

# Health Status of Pediatric Refugees in Portland, Me

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**Background:** An understanding of the health conditions affecting pediatric refugees is essential to providing responsible health care for them when they arrive in the United States.

**Objective:** To assess the health status of pediatric refugees in an area of increased refugee resettlement.

**Design:** Retrospective medical records review.

**Setting:** Ambulatory clinic at Maine Medical Center in Portland, a community and referral hospital.

**Patients:** One hundred thirty-two refugees and immigrants aged 2 months through 18 years who had initial health care evaluations during 1994 and 1995.

**Results:** Sixty-six patients arrived from Africa, 22 from the former Yugoslavia, and the remainder from the former Soviet Union, Middle Asia, Southeast Asia, and Latin America. The mean age of the patients was 10 years; 56 (42.4%) were female. The overall health status of most of the children

was good, with most having appropriate weight and height for age. Dental caries and dermatologic conditions were the most prevalent findings on physical examination. Two patients had evidence of traumatic injuries. The results of tuberculin (Mantoux) tests were positive ( $\geq 10$  mm) in 45 (35.2%) of 128 children for whom results were noted, hepatitis B surface antigen was detected in 5 (4.0%) of 124 children, and hepatitis B surface antibody was detected in 26 (21.1%) of 123 children. Five (16.7%) of 30 children younger than 6 years had elevated blood lead levels; anemia was detected in 25 (19.7%) of 127 children with hematocrit results available. Stool specimens were obtained from 87 patients, of whom 38 (43.7%) had pathogenic parasites in at least 1 specimen.

**Conclusions:** Pediatric refugees arrive in the United States with a variety of conditions that may be unfamiliar to practitioners trained in this country. The results of this study support the screening of refugees from Africa and other regions for tuberculosis, stool parasites, and hepatitis B.

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**Editor's Note:** Refuge for these refugee children (and probably their parents) requires a vastly expanded view of screening, health maintenance, and disease prevention. In truth, they are a microcosm of international health.

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**D**URING FEDERAL fiscal years 1994 and 1995 (January 1 through December 31), more than 60 000 foreign refugee children were admitted into the United States (Livia Farkas, Refugee Data Center, New York, NY, written communication, July 1996). Pediatric providers in communities where these children have been resettled may have received little, if any, training in managing refugee health problems. A basic understanding of the

health care status of refugees and immigrants is essential to the incorporation of such patients into the health care system in this country and to ensuring the provision of responsible medical care.

To assess the health status of pediatric refugees in an area of recently increased refugee settlement and to provide information for improving the quality of health care services for refugees, we reviewed the medical records of initial health status evaluations for refugee children seen at the International Clinic of the Maine Medical Center (MMC) in Portland from January 1, 1994, through December 31, 1995.

Several recent studies have evaluated the health status of refugees arriving in developed countries,<sup>1-3</sup> but most have focused on refugees from Southeast Asia, Latin America, and the former Soviet Union. Meropol<sup>1</sup> evaluated the health sta-

## METHODS

Through a coordinated process involving refugee resettlement programs, state public health nurses, and the MMC, most refugees arriving in Portland receive an initial health evaluation at the center's International Clinic. We reviewed the medical records of patients aged from neonate through 18 years who were identified through admission log and chart review as having had an initial health care evaluation at the International Clinic between January 1, 1994, and December 31, 1995. We included only those patients who had been in the United States less than 1 year before their initial clinic visit and whose record indicated no comprehensive health evaluation elsewhere in this country before their initial clinic visit. Patients who had received care for an acute condition before their comprehensive evaluation were not excluded. Although it was not possible to definitively differentiate refugees from other immigrants based on the record review, most patients seen for health care evaluations at the International Clinic during 1994 and 1995 were known to be refugees. A total of 132 patients met the above criteria, 9 of whom arrived in the United States in late 1993, 56 in 1994, and 67 in 1995. By comparison, the Refugee Health Program of the Maine Bureau of Health reported that 79 refugees younger than 19 years were settled in all of Maine in 1994 and 103 in 1995 (Joan Blossom, MSN, oral communication, April 1996). We abstracted data from the first comprehensive health evaluation and initial laboratory results from each patient's medical record.

As part of their routine health evaluation at the clinic, patients had been given a complete physical examination, usually by pediatric residents, and most had tests for hepatitis B surface antigen and antibody, a complete peripheral blood count, and stool parasites. Blood lead levels had been measured in most children younger than 6 years. Mantoux tuberculin skin tests using 5 TU of purified protein derivative (PPD) had been applied to most refugee patients by public health nurses shortly after their arrival in Portland and the results were read 48 to 72 hours after administration. The results of PPD tests were recorded in patients' records. Chest radiographs had been obtained on all patients with PPD injection site induration of 10 mm or more. We reviewed each patient's record and collected the data, when available, on each of the tests or examinations mentioned above.

Height and weight for age were calculated for patients up to 18 years of age. Weight for height was calculated for girls up to 10 years of age and less than 137 cm in height and for boys up to 11½ years of age and less than 145 cm in height. All anthropometric indexes were calculated using a computer software program (Epi-Info, Centers for Disease Control and Prevention, Atlanta, Ga) based on reference growth curves for children in the United States and recommended by the World Health Organization for international use.<sup>4</sup>

The study protocol was reviewed by the chair of the MMC Institutional Review Board and exempted from full board review.

**Table 1. Regions and Countries of Origin of 132 Pediatric Patients Seen at Maine Medical Center's International Clinic, 1994-1995**

Region (Patients, Total No.)	Country	No. of Patients
East Africa (61)	Somalia	29
	Sudan	28
	Ethiopia	3
	Kenya	1
Former Yugoslavia (22)	Bosnia	18
	Serbia	4
Former Soviet Union (17)	Russia	11
	Ukraine	4
	Kazakhstan	2
Middle Asia (11)	Iran	9
	Afghanistan	2
Southeast Asia (10)	Vietnam	10
Latin America (6)	El Salvador	3
	Cuba	2
	Guatemala	1
	Zaire	3
Sub-Saharan Africa (5)	Zaire	3
	Burundi	2

tus of 107 pediatric refugees in Buffalo, NY, most of whom were from Vietnam and the former Soviet Republics, noting the need for further information on children from other regions of the world. Most refugees arriving in Portland in recent years have originated from countries in Africa. By providing new information on refugees from Africa, as well as additional information on refugees from other parts of the world, we hope to contribute to an increased understanding of pediatric refugee health status in the United States.

## RESULTS

The countries and regions of origin for the 132 patients are shown in **Table 1**. Some lived in neighboring countries within the same region before arriving in the United States. The time between arrival in the United States and the health maintenance evaluation ranged from a few days to 7 months, with a median of 2 months.

Patients' ages ranged from 2 months to 18 years, with a mean of 10 years. Ages were calculated based on birth dates listed in the medical record, but some families had been uncertain of their children's birth dates and may have provided approximate dates. Fifty-five patients (41.6%) were female. Weights were recorded for 126 of the 128 patients younger than 18 years; 5.6% of these children were below the 5th percentile for weight for age, and 96.0% were below the 95th percentile. Heights were recorded for 114 patients younger than 18 years of age; 9.6% of these children were below the 5th percentile for height for age, and 86.8% were below the 95th percentile. Fifty-seven children met the age and height criteria for weight-for-height calculations (height was missing on 3 children in the appropriate age range); none were below the 5th percentile for weight for height, and 54 (94.7%) were below the 95th percentile.

Dental caries, found in 22 (16.7%) of the patients, were the most prevalent finding on physical examination. Der-

**Table 2. Parasites Found in Stool Specimens From 38 Children Seen at Maine Medical Center's International Clinic, 1994-1995**

Parasite	No. of Patients*
<i>Ascaris</i> species	5
<i>Entamoeba histolytica</i>	2
Pinworm	2
Hookworm	4
<i>Hymenolepis nana</i>	5
<i>Giardia lamblia</i>	19
<i>Schistosoma</i> species	5
<i>Trichuris trichiura</i>	16

\*Some patients had more than 1 type of parasite.

matologic conditions were noted in 12 (9.1%) of the patients (tinea infection in 5, molluscum contagiosum in 3, acne in 2, and unspecified rash in 2). Two patients, both from Somalia, were noted to have had traumatic injuries (1 with a healed fracture of the arm, and 1 with shrapnel in the right leg and traumatic left leg amputation).

The time between arrival and the PPD test ranged from a few days to 7 months, with a median of 1 month. The results of PPD skin tests were available for 128 patients; 45 (35.2%) of these had indurations of 10 mm or greater. Of the 45, one 15-year-old girl had chest radiographic findings suggestive of active pulmonary tuberculosis. Two patients had radiographic findings that were inconclusive, and in 42 patients, radiographs showed no evidence of pulmonary disease.

Five (4.0%) of 124 patients tested positive for hepatitis B surface antigen, and 26 (21.1%) of 123 patients tested positive for hepatitis B surface antibody. Blood lead levels were obtained on 30 of the 34 patients younger than 6 years; 5 (16.7%) had blood lead levels of 0.48  $\mu\text{mol/L}$  or higher ( $\geq 10 \mu\text{g/dL}$ ). The highest level was 0.82  $\mu\text{mol/L}$  (17  $\mu\text{g/dL}$ ). Anemia (defined as a measured hematocrit below the lower limit of normal hematocrit for age)<sup>4</sup> was detected in 25 (19.7%) of 127 patients with hematocrit results available. Six (24.0%) of the 25 patients with anemia had microcytosis, and the remainder had mean corpuscular volumes within the normal range for age.<sup>5</sup> Among the patients with anemia, measured hematocrits ranged from 0.31 to 0.37 (30.7%-36.6%) and were 0.1 to 2.7 (mean, 1.2) percentage points below the lower limit of normal hematocrit for age.

A total of 140 stool specimens were obtained from 87 patients. Pathogenic parasites were found in at least 1 specimen from 38 (43.6%) of the 87 patients. **Table 2** lists the parasites found. Of 32 second stool specimens, 3 (9.4%) revealed pathogens that were not found in the first specimen. Of 21 third stool specimens, 4 (19.0%) revealed pathogens that were not found in either the first or second stool specimen. Hematocrit results were available for 37 of the patients with stool parasites; 6 (16.2%) had anemia. Stool specimens were obtained from 17 of the patients with anemia; 6 (35.3%) had intestinal parasites (*Giardia lamblia*, *Hymenolepis nana*, *Enterobius vermicularis*, and *Trichuris trichiura*), but only 4 of the 17 had provided 3 specimens. The 4 patients with hookworm did not have anemia.

There was no order for a stool test in the record of some patients who provided stool specimens, possibly because of charting errors or because stool tests were ordered on a different day than the comprehensive evaluation. Of 108 patients whose medical record showed an order for at least 1 stool specimen at the time of the comprehensive evaluation, the overall compliance in providing a stool specimen was 67%. An order for 3 specimens was noted for 73 patients. Only 1 specimen was obtained from 30 (41.0%) of these patients, 2 specimens were obtained from 8 (10.9%), and 3 specimens were obtained from only 11 (15.1%); the remaining 24 patients provided no specimens.

The prevalence of several of the medical conditions described above is presented by region in **Table 3**. These data allow some assessment of the health status of refugees from Africa and suggest a higher prevalence of hepatitis B antibody and stool parasites among African refugees than among those from the former Yugoslavia. The prevalence of anemia appears similar for refugees from different regions. The small number of patients in our study, however, and the potential for conditions to cluster in families or small groups of refugees preclude generalizing our results on regional variation with a high level of confidence.

#### COMMENT

Although the principles of pediatric care for refugees are essentially the same as for local resident children, refugees have markedly different histories and may have an increased risk of certain conditions compared with children born in the United States. Pediatric practitioners who infrequently see refugee children must focus more attention on screening for these conditions than they might in their usual daily practice. The results of this study, while they may not be representative of all pediatric refugees arriving in the United States, help illuminate some of the conditions that deserve increased attention from clinicians and the health care system as a whole when such patients are seen.

Overall, the health status of the pediatric refugees seen in Portland appears relatively good. We found no evidence of severe malnutrition, stunting, or wasting and a relative scarcity of serious abnormalities on physical examination. These results are consistent with the findings of at least 2 other similar health status evaluations of pediatric refugees in this country.<sup>1,6</sup> The prevalence of caries among children in our study group, although not evaluated by dentists, is similar to the 16% found among 409 fifth-grade schoolchildren screened by the City of Portland Public Health Division (Karen O'Rourke, MPH, oral communication, November 1996). Dermatologic findings were mostly limited to conditions that are not uncommonly seen in many pediatric practices. The presentation of children with traumatic war injuries is, fortunately, unusual for most pediatricians in the Portland area.

The American Academy of Pediatrics recommends immediate tuberculin skin testing of children immigrating from countries where tuberculosis is endemic, and it defines PPD reactions of 10 mm or greater as positive in such children regardless of previous vaccination with

**Table 3. Prevalence of Selected Medical Conditions Among Patients by Region of Origin\***

Region	Test or Condition				
	HBsAg	Anti-HBs	PPD > 9 mm	Anemia	Stool Parasites
East Africa	2/60 (3)	20/60 (33)	25/59 (42)	20/59 (34)	28/43 (65)
Latin America	0/5 (0)	0/5 (0)	0/5 (0)	2/6 (33)	1/5 (20)
Middle Asia	0/10 (0)	1/10 (10)	0/10 (0)	3/10 (30)	2/6 (33)
Southeast Asia	2/7 (29)	3/6 (50)	3/10 (30)	2/9 (22)	4/8 (50)
Soviet Union, former	1/16 (6)	2/16 (13)	6/17 (35)	4/17 (24)	2/9 (22)
Sub-Saharan Africa	0/5 (0)	0/5 (0)	0/5 (0)	1/5 (20)	1/3 (33)
Yugoslavia, former	0/21 (0)	0/21 (0)	11/22 (50)	9/21 (43)	0/13 (0)
<b>Total</b>	<b>5/124 (4)</b>	<b>26/123 (21)</b>	<b>45/128 (35)</b>	<b>41/127 (32)</b>	<b>38/87 (44)</b>

\*Results are given as number with condition present/number tested (percentage with condition). HBsAg indicates hepatitis B surface antigen; anti-HBs, hepatitis B surface antibody; and PPD, purified protein derivative.

BCG vaccine.<sup>7</sup> Whereas some of the reactions of 10 mm or more might be due to previous BCG vaccination, the 35% prevalence of positive PPD test results found in this study population is similar to the 20% prevalence reported by Meropol<sup>1</sup> and 26% reported by Tittle et al<sup>6</sup> and much higher than expected community rates in Maine, which are likely to be below 5%.<sup>8</sup> Current public health screening of immigrants seeks to detect persons with infectious tuberculosis before entry into the United States.<sup>9,10</sup> The finding of 1 child with active infection in our study, however, is consistent with other reports that indicate the need for a high degree of suspicion of tuberculosis and timely screening of children who immigrate from endemic countries.<sup>9,10</sup> In addition, the American Academy of Pediatrics recommends considering skin testing at ages 4 to 6 and 11 to 16 years for those children whose parents immigrated, with unknown skin test status, from endemic regions.<sup>7</sup>

The prevalence of hepatitis B virus surface antigen among patients in this study (4%) is similar to that found in internationally adopted children in Minneapolis, Minn (5%),<sup>11</sup> and only slightly lower than in pediatric refugees in Buffalo (7%)<sup>1</sup> and in California (9%)<sup>6</sup> and reflects the increased risk of hepatitis B infection in many of these refugees' countries of origin.<sup>12</sup> Of the children tested in our study, 21% were seropositive for hepatitis B surface antibody; the highest prevalence was found in children from Southeast Asia and Africa. Because the presence of antibody to core antigen was not evaluated, we were unable to determine accurately the proportion of children who had previously been vaccinated. Thirty-five (43%) of 81 refugee children studied in Buffalo had hepatitis B surface antibody, 12 of whom had a history of hepatitis B vaccination.<sup>1</sup> Whether from vaccine or naturally acquired infection, the high prevalence of surface antibody may make screening for hepatitis B markers before vaccination more cost-effective than vaccination without screening in some refugee populations. This decision depends on the ratio of the costs of testing to the costs of vaccination and on the compliance with follow-up visits.<sup>13</sup>

We did not find evidence of severe lead poisoning in this patient population. Dangerously high lead levels have been found in refugee populations in the past, ascribed to the use of traditional folk remedies that contain lead.<sup>14</sup> The mild elevations found among the children in our study are in the range that could result from

exposure to leaded gasoline in their countries of origin.<sup>15</sup> The prevalence of blood lead levels above 0.48  $\mu\text{mol/L}$  ( $>10 \mu\text{g/dL}$ ) among these children (17%) is lower than that (24%-27%) among local area children screened by the Portland Public Health Department (Lisa Belanger, MSN, oral communication, October 1996). When refugees move into areas of the United States with old housing stock containing deteriorated lead paint, it is possible that their risk of severe lead poisoning will be higher here than it was in their country of origin.

Although 20% of the patients screened had hematocrits below the lower limit of normal for age, none had severe anemia. In Buffalo, 7% of pediatric refugees had anemia of undetermined cause.<sup>1</sup> In California, 29% of Indochinese refugee children had anemia, many apparently with hookworm infection, and most with iron deficiency.<sup>6</sup> Mild anemia in pediatric refugees could be due to nutritional iron deficiency, intestinal parasitic infection, or mild phenotypic variants of hemoglobinopathies. Although only 35% of patients with anemia in our study had parasites in their stool specimens, most patients with anemia had not provided 3 stool specimens and may have had undetected parasitic infections. Because of the mild nature of the anemia, most of these patients were not evaluated further but rather given treatment for any pathogenic parasites found in stool and counseled to improve their dietary sources of iron.

Pathogenic stool parasites were found in 45% of children who provided at least 1 stool specimen. This figure may be an underestimate of the actual prevalence because many of the children in our study provided fewer than 3 stool specimens,<sup>16</sup> or it may be an overestimate if children with parasites were more likely to provide stool specimens. Stool parasites were found in 22% of pediatric refugees in Buffalo,<sup>1</sup> 35% of Latin American immigrant children seen in Massachusetts,<sup>17</sup> and 21% of refugee children in Sweden.<sup>2</sup> The prevalence of pathogenic parasites in Indochinese refugee children in California was 65% but dropped to 36% among new refugees in subsequent years.<sup>7</sup> *Giardia lamblia* was the most frequently encountered parasite in our study and in the studies from Massachusetts and Sweden.<sup>2,17</sup> The large number of patients examined in Sweden (N=3938) allowed an analysis of the prevalence of pathogenic parasites by region. Refugees from the Indian subcontinent and Southeast Asia had the highest prevalence (39%), followed by those from



Africa (25%), the Middle East (21%), and Latin America (14%).<sup>2</sup> Refugees from eastern Europe had the lowest prevalence of parasitic infection (4%).<sup>2</sup> Although our study lacked sufficient numbers to draw strong conclusions about differences in refugee health status by region, the prevalence of parasites was highest among refugees from Africa and lowest among those from the former Yugoslavia. Several factors may need to be considered in determining the relative benefit of screening refugees for intestinal parasites, including their country of origin, the sanitary circumstances of their living conditions before arrival in the United States, and the medical consequences of untreated infection.

The overall compliance in providing stool specimens (67%) seen in this population is similar to the 61% compliance reported by Bass et al.<sup>17</sup> In that study, 21% of patients provided 3 specimens, which is only slightly higher than the 15% compliance in returning 3 specimens that we report here. Although 3 specimens are generally recommended to rule out parasitic infection, the number of stool specimens needed depends on the parasite.<sup>15</sup> Because of limited compliance in providing 3 stool specimens, the International Clinic at MMC no longer provides refugees with 3 stool kits at the initial visit, but rather provides 1 kit initially and subsequent kits only after the first kit is returned. The optimal screening strategy for any particular setting may need to be determined based on local data on parasite yield, compliance, the presence or absence of symptoms, and the cost of stool specimen kits.

This study contributes information on the health status of pediatric refugees from Africa. Our results indicate that the prevalence of stool parasites, reactive PPD tests, and hepatitis B markers are high in this population. Although information on previous hepatitis B vaccination was not generally available through the medical record review, it is the impression of the clinic staff that most of these children had not been vaccinated against hepatitis B before their arrival. These results support the need for screening for parasites, tuberculosis, and hepatitis B in pediatric refugees from Africa.

There are several limitations to this study. The data were gathered through a retrospective review of medical records and thus may be subject to charting errors and inconsistencies arising from different health examiners. The number of children represented in the study is too small to allow for an analysis of the data by subgroupings such as age groups and country of origin. Some of the infectious conditions we evaluated may tend to cluster in families or refugee groups. Although the conditions found in our study should be indicative of what might be found in other pediatric refugees, the actual prevalence of infectious diseases reported here may not be generalizable to other groups of refugee children. We did not collect data on all health conditions that might be of concern in refugee populations. Practitioners should consider the need to screen for other conditions such as human immunodeficiency virus infection and hemoglobinopathies. Finally, with this study design, we were not able to systematically collect information on psychological and social problems. For many of the refugees seen at the International Clinic at MMC, social and psychological issues may be of greater im-

mediate importance to their overall well-being than their initial physical health status.

Despite these limitations, the results of this study contribute to the assessment of refugee health status in the United States and support the need for a basic knowledge of tropical medicine and international health issues among pediatric practitioners in this country. Pediatric residents and medical students at MMC receive exposure to these issues through participation in the International Clinic. As travel between countries becomes more prevalent and refugee resettlement continues to bring children from underdeveloped countries into the United States, the breadth of conditions facing primary care clinicians is likely to continue to expand. The provision of responsible health care to these children depends on understanding their underlying health status and integrating international health principles into pediatric provider training.

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