The Characteristics of Blastocystis Hominis Infection in Outpatient Health Surveys of a Medical Center in Taiwan

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Blastocystis hominis **has not been endemic or epidemic in Taiwan, but with increasing immigration and international travel, this protozoan is found more frequently. We investigated the characteristics of *B. hominis* infection in Taiwan. Descriptive and retrospective analyses were performed in individuals who had undergone outpatient examinations in a medical center in Taiwan between January 1 and December 15, 2002. From the patients' charts, we recorded their age, sex, occupation and/or residence, nationality, therapeutic medication and its effect on *B. hominis* infection, and associated risk factors. A total of 7,754 participants, including 220 immigrants, completed health surveys. Among them, 1,975 had undergone routine stool examination. Thirty-one (1.6%) had *B. hominis* infection. Their mean age was 34.4 ± 11.7 years (range: 23 to 71 years), and they were predominantly younger than 30 years (51.6%), female (71.0%), immigrants (71.0%), and from southeastern Asia (45.2%). Nine subjects were Taiwanese, including six overseas volunteers and three native residents, all of whom had contact with immigrants in the past. All infected patients were asymptomatic except for one who had constipation. Fifteen (48.4%) were treated with metronidazole or mebendazole. In five (16.1%), the infection resolved spontaneously without medication, and 11 (35.5%) were lost to follow-up. Only five subjects had systemic disease. Therapeutic choices differed significantly with sex (p=0.04) but not age or occupation (p>0.1).**

In summary, *B. hominis* infection is not limited to immigrants to Taiwan, and transmission among native residents may occur. Thus, aggressive screening for *B. hominis* infection and active treatment are indicated.

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Key words: blastocystis hominis, immigrants, natives, health surveys

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INTRODUCTION

Blastocystis hominis is a protozoan that occurs worldwide, especially in developing countries. Many researchers had debated its pathogenic roles and therapeutic indications in the past [1-4]. Water-borne and people-to people transmission have been identified [5,6]. Investigators from recent studies agree that the protozoan can exist in asymptomatic, otherwise healthy people. However, the parasite can cause intestinal symptoms, such as abdominal pain, cramps, diarrhea, and constipation, especially in immunocompromised individuals [7]. Some researchers believe that symptomatic Blastocystis infection is associated with increased fecal colonial counts, as determined under high-power microscopy [8,9]. The pathogenic forms of *B. hominis* vary in different reports [5,10].

To our knowledge, no endemic or epidemic *B. hominis* infections have been described in Taiwan, except for a few descriptive reports and abstracts from symposia [11,12]. However, more immigrants and international travelers are found to have this protozoan in health surveys. Immigrant workers from developing countries have been brought to Taiwan in recent years because of escalating local labor costs. With Taiwan undergoing social and economic transitions, the introduction of unfamiliar organisms brought by international travelers and immigrants is inevitable. The aim of this study is threefold: first, to investigate the characteristics of persons with *B. hominis* infection, second, to investigate the therapeutic choices for treating the infection and third, to evaluate the relationships among possible risk factors.

MATERIALS AND METHODS

The subjects for the health surveys conducted in this study had visited the outpatient clinics of the family medicine department in a medical center of Taipei, Taiwan. Routine fecal examinations had been performed, and the results, including the finding of cysts or other forms of *B. hominis*, indicated the infection. Data from infected groups were included in the analysis by reviewing the charts. We analyzed the distributions of age, sex, occupation and/or residence, and nationality. Age was categorized by decade: 20-29 years, 30-39 years, 40-49 years, and 50 years or older. Occupation and/or residence groups were classified as immigrants, overseas volunteers, or local native residents. The overseas volunteers were Taiwanese citizens who had served in a civil organization providing agricultural, educational, economic, and medical assistance to developing countries. Local native residents were defined as citizens living in Taiwan who had not traveled abroad in the past year. Nationality was classified by the individual's country of origin, as follows: Taiwan, People's Republic of China, Southeast Asia (including Vietnam, the Philippines, Indonesia, and India), and other. Therapeutic choices were classified according to repeat visits, which included visits with medication and without medication, or lost to follow-up. Subjects lost to

follow-up were defined as those who had no record of a visit after completing the health survey, as determined by means of chart review. In this medical center, the regimen for metronidazole was 1500 mg/d, three times a day, for 10 days. The regimen for mebendazole was 200 mg/d, twice a day, for 3 days. Spontaneous eradication was defined as the disappearance of cysts or other forms in subsequent fecal samples without drug treatment, as observed during outpatient follow-up at least 7 days later. The therapeutic results of the medication were recorded. For those with *B. hominis* infection, the results of human immunodeficiency virus enzyme-linked immunoassay (HIV-EIA) tests were also recorded. Combined systemic diseases were recorded from the visit records and histories on the patients' charts. The relationships between therapeutic choice, age distribution, sex distribution, and occupation were also evaluated. The Chi-square test and Fisher's exact test were used to evaluate the various risk factors. The software of analysis was SPSS version 11.0 in this study. A p value of less than 0.05 was used to define a significantly statistical difference.

RESULTS

From January 1 to December 15, 2002, a total of 7,754 subjects, including 220 immigrants, had completed health surveys. Among them, 1,975 had undergone routine stool examination as part of their health evaluation. These subjects included 220 immigrants, 73 overseas volunteers, and 1,682 local residents. Thirty-one (1.6%) had *B. hominis* infection, as demonstrated by the finding of cysts or other forms of *B. hominis* during routine stool examination. Twenty-two infected subjects were immigrants, who accounted for 10.0 % of all examined immigrants. Six infected subjects were overseas volunteers, who accounted for 8.2% of all examined overseas volunteers. Three infected subjects were local residents, who accounted for 0.2% of all examined local residents. The general characteristics of subjects with *B. hominis* infection, including their age, sex, occupation/or residence, and nationality, are shown in Table 1. The average age of the subjects was 34.4 $\pm$ 11.7 years (range: 23 to 71 years).

The therapeutic medications and results are shown in Table 2. All infected subjects had undergone HIV-EIA testing, which showed negative findings. Most of these individuals had no symptoms, except one, who complained of constipation. Fifteen (48.4%) infected subjects had received drug treatment; their drug regimens are also shown in Table 2. Five (16.1%) subjects received no medication and were spontaneously cured, as determined by further outpatient follow-up at 1 to 8 weeks. The other 11 patients (35.5%) were lost to follow-up. In all 20 patients who underwent outpatient follow-up, repeat evaluation of their fecal samples showed no protozoa; this finding indicated that the infection had been eradicated. The relationship between therapeutic choice and the different risk factors are shown in Table 3. Therapeutic choice did not differ significantly with age (p=0.21) or

Table 1. General characteristics of subjects with *B. hominis* infection

Characteristic	Number (%) n = 31
Age(years old)	
20-29	16 (51.6)
30-39	9 (29.0)
40-49	2 (6.5)
≧50	4 (12.9)
Sex	
Male	9 (29.0)
Female	22 (71.0)
Occupation and/or residence	
Immigrants	22 (71.0)
Overseas volunteers	6 (19.4)
Native residents	3 (9.7)
Nationality	
Taiwan*	9 (29.0)
People's Republic of China	5 (16.1)
Indonesia	8 (25.8)
Vietnam	3 (9.7)
Philippines	2 (6.5)
India	1 (3.2)
Other†	3 (9.7)

* Includes three local residents and six overseas volunteers.

† Includes one Korean individual, one Canadian individual, and one South African individual (from Swaziland).

Table 2. Regimen & outcome of medical treatments in subjects with *B. hominis* infection

Treatment	Number (%) n = 31*	Percentage (%)
Medication†	**15**	**48.3**
Metronidazole, 1500 mg × 10 days	13	41.9
Mebendazole, 200 mg × 3 days	1	3.2
No medication, with follow-up	**5**	**16.2**
Loss of follow-up	**11**	**35.5**

* In all 31 patients, HIV EIA results were negative.

† One subject received sennoside B for constipation.

occupation (p=0.14), but it did differ significantly with sex (p=0.04).

Twenty-six (84.0%) subjects were healthy, without combined systemic diseases, which included coronary artery disease, pulmonary tuberculosis, polycystic ovaries, iron deficiency anemia, and hyperthyroiddism.

Among Taiwanese participants, six overseas volunteers had been sent to developing countries for overseas service lasting at least 1 year. Two of the three infected local residents were personal nurses and served in a hospital. The other one was a resident living in a nursing home. As determined with mail and telephone interviews, all three of these local residents had been exposed to infected immigrant partners or care-providers in the past.

DISCUSSION

General Characteristics

B. hominis belongs to the phylum of protozoa. Its pathogenic role in infection remains controversial, though recent researchers consider *B. hominis* to be pathogenic [1,7]. This protozoan is common in some areas, especially tropical regions and developing countries. Groups at high risk for *B. hominis* infection include immunocompromised patients, residents living in long-term healthcare facilities, immigrants from developing countries, international travelers to tropical countries, and hospital employees [7,13]. The inclusion of *B. hominis* in health surveys has also been controversial because this protozoan can exist in otherwise healthy individuals without symptoms. In this study, the prevalence of *B. hominis* infection in immigrants was 10.0%, which is lower than in some Southeast Asian [4,6] and Middle Eastern populations (Table 4) [8,14,15]. We considered the possibility that manpower agencies may recruit healthier and younger individuals to be immigrant workers, and this process might have created some selection bias.

In the overseas volunteers, risks of exposure to *B. hominis* were similar to those of international travelers, and they stayed in endemic areas longer. Researchers found that volunteers serving in Central America had the highest incidence of *B. hominis*

Table 3. Therapeutic choice versus age, sex and occupation

	Re-visiting (n=20)	Loss of follow-up (n=11)	*p* value
Age distribution (<30/≧30 y/o)	12/8	4/7	0.21
Sex distribution (male/female)	2/18	5/6	0.04
Occupation (immigrants/natives)	16/4	6/5	0.14

infection, among other intestinal pathogens [16]. In the initial analysis of our study, *B. hominis* was the most common protozoan found in routine fecal examinations. Other pathogenic protozoan was relatively rare. No mixed or combined protozoa's infections were found. We believe that aggressive fecal screening examination is indicated for groups identified as being high risk during health surveys.

Notably, the three infected local natives may pose potential risks. Two of them were hospital employees, and the other lived in a nursing home for long-term care. Several researchers have found that hospital employees and residents of healthcare facilities have an increased risk of *B. hominis* infection [2,7,13]. To our knowledge, only a few descriptive reports and abstracts about immigrant workers with *B. hominis* infection have been published in Taiwan [11,12]. Many immigrant workers are employed as housekeepers, servants, or personal nurses in healthcare facilities. They have contact with children, elderly individuals, hospital patients, and their partners. Local transmission or spread may occur by means of contaminated water. We believe that both aggressive screening and early eradication are needed in such high-risk groups.

Medical Treatment

The treatment of *B. hominis* remains controversial. Symptomatic *B. hominis* infection has been noted in immunocompromised patients, such as those with acquired immunodeficiency syndrome or malignancies [7,15]. This protozoan can be controlled or eradicated, even without the use of antiprotozoal drugs [13,17,18]. Intestinal obstruction, including that due to tumor or fecal retention, is considered to be a risk factor for *B. hominis* infection [17]. In this study, one woman from India experienced constipation with *B. hominis* infection; this resolved after she took laxative agents. In

Table 4. The demographic prevalence of *B. hominis* in different studies

Authors	Region/Countries	Prevalence (%)
Taamasri P et al.[6]	Thailand	21.9
Tasova Y et al.[15]*	Turkey	13.0
Jelinek T et al.[26]†	Germany	14.7
Nimri L et al.[8,14]‡	Jordan	20.3 to 25.0
Ashford RW et al.[4]	Asaro Valley / Papua New Guinea	54.0
Martin-Sanchez AM et al.[20]‡	Salamanca/Spain	5.3 to 19.4

* For patients with hematological malignancy.
† For German international travelers to tropical or developing countries.
‡ For preschool (including day-care center) and school children.

five subjects, *B. hominis* infection resolved without any drug treatment. However, water-borne and people-to-people transmission may affect individuals in groups, such as camping soldiers [6,19], school children [8,14,20], and residents of healthcare facilities [2,13]. We believe that infected individuals who do not receive medication pose a potential risk for transmission before spontaneous resolution occurs. Thus, aggressive medical treatment is still indicated.

The first therapeutic choice for *B. hominis* infection was metronidazole. The use of trimethoprim-sulfamethoxazole is also reported for treating *B. hominis* infection, with good effect [21]. Strains with various degrees of resistance to metronidazole have been found in Southeast Asia, [22] and trimethoprim-sulfamethoxazole is considered an alternative to metronidazole. The return-visit rate of the infected patients (64.5%) in this study was not satisfactory. Aggressive appointment setting by calling or writing patients may be helpful in providing treatment. The relationship between female sex and return visits may have reflected the official rules in Taiwan and the selection bias of immigrants in this study. Continuity of care and health education should be actively practiced in infected individuals.

Systemic Diseases

In this study, 84.0% of the infected subjects appeared healthy, and all five patients with systemic diseases had no symptoms. Symptomatic *B. hominis* infection has been associated with malignancies [15], HIV infection [7,23], irritable bowel syndrome [24], and pediatric gastroenteritis [8,14,25]. A selection bias still exists and was created by manpower agencies. Further epidemiological studies based on larger populations or cohorts are indicated.

In summary, *B. hominis* is a novel organism to many people and medical providers in Taiwan. This protozoan has appeared with increasing frequently in health surveys, reflecting increased international travel and immigration. The major controversies involve the issues of whether *B. hominis* is pathogenic and whether the results of health surveys should be judged on a pass/fail basis when this protozoan is found, especially in an immigrant. We concluded the following: First, immigrant workers have a higher risk of exposure to *B. hominis* infection than do others. Second, *B. hominis* can potentially cause endemic or epidemic outbreaks spread via water-borne transmission. From the viewpoint of preventive medicine, aggressive fecal screening examinations in high-risk groups, health education, active medical treatment, and regular physical examinations are all recommended to prevent further transmission. Unfamiliar organisms are always challenges to modern physicians, and a more active international exchange of information about such possible epidemics is needed.

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人芽胞囊蟲在台灣某醫學中心門診體檢的分佈特性

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人芽包囊蟲（*Blastocystis hominis*）過去在台灣並未有流行紀錄。近年來，隨著境外移民及國際旅遊的增加，本病在台灣也愈加常見。本文著眼於該寄生蟲於醫院門診體檢的分布狀況，採描述及回溯性研究，自公元 2002 年 1 月 1 日迄同年 12 月 15 日，將台灣某醫學中心家庭醫學科門診體檢的受檢人納入分析。受檢人年齡、性別、身分和國籍均列入紀錄，針對感染個體之治療用藥以及療效均納入分析。

於研究期間，共有 7,754 人受檢，包含 220 位外籍移民。其中 1,975 人做過糞便常規檢查，31 人（1.6%）被發現有人芽包囊蟲感染，其平均年齡為 34±11.7 歲，自 23 至 71 歲不等。佔多數者為小於 30 歲（51.6%），女性（71.0%），外籍移民（71.0%），來自東南亞國家（45.2%）。國人感染者共 9 位，包含 6 位海外志工及 3 位本地居民。除 1 人以便秘表現，餘皆無症狀。其中 15 位（48.3%）接受藥物治療，5 位（16.1%）自發性痊癒，其餘 11 位（35.5%）門診失聯。除 5 位感染者併有其他疾病外，餘皆無合併症。治療方式選擇與性別顯著相關（p=0.04），但與年齡及身分無顯著相關（p>0.1）。3 名本地感染居民過去均有與外籍同事或照顧者接觸。人芽包囊蟲並非外籍移民特有，在本地居民間的傳播有可能發生。因其仍具致病性及潛在傳染危險，積極篩檢及治療有其必要。

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