age orphans (1-7 years). The present study aimed to help the Thai public. The orphans were from impoverished families or broken homes, abandoned in hospitals or public places and from families under distress whose parents are chronically ill, mentally ill or imprisoned. All had no history of HIV infection and were recruited for this study. The paramedical staff and childcare workers dealt directly with the children. After the stool samples were all collected, the authors took the specimens from the orphanage to be tested. Informed consent was obtained from the superintendent, Khun Anchalee Ampavasiri (mother-superior) before the study. After the study, drug treatment was given to all the victims in the orphanage.

Examination for stool parasites

Stool specimens were collected and examined for parasites by simple smear preparation and formalin-ether concentration technique. Each sample was also cultured in Boeck and Drbohlav's Lock-Egg-Serum (LES) medium at 37°C for 48 h by modification as described by Sawangjaroen N et al, 1993 to ensure a high detection rate as some protozoa from the microscopic examination may yield a negative result, (eg: *E. histolytica, B. hominis and T. hominis*) [8]. The modified acid-fast and modified trichrome, special stains for *Cryptosporidium parvum* and *Microsporidium* spp, were also performed. These staining conditions were optimized as described by Garcia et al, 1983 and Ryan et al, 1993[9,10].

RESULTS

All 106 pre-school orphans (60 males and 46 females) in the center were examined for the presence of intestinal parasites by the described techniques. The children ranged in age from 10 months to 82 months (36.2 ±15.6 months). Interestingly, most of the parasitic organisms found were protozoa. Only one case of helmithic infection caused by *S. stercoralis* was detected.

The overall infection rate was very high (81.1%). A higher prevalence was found in females (89.1%) than males (75.0%) with statistical significance ($p < 0.05$). Children aged 25-36 months had the highest infection rate (91.1%, Table 1). Among the investigated stool specimens, all six characteristics were noted including formed, soft, loose (mushy), mucous, loose-watery (liquidy) and watery (Table 1). Typing of the stools followed that described by WHO[11]. All infected stool samples were either the formed type or others.

With regard to the protozoa found, the highest prevalence was *B. hominis* (45.2%). There were 37.7 per cent and 3.7 per cent positive with *G. lamblia* and

Table 1. Stool types from infected and investigated cases of the children in an orphanage in Pathum Thani province, Thailand.

Age (month)	No. investigated			Infected				No. stool type of infected/investigated					
	No.	Female	Male	No.	Female	Male	%	Form	Soft	Loose	Mucous	Loose-watery	Watery
1-12	4	1	3	-	-	-	0	-	0/2	0/2	-	-	-
13-24	20	7	13	13	6	7	65.0	1/2	5/7	5/8	1/2	1/1	-
25-36	34	21	13	31	20	11	91.1	3/4	8/9	14/15	4/4	1/1	1/1
37-48	28	10	18	25	8	17	89.2	1/1	10/11	10/11	3/3	1/1	0/1
49-60	10	4	6	9	4	5	90.0	1/1	4/5	2/2	1/1	1/1	-
> 60	10	3	7	8	3	5	80.0	2/3	2/2	3/4	1/1	-	-
Total	106	46	60	86	41	45		8/11	29/36	34/42	10/11	4/4	1/2
Percentage				86	89.1	75.0	81.1	72.7	80.5	80.9	90.9	100	50

E. histolytica, (Table 2). The detected *E. histolytica* was the only cyst form. Other protozoa identified were non-pathogenic including *T. hominis* (39.6%), *E. coli* (18.8%) and *E. nana* (3.7%), respectively (Table 2). Interestingly, the culture technique using LES medium provided a much higher sensitivity compared to the simple smear and concentration technique; 44 cases compared to 5 by simple smear and 6 by concentration for *B. hominis* and 39 cases compared to 5 by simple smear and 3 by concentration for *T. hominis* (Fig. 1). No case of *C. parvum* and Microsporidium spp. was detected by the described techniques. The present study did show a higher prevalence of blastocystosis and giardiasis than a previous report[12] (Table 3).

DISCUSSION

Generally, the prevalence rates of intestinal parasitic infections vary from one area to another depending on the degree of personal and community hygiene, sanitation and climatic factors[3,13]. Consequentely, the occurrence of parasitic infections are most commonly due to high-risk behaviors in uneducated or unconcerning individuals. The public health burden of intestinal infectious diseases is substantial, particularly among children worldwide including underprivileged children. It is accepted that living in a orphangage shapes the child's health and development[1,14].

According to the present study, a high prevalence of protozoan infections among these orphans could be observed and four-fifths of the children carried at least one type of protozoa. The infection prevalence was higher both for pathogenic and non-pathogenic protozoan than another orphanage studied in Thailand[6,12]. The general detection of protozoan in children aged over 12 months as reported from other orphanages and other countries was also shown in the present study (Table 2)[12-16]. *B. hominis* was found at the highest prevalence (45.2%). The infection rate of *G. lamblia* in this orphanage was 37.7 per cent. The prevalence of these commonly found parasites (*B. hominis* and *G. lamblia*) in abandoned children of other countries varied from 14.0 per cent to 51.0 per cent[13-16]. The sources of infections may be natural reservoirs (eg. food providers, domestic animals or contaminated food or water)[17]. The present study was not carried out on the childcare staff. More epidemiological studies in these individuals will provide the necessary information to achieve ways to prevent and control the infections. *B. hominis*, was

Table 2. Prevalence of intestinal parasitic infections of the children in an orphanage in Pathum Thani province, Thailand, classified by age and sex.

Age (month)	No. Investigated			Pathogen												Non-pathogen						Mixed infection		
				S. stercoralis			*B. hominis*			*G. lamblia*			*E. histolytica*			*T. hominis*			*E. coli*			*E.nana*		
	No.	F	M	No.	F	M	No.	F	M	No.	F	M	No.	F	M	No.	F	M	No.	F	M	No.	F	M	No.	F	M
1-12	4	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13-24	20	7	13	-	-	-	3	3	0	7	4	3	-	-	-	7	3	4	1	0	1	-	-	-	4	4	0
25-36	34	21	13	1	1	0	21	12	9	12	5	7	2	0	2	16	5	1	8	4	4	2	0	2	18	6	12
37-48	28	10	18	-	-	-	13	5	8	13	7	6	-	-	-	10	4	6	6	3	3	-	-	-	13	4	9
45-60	10	4	6	-	-	-	6	1	5	5	4	1	2	1	1	7	3	4	3	1	2	2	1	1	8	6	2
> 60	10	3	7	-	-	-	5	1	4	3	1	2	-	2	1	1	2	2	0	-	4	2	2				
Female	46			1			22			21			1			16			10			1			22		
Male	60			-			26			19			3			26			10			3			25		
Total	106			1			48			40			4			42			20			4			47		
Percentage				0.9			45.2			37.7			3.7			39.6			18.8			3.7			44.3		

generally considered to be a nonpathogenic yeast in the past, but this organism has protozoan affinities due to the basis of rRNA sequencing[18]. Much attention has been focused on it in the past two decades, principally because of its classification as a protozoan. It is indeed frequently found in patients with gastrointestinal disorders. However, studies by Udkow and Markell in 1993 showed that in a blinded examination of the stools of both asymptomatic and symptomatic persons, essentially the same prevalence of Blastocystis was found. It has now been presented in at least four serologic variants and its pathogenenicity remains highly questionable[7]. Furthermore, the authors showed that the LES medium culture system greatly increased the sensitivity for protozoan detection especially *B. hominis* and *T. hominis*. (Fig. 1) This confirms the principle that the vegetative form of these protozoa are viable in culture media which are superfluous[8,19]. This is why the present report showed higher positive protozoan infections than a report from the Phayathai Babies' Home, Bangkok [12] which did not use the culture technique. In addition, in the rural area of Pathum Thani province, there are more underlying factors which may influence the prevalence of these protozoan infections compared to an urban or city area particularly in Bangkok. The method of investigation was more pronounced in the different sensitivity or the outcome results. Apart from *G. lamblia*, the other alimentary flagellate is Dientamoeba fragilis. A number of reports indicated that it can cause symptoms in some infected persons [4]. However, the present study did not find this organism either by simple smear or by LES culture. Although this LES medium was reported to be the most efficient for this organism cultivation[2], failure of this trophozoite to grow may be due to the process of stool collection which provided non-fresh specimens. It is common for *D. fragilis* to degenerate rapidly after leaving the stool for 12-24 h at room temperature[8,20].

Curiously, during the present investigation, no diarrhea sysmptoms among the children were reported by the paramedical staff and from the health records. However, the stool type of most infected cases were found to be either loose or soft or mucous or loose-watery or watery. Unfortunately, there were no data of stool types from the other studied orphanages[6,12,13]. However, it is very difficult to assess the symptoms in parasitic infection in children since

Table 3. Prevalence of protozoan infections between orphanage children from a previous study and the present study.

Setting	Detected protozoan	
	Phayathai, Bangkok[12] %	The Pathum Thani study %
Pathogenic		
B. hominis	6.5	45.2
G. lamblia	10.5	37.7
E. histolytica	0.3	3.7
C. parvum	8.6	Not found
Microsporidium spp	1.3	Not found
Non-pathogenic		
T. hominis	1.6	39.6
E. coli	1.1	18.8
E. nana	Not found	3.7

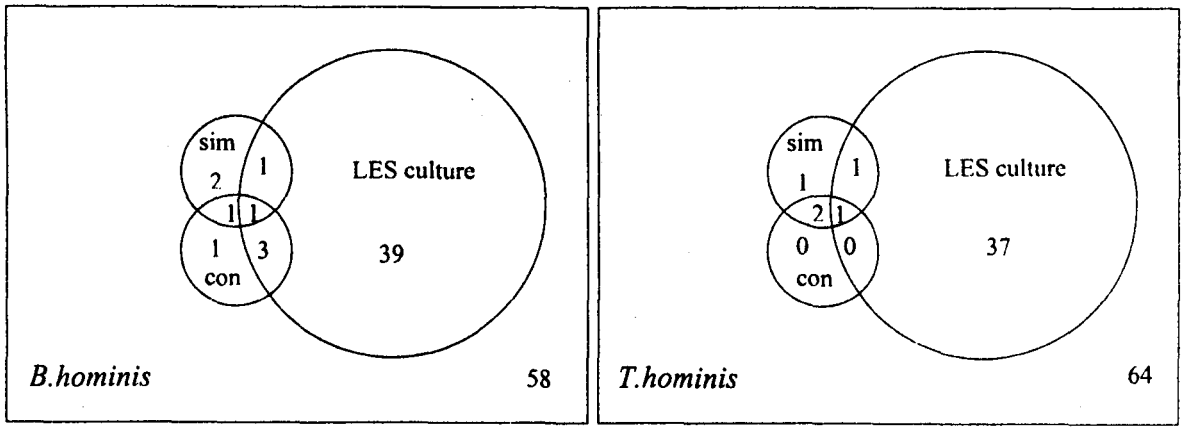

Fig. 1. Increased sensitivity for detection of *B. hominis* and *T. hominis* by Boeck and Drbohlav's Locke-Egg Serum (LES) culture. When compared to simple smear (sim) and concentration (con) techniques.

not only parasites can cause diarrhea but also other gastrointestinal illnesses which could be mild or non-specific. Moreover, infants and toddlers are unable to describe the symptoms themselves.

It is worth noting that the prevalence of helminth infection was markedly low in this orphanage. A similar finding was also reported by Termmathurapoj et al, in Phayathai Children's home, Bangkok [12]. This is not entirely unexpected because mass-therapy of albendazole, an anti-helminthic drug, is usually carried out yearly under the policy of the Department of Social Development and Welfare, Ministry of Social Development and Human Security.

Contrary to the present study, *C. parvum* and Microsporidum spp could be detected in 8.6 per cent and 1.3 per cent, respectively, at Phayathai Babies' home, Bangkok. However, 48 of 266 cases in that orphanage were those with HIV-positive children. Among these immunocompromised children, 4 cases and 3 cases had cryptosporidiosis and microsporidiosis respectively[12]. These infections were significantly more common in the HIV-infected group[4, 21]. The other reason for the negative finding of these coccidian in the present study might be that cryptosporidiosis is waterborne and outbreaks have all occurred in communities where water utilities met state and federal standards[4]. In addition, the method used for coccidian staining in the present study might provide different or lower sensitivity when compared to the technique used by Termmathurapoj et al. How-

ever, the disease is also now recognized as a zoonosis which may be acquired from domestic animals (17). The source for infecting humans and the modes of transmission of microsporidiosis are uncertain(4).

Nevertheless, orphanages and day care centers have been implicated as a major site of significant endemic giardiasis and transmission(1,15,16). A report on severe giardiasis in the United States by the Centers for Disease Control and Prevention identified two high-risk groups: children younger than 5 years of age and women of child bearing age(1,4,16). Isoenzyme characterization of Giardia isolates suggests that domestic animals (cattle, sheep, dogs) may also serve as reservoirs for cross-transmission between humans and animals(4). The surveys of prevalence in other orphanages, in childcare-workers and natural reservoirs remain to be done. Health care coverage among orphans is recommended.

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เชื้อปรสิตในลำไส้ของเด็กอ่อนในสถานสงเคราะห์เด็กแห่งหนึ่ง จังหวัดปทุมธานี

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การติดเชื้อปรสิตในลำไส้ยังเป็นปัญหาต่อสุขภาพของเด็ก โดยเฉพาะในประเทศกำลังพัฒนา เด็กกำพร้าเป็นกลุ่มบุคคลที่ถูกทอดทิ้งในสังคม เพื่อประเมินการติดเชื้อปรสิตในลำไส้ของเด็กกำพร้าในสถานเลี้ยงเด็กกำพร้าแห่งหนึ่งของจังหวัดปทุมธานีในประเทศไทย ได้ทำการเก็บตัวอย่างอุจจาระในช่วงเดือนเมษายน 2544 ศึกษาโดยใช้วิธีเสมียรอย่างง่าย วิธีความเข้มข้นแบบฟอร์มาลิน-อีเธอร์ วิธีเพาะเลี้ยงในอาหารเลี้ยงเชื้อชนิด Boeck และ Drbohlav's Locke-Egg-Serum (LES) และวิธีการย้อมสีพิเศษแบบ modified acid-fast และ modified trichrome จากเด็กกำพร้าก่อนวัยเรียน 106 คน (ชาย 60, หญิง 46) อายุระหว่าง 10 ถึง 82 เดือน ที่เข้ารับการตรวจ มีเด็กจำนวน 86 ราย (81.1%) คิดเป็นชาย 45 คน หญิง 41 คน ที่ติดเชื้ออย่างน้อยหนึ่งชนิด เป็นที่น่าสนใจว่าเชื้อส่วนใหญ่ล้วนเป็นโปรโตซัว ความชุกสูงสุดคือเชื้อ *Blastocystis hominis* คิดเป็น 45.2% เชื้อ *Giardia lamblia* คิดเป็น 37.7% และเชื้อ *Entamoeba histolytica* คิดเป็น 3.7% ส่วนโปรโตซัวไม่ก่อโรคที่พบได้แก่ *Trichomonas hominis* (39.6%) เชื้อ *Entamoeba coli* (18.8%) และเชื้อ *Endolimax nana* (3.7%) เชื้อหนอนพยาธิพบรายเดียวเป็นชนิด *Strongyloides stercoralis* (0.9%) ความไวของการตรวจหาเชื้อ *B. hominis* และ *T. hominis* เพิ่มขึ้นในวิธีของการเพาะเชื้อใน LES ช่วงเวลาที่ศึกษานี้ เด็กแต่ละคนไม่มีประวัติระบุว่ามีอาการท้องเสีย แต่อย่างไรก็ดีเนื้ออุจจาระที่นำมาตรวจพบลักษณะทั้ง 6 แบบ คือ มีรูงทรง, นิ่ม, เหลว, มูก, เหลวน้ำ และเป็นน้ำ

ผลการศึกษานี้เน้นให้เห็นปัญหาของการติดเชื้อโปรโตซัวในเด็กกำพร้า งานด้านสุขศึกษา รวมทั้งการเฝ้าระวังเป็นสิ่งจำเป็นในการควบคุมการติดเชื้อ

คำสำคัญ : เชื้อปรสิตในลำไส้, เด็กกำพร้า, สถานเลี้ยงเด็กกำพร้า

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