ORIGINAL ARTICLE INFECTIOUS DISEASES

Transmission of infectious diseases from internationally adopted children to their adoptive families

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Abstract

Internationally adopted children may suffer from different pathologies, including infectious diseases contracted in the country of origin. We evaluated the frequency of infectious diseases that may disseminate from adoptees to adoptive families on their arrival in France. All children who attended the clinic for international adoption in Clermont-Ferrand from January 2009 through to December 2011 were eligible for inclusion in the study. Standardized medical records dedicated to international adoption were retrospectively reviewed for demographic data, clinical diagnosis, and biological and radiological results. Data were completed by phone interviews with adoptive families after informed consent. One hundred and forty-two medical records were retrospectively reviewed and 86% of families agreed to be interviewed. One hundred and seventy-one potentially transmissible infections were diagnosed in 142 children, 12% (n = 20) of which were transmitted to adoptive families. Most of these infections were benign and transmission was restricted to the close family. Tinea was diagnosed in 44 adoptees and transmitted in 15 cases. Panton Valentine leukocidin producing methicillin-sensitive *S. aureus* (MSSA) was transmitted to an adoptive father who required hospitalization for bursitis. Transmission also occurred for CMV (n = 1), hepatitis A (n = 1), giardiasis (n = 1), scabies (n = 1), *Moluscum* (n = 2) and pediculosis (n = 2). Two cases of chronic hepatitis B and latent tuberculosis were diagnosed without subsequent transmission. In conclusion, infectious diseases are common in internationally adopted children and should be detected shortly after arrival to avoid transmission.

Keywords: Adoptee, infectious diseases transmission, *Staphylococcus aureus*, tinea, travel medicine
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Introduction

France is the third country for international adoption after Italy and the USA [1]. Currently, one child out of every 100 in France is adopted, and 80% of adoptions are international [2]. In 2010, French families adopted 3504 children from 67 different countries, mainly Haiti (28%), Vietnam (13%), Colombia (11%), Ethiopia (10%) and China (3%) [2]. Most of the adoptees are entrusted to international adoption for social and economical reasons. They remain in institutions for months or years during the time of the administrative process of adoption. In the institution, many adoptees suffer from different illnesses that reflect the socio-economical conditions of their families. These include malnutrition, previous exposure to drugs and alcohol, abuse or infectious diseases such as tuberculosis. Children would receive appropriate care in an institution but may suffer from

crowding-related infectious diseases such as scabies, tinea or hepatitis. In France, most regions have a medical structure called COCA (Center for Orientation and Counsel in Adoption) that is available for adoptive families and where children are screened shortly after arrival for viral, parasitic and bacterial infections [3–7]. Some of these infections, including hepatitis A and B (HAV, HAB), scabies, tuberculosis or tinea, may cause outbreaks by spreading from the adoptees to their adoptive family or to communities such as schools [8–10].

Based on the experience of our clinic for international adoptive familiese, we sought to evaluate in adoptees from various countries the frequency of transmissible infectious diseases that may be involved in outbreaks.

Methods

All children who attended the clinic for international adoption in Clermont-Ferrand from January 2009 through to December 2011 were eligible for the study. Standardized medical records dedicated to international adoption were retrospectively reviewed for demographic data, clinical diagnosis, and biological and radiological results. All children had blood tests and a chest X-Ray as recommended by the French Agency of Adoption [11]. An information letter was mailed to the eligible families and a phone contact was made by a physician 1 month later. After oral consent, families were interviewed to double check and retrieve missing data. The following information of interest was recorded: demographical data, date of arrival and clinic attendance, school attendance, the diagnosis and outcome of infectious diseases with a potential risk of transmission and spread of an infectious disease from adoptee to another person, and travel preparation of the adoptive family, including vaccines and malaria prophylaxis [12].

Hepatitis A, HBV, hepatitis C (HCV), syphilis and HIV were diagnosed by serology [13–15]. Parents were asked to collect at least one stool for parasite and bacteria analysis [16]. Latent TB infection was defined by a tuberculin skin test (TST) of at least 10 mm without clinical symptoms and normal chest radiography. All children with positive TST had an interferon (IFN)-γ response to *Mycobacterium tuberculosis* (*M. tuberculosis*) antigens performed before treatment [17,18]. Skin infections such as scabies, impetigo and tinea were defined by clinical criteria [19]. The study was approved by the Ethics Committee of the Rhône Alpes and by the CNIL (Commission Nationale de l'Informatique et des Libertés). Statistical analysis was performed using SPSS.10 software.

Results

Demographical data

One hundred and forty-two medical records were retrospectively reviewed and 86% of families agreed to answer the questionnaire. For the 20 remaining records, data were collected only from the hospital chart. Demographical data are reported in Table 1. Children came from 18 different countries, mostly Haiti, Ethiopia and Colombia. Fifty-five per cent of Haitian children (n = 22) were adopted after the earthquake that occurred on 12 January 2010. Most children were placed in child care institutions before adoption (86%). The average age of admission to the institutions was 19 months ± 2 (birth to 7 years old), with an average period of 1.5 years ± 1 month. Among the 62 children of education age (more than 3 years old), 35 were attending school (57%) within the month that followed their arrival in France.

Anthropometric parameters at the time of consultation

Twenty-four per cent (n = 34) of children failed to thrive at the time of consultation. Thirteen per cent (n = 19) had a body mass index less than or equal to the third percentile, and 11% had clinical symptoms related to malnutrition.

Transmissible infectious diseases diagnosed

One hundred and seventy-one potentially transmissible infections were diagnosed in the 142 adopted children. In 12% of

TABLE 1. Characteristics of adoptees and their adoptive families

Mean age ± SEM (standard error of the mean)	3.5 years ± 2 months (range, 4 months to 10 years)
Boys/girls	49/51%
Countries of origin, % (Nb)	
Haiti	28 (40)
Ethiopia	28 (40)
Colombia	13 (18)
Russia	8 (12)
Vietnam	7 (10)
Burkina Faso	2 (3)
Thailand	2 (3)
Brazil	2 (3)
Ivory coast	1,5 (2)
Kazakhstan	1,5 (2)
Mali	1,5 (2)
Other[a]	7 (7)
Adoptive families' characteristics, % (Nb)	
Couples without child	54 (77)
Couples with at least one child	32 (45)
Single parents	12 (16)
Average distance between clinic and parent's home ± ESM	65 km ± 5
Mean time between arrival in France and consultation ± ESM[b]	8 months ± 2 (Range, <1–92 months)
Families consulting within the first month, % (Nb)	62 (88)

[a]Latvia, Laos, Congo Brazzaville, Lithuania, China, Cameroon, Nepal.
[b]14% (20) who came after 1 year did so because of psychological troubles and/or symptoms suggesting early puberty.

cases (n = 20), infections were transmitted to a member of the adoptive family (Fig. 1). Among the serious potentially transmissible infectious diseases contracted in the country of origin, no diagnosis of malaria, typhoid, HIV, HTLV or HCV infections was made. However, three cases of cured hepatitis B and two cases of chronic hepatitis B were identified. These two children came from Vietnam and were screened negative for hepatitis B at the time of arrival at an institution, suggesting that transmission may have occurred during the stay at the institution. All the adoptive families of these children were vaccinated against hepatitis B and no transmission occurred. Among the 68% (n = 96) who had a tuberculin skin test for tuberculosis screening, two children were diagnosed with latent tuberculosis and treated by isoniazid for a 9-month period. Ninety per cent had a chest X-ray, which was normal for all. A nasal swab to detect *Staphylococcus aureus* carriage was performed in 78 children. Among them, seven were positive for methicillin-sensitive *S. aureus* (MSSA) and five for methicillin-resistant *S. aureus* (MRSA). Among them, a 2-year-old girl coming from Haiti after the earthquake was seen with her parents within a month of her arrival for tinea and scabies lesions. Several swabs were performed and yielded Panton Valentin's leukocidin producing MSSA. A few days later, her father was hospitalized for a bursitis of the knee, due to a Panton Valentin's leukocidin producing MSSA with the same antibiogram. Children diagnosed with *S. aureus* carriage, including this last case, were decontaminated with a combination of mupirocin and chlorhexidine.

Thirty-one per cent of children (n = 44) were diagnosed with tinea. The majority came from Ethiopia (70%, n = 28) and Haiti (33%, n = 13). The main locations of infection were the scalp (95%), skin (36%) and ungueal dermatophytosis (20%). Mycological sampling was performed in 30 children: 12 were negative, eight positive to *Trichophyton soudanense*, five positive to *T. tonsurans*, four positive to *T. violaceum* and one positive to *Trichophyton* spp. Tinea transmission occurred in 10 families,

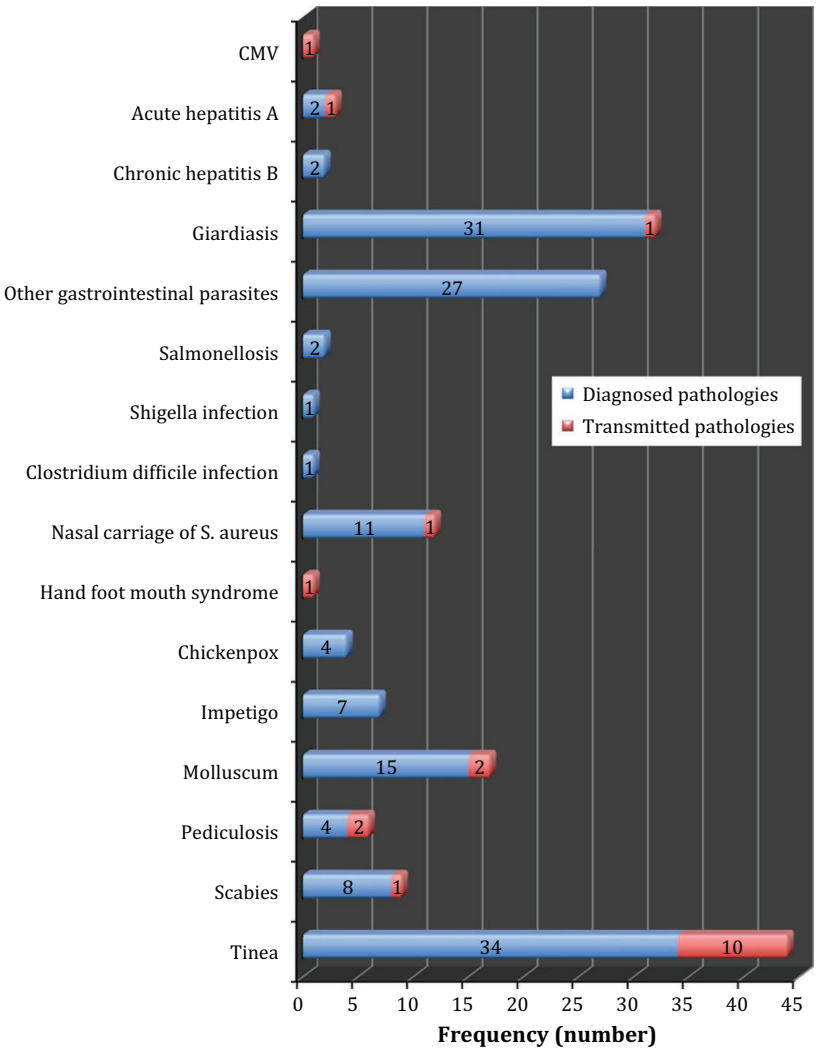

FIG. 1. Diseases diagnosed and transmitted to the close family in 142 adoptees.

generating dermatophytosis in 15 individuals (six mothers). In one case, a diagnosis of tinea was incidentally made several years after arrival, because the adoptive family consulted for another reason. All patients, except one, were treated at the time of diagnosis and no school exclusion was implemented.

Six per cent of children suffered from scabies, including one florid presentation and three complicated with impetigo. One mother was infected by her 2-year-old girl originating from Ethiopia. Four per cent of children had *Pediculosis capitis*, with two cases of transmission.

Seventy-four children (52%) had at least one stool culture. Four were positive (two *Salmonella*, including one multidrug-resistant *Salmonella*, one *Shigella* and one *Clostridium difficile*) with no transmission reported. At least one parasitological stool examination was performed in 105 children, 59 (56%) of which were positive (Table 2). One mother presented with diarrhoea due to *Giardia duodenalis* after the arrival of her child, who was diagnosed with the same parasite at our clinic for international adoptive families. Antiparasitic treatments were systematically prescribed in 76 children.

Among viral diseases, acute hepatitis A was diagnosed in three children, whereas 56 (39%) were already immune. One case of hepatitis A transmission from a child to her mother was recorded. A father required hospitalization for acute CMV infection. The source of infection was considered to be his 1-year-old daughter, who had recently arrived from Vietnam and had CMV IgM antibodies even though she was asymptomatic. However, CMV culture was not performed. Seventeen children had *Molluscum contagiosum*, one of whom transmitted it to a 2-year-old cousin. One Haitian girl developed a hand, foot and mouth syndrome, which was transmitted to her mother.

Vaccination status of adoptees

Thirty-four per cent (n = 24) of the children had a complete vaccination against tetanus, 48% (n = 48) an incomplete vaccination and 19% (n = 19) were not vaccinated. For diphtheria, 14% (n = 27) were updated, 23% (n = 32) needed an immediate reminder, 10% (n = 14) a reminder in 2 years and 21% (n = 29) did not receive any dose. Vaccination was updated in 45% of the children (n = 48) for *Haemophilus influenzae*, 37% (n = 38) for hepatitis B, 66% (n = 69) for measles, and 49% (n = 51) for rubella; 58% (n = 82) were immunized against hepatitis A.

TABLE 2. Results of stool analysis for parasites

Parasites found in stool analysis (n = 105)	% (number)
Giardia intestinalis	23 (33)
Endolimax nana	10 (14)
Hymenolepis nana	9 (13)
Entamoeba coli	8 (12)
Blastocystis spp.	8 (11)
Entamœba histolytica	7 (10)
Trichuris trichiura	5 (7)
Chilomastix mesnili	4 (6)
Ascaris lumbricoïde	3 (4)
Ankylostome	2 (3)
Strongyloïdes stercoralis	2 (3)
Trichomonas intestinalis	2 (3)
Entamoeba hartmanni	1.5 (2)
Pseudolimax butschlii	0.5 (1)
Enteromonas intestinalis	0.5 (1)
Schistosoma mansoni	0.5 (1)

Pre-travel preparation in adoptive families

Seventy-four per cent (n = 105) of families travelled to the county of origin of their child during the adoption procedure, for an average time period of 7 days (ranging from 1 to 480 days). The trip was made by one family member in 28%, both parents in 65%, and both parents and children in 4% (other case 3%). A healthcare professional was consulted by 83% of families before their travel. This was a general practitioner in 40% of cases, a specialist consultant for travellers in 28%, and both of these in 24%. In 82% of cases, French vaccinations were reviewed. A serology or vaccination against hepatitis A was suggested in 55%, vaccination against hepatitis B in 49% and vaccination against typhoid in 28%. Of interest, vaccination against hepatitis A and B was not proposed for any of the adoptive family members when they did not participate in the trip. Health advice about water and food was delivered in 68% of cases. Forty-six per cent should have received malaria prophylaxis, which was not prescribed in 22% (n = 23). However, most stays in the country of origin of the child did not exceed 7 days. Among 47 families (45%) who should have been vaccinated against yellow fever, 9% did not receive the recommended vaccine.

Discussion

Infectious diseases are common in internationally adopted children and may be transmitted to the close adoptive family. In our study, among the 171 potentially transmissible infections diagnosed from 142 adoptees, 20 (12%) were transmitted to a member of the adoptive family. Most of the cases were benign infections and transmission was restricted to the close family. However, failure in the early detection of these infections contracted by children in their country of origin may have several consequences. First, it may lead to an outbreak, especially for hepatitis A and tuberculosis [8,10]. Second, some of these infections may be severe. Among chronic serious infections, we must emphasize two cases of chronic hepatitis B and two of latent tuberculosis, which can lead to a high risk of tuberculosis disease [17]. Some infections identified as benign may be severe: hepatitis A can be life threatening [20];

undiagnosed tinea, scabies or parasitological chronic diarrhoea may alter the quality of life and have some psychological/social consequences during a difficult period for a child adjusting to his/her new family; *S. aureus*, especially PVL producers, may be easily transmitted and may cause serious diseases (one hospitalization in our study) [21]. Finally, we found that some adoptees were carrying drug-resistant bacteria, including MRSA and multidrug-resistant salmonella [22].

The high rate of infectious diseases in adoptees reflects the high prevalence of these pathologies in the countries of origin. Moreover, children are more frequently susceptible to infectious diseases because of inadequate nutrition or malnutrition (11% in our study). This may be worsened by the high frequency of symptomatic diarrhoea due to intestinal parasites, diagnosed in 52% of children. In our study, children stayed in an institution for a mean time of 1.5 years and were exposed to many pathogens during this period. Some children who screen negative for hepatitis B on arrival at an institution may contract hepatitis B during this period (two cases in our study). In some rare cases, it cannot be ruled out that a false serology may have been provided to enhance the adoption of the child. Therefore, serologies including HIV, hepatitis A and B and syphilis have to be performed on arrival, even if they have already been carried out in the country of origin. Adoptive parents should be aware of the possibility of unknown chronic disease because this may significantly destabilize the family and alter the attachment process. Then, potential transmission should be prevented by vaccination of the entire family (and not only those who will make the trip to the country of origin of the child) and by early screening of the adoptees on arrival. However, some systematic investigations performed at our institution, such as chest X-ray or staphylococcal screening, may be a matter of debate and be considered as not obligatory.

Some characteristics of adoptees and their families may favour potential occurrence of outbreaks: a majority of adoptees are over 3 years old at arrival (53.5%) and of an age to go to school. Many adoptive parents think it is important for their child to quickly attend school, because of the belief that their child is eager to have a community life similar to the one in an institution [3]. This may increase the potential risk of outbreaks in school. Even if no transmission of tinea, for instance, was reported at school, we cannot rule it out completely.

The period of time between arrival of the child and consultation is not short enough (<1 month for 62% of families) to avoid infectious disease transmission in the family circle. The transmission rate may be improved by encouraging families to consult within 15 days following arrival. However, it is understandable that families feel reluctant to have an early health check-up. Moreover, this consultation is made difficult by several constraints: the frequency of clinics is low (two per month) and parents are frequently short of time because of their jobs and because most of their holiday time has been invested in the trip to pick up their child. Moreover, families have to travel an average of 65.5 km to come to a consultation.

Our study highlighted that adoptive families are quite prepared to travel to the country of origin of their child. However, vaccination against hepatitis A and B was always restricted to the family members who visited the child. General practitioners should anticipate the arrival of the child and vaccinate all the members of the family circle, even those who did not travel.

Our study has some limitations. It is a monocentric study, so the studied population may not be representative of the French general population of adoptees. The study was retrospective and data from the 20 families who refused to answer our questionnaire may be incomplete. For these cases, we cannot exclude the occurrence of infectious disease transmissions after the consultation if families did not present for follow-up. However, international adoption records were standardized and systematically addressed all the items covered by the study. Otherwise, for a majority of families, data were reviewed by phone interview and even if a memory bias could not be excluded, the obtained data are robust. Another limitation is that some transmission may be uncertain because some infections such as enteric infections may have been contracted during travel. Finally, an actual trend, non-visible in our study, is the increasingly significant number of children identified as 'special needs' (for example, adoption of a child with chronic hepatitis B or HIV) [23]. This will be a new challenge in the near future.

Transparency Declaration

There is no conflict of interest for any of the authors.

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