Health Needs of Refugee Children Younger Than 5 Years Arriving in New Zealand

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Background: New Zealand accepts 750 refugees annually who enter via the Mangere Refugee Resettlement Centre.

Aims: To evaluate the health needs of refugee children less than 5 years of age.

Methods: Retrospective audit on the outcomes of health screening and referrals in children less than 5 years of age at the Mangere Refugee Resettlement Centre between 2007 and 2011.

Results: Of the 343 children, the most common infectious diseases were latent tuberculosis (15%) and parasitic infections (15%). In those older than 1 year old who had rubella and measles serology information, immunity was found in 50% and 59%, respectively. Hepatitis B immunity was found in 68%. Complete vaccination certificates were available for 66% on arrival to New Zealand. Vaccinations were administered to 73% while at the Mangere Refugee Resettlement Centre. Iron deficiency and vitamin D deficiency were the main noninfectious diseases found and were present in 33% and 12%, respectively. The total requiring referral for further medical assessment or support was 58% with 19% requiring referral to more than one service.

Conclusions: Screening identified health needs in otherwise asymptomatic newly arriving refugee children. A proportion of children required access to multiple specialized medical services and may benefit from a comprehensive pediatric service.

Key Words: New Zealand, pediatric, child, pediatric, refugee, screening

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New Zealand (NZ) accepts a quota of 750 refugees each year. In addition, there are 200–300 people arriving each year seeking asylum.[1,2] On arrival to NZ, all refugees stay at the Mangere Refugee Resettlement Centre (MRRC) in the city of Auckland for 6 weeks. At the MRRC, a collection of agencies are available including those for immigration, education, language, welfare, counseling and medical screening. The medical screening process undertaken is the same for both adults and children.[1]

Pediatric refugees have complex medical and psychological needs. This includes incomplete vaccinations, untreated infections, nutritional deficiencies and poor growth.[3,4] They are at risk of developmental and mental health problems due to socioeconomic adversity, exposure to violence and migration stressors.[5]

About 13% of those seen at the MRRC are aged between 0 and 4 years, but little is known about the health needs of these children.[1] The aim of this retrospective audit was to assess the results of the current health screening program and to determine whether it could be better tailored to meet the needs of these children. This was achieved by evaluating the outcomes of screening and referrals as well as documentation of complete vaccination certificates, developmental screening and the need for an interpreter.

METHODS

A retrospective audit of all refugee children under 5 years of age at the MRRC in the years 2007 to 2011 was conducted. The medical clinic at the MRRC is specialized to assess the health of all newly arrived refugees. All refugees undergo a clinical evaluation that consists of a history and examination. In addition, routine screening tests are conducted. In those under 5 years of age, tuberculosis (TB) was screened for using a tuberculin skin test (TST). If the TST was ≥5 mm without a history of Bacillus Calmette–Guérin vaccination or ≥9 mm with a Bacillus Calmette–Guérin history then a referral was made to the pediatric TB clinic. Serological testing was carried out for hepatitis B, hepatitis C, HIV, syphilis, and immunity to rubella and measles. Those under 1 year of age were not tested for rubella and measles immunity because they were unlikely to have been vaccinated for these diseases.

In addition, 3 stool specimens were examined for ova and parasites. Examination of feces and/or urine for ova is the gold standard for detection of schistosomiasis but this can be logistically difficult.[3] As such the initial investigations were serology and microscopic examination of the 3 stool specimens. The local practice was to conduct a urine dipstick test if the schistosomiasis titer was ≥1:64 because this was likely to reflect active disease. If the urine dipstick was positive for blood then 3 midday urine specimens for parasites were requested. Children with a titer ≥1:32 were referred to the pediatric Infectious Diseases clinic.

A full blood count, renal and liver function tests, ferritin level and hemoglobinopathy screen were requested on all patients. Low ferritin levels (normal: 20–200 μg/L) were used as a marker of iron deficiency. Vitamin D levels were routinely measured and the following definitions were used: toxicity >250 nmol/L, sufficiency 50–230 nmol/L, mild deficiency 26–50 nmol/L, moderate deficiency 12.5–25 nmol/L and severe deficiency <12.5 nmol/L.[4]

All health encounters, including referrals and the results of screening tests, were recorded in a computerized patient management system called MedTech. The outcomes of referrals were documented in hospital-based databases. In terms of primary care referrals, all refugees were referred to a primary care physician and to a health support service called "Plunket," but records were only entered into MedTrak if there was a specific issue requiring attention. Furthermore, in NZ, pediatrics is a secondary and not a primary care service.

The case notes from 50 of the most recently seen children under 5 years of age were sampled to evaluate the documentation of a complete vaccination certificate, developmental screening and the need for an interpreter.

For the data analysis, the countries of origin were grouped by region as follows:

Africa: Burundi, Congo, Eritrea, Rwanda, Somalia and Sudan
Americas: Colombia
Asia: Bangladesh, Bhutan, Indonesia, Mauritius, Myanmar, Nepal and Sri Lanka
Middle East (ME): Afghanistan, Iran, Iraq, Palestine

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Data were entered into a Microsoft Excel spreadsheet. A descriptive analysis was carried out using the JMP V10 (SAS Institute Inc., Cary, NC) software. Comparisons were made across all the groups using the Pearson χ^2 test. Where there were 3 or more groups compared the *P* value describes variation across all the groups.

Ethical approval for an audit was obtained from the Northern X Ethics Committee.

RESULTS

Demographic Data

There were 343 refugee children under 5 years old who arrived in New Zealand between January 1, 2007, and December 31, 2012, which represented 10% of the total population seen at the MRRC. There was an even distribution of females (51%) and males (49%) and age ranged from 7 weeks to 4 years 51 weeks. The average age was 2 years 17 weeks, with age groups <1, 1 and 2 years more prevalent than age groups 4 and 5 years.

The majority of children (n = 245/343; 72%) were from countries receiving the Global Alliance for Vaccines and Immunization (GAVI) program.[6] GAVI-assisted countries included Myanmar (n = 135/343; 40%), Bhutan (n = 34/343; 10%), Afghanistan (n = 27/343; 8%), Congo (n = 22/343; 6%) and Eritrea (n = 14/343; 4%) with Rwanda, Nepal, Somalia and Bangladesh each contributing to ≤2% of the sample. Non-GAVI countries include Colombia (n = 44/343; 13%) and Iraq (n = 24/343; 7%) with Sudan, Burundi, Sri Lanka, Iran, Indonesia, Palestine and Mauritius each contributing to <2% of the sample.

Regionally, the largest proportion of refugees was from Asia (53%). The regional proportions were broadly similar to the worldwide refugee population with the exception that this study had no refugees from Europe.[7] Over the period studied the numbers from the Americas increased whereas those from Africa and the ME decreased. This contrasted with worldwide figures over the same period where the numbers of African and Americas refugees were relatively stable and numbers from the ME decreased.[7]

All the children received an informal verbal developmental screen to identify major abnormalities. Almost everyone (96%) required an interpreter.

Infectious Diseases

There were no cases of active TB disease identified, but 17% had a positive TST and were referred to the TB clinic. The majority were treated for latent TB (86%) on the basis of a positive TST with no evidence of active disease on physical examination or chest radiograph. Ten percent required ongoing review. Further investigation with gastric aspirates or bronchoscopy and lavage was not required. The rates of latent TB were similar across the groups (Africa 16%, Americas 24%, Asia 24%, ME 18%).

One or more stool parasites were present in 11% of samples. The most common parasite was giardia (58%), followed by ascaris (16%) and trichuris (14%). Ascaris and hookworm were only found in those from Asia. Rates of giardia varied between regions, but there was no statistical difference (*P* = 0.38). All cases of hymenolepis were from Africa (n = 5).

Schistosomiasis serology was positive in 4%, and there was no difference between countries. Three (25%) required referral to the pediatric Infectious Diseases clinic.

There was a low incidence of hepatitis B carriers (1%) and hepatitis C carriers (0.6%). There were no patients with HIV or syphilis.

Vaccination

In those over a year old who had rubella and measles serology, immunity was found in 50% and 59%, respectively (Table 1). There was no difference in measles immunity rates among the different regions, but rubella immunity was highest in the Americas group (71%) with 44% in the Asia group, 34% in the ME group and 14% in the Africa group (*P* < 0.0001).

In this sample, 68% were immune to hepatitis B. The majority of those from the Americas (74%), Asia (70%) and the ME (69%) had immunity to hepatitis B (Africa 58%; *P* = 0.60). There was little difference in immunity rates between refugee children from GAVI-assisted countries compared with non-GAVI–assisted countries (Table 2). A complete vaccination certificate was available for 66% on arrival to the MRRC. One or more vaccines were given to 73% of the sample to align them with NZ vaccination schedule.

Noninfectious Diseases

Iron deficiency was found in 33%, and the highest rates were in those from the ME (50%) and Africa (42%) (Asia 27%, Americas 20%, *P* = 0.002). The incidence of hemoglobinopathies was low (2%) and all were traits.

Vitamin D deficiency was found in 15% (n = 41). The majority (n = 34, 83%) had mild deficiency and the remainder had moderate deficiency. Vitamin D deficiency was highest in the ME group (20%) and the Asia group (19%) with rates of 7% in the Americas and 2% in the Africa groups (*P* < 0.001). There was no association between vitamin D deficiency and increased rates of latent TB (*P* value 0.78).

Referrals

Of the sample, 58% had at least 1 referral to another medical service with 37% made to primary care services and 63% to secondary care services (Fig. 1). The proportion requiring more than 1 referral was 19% (n = 65). Those requiring at least 1 referral were mainly from Africa (75%) and the ME (68%) with 53% from the Asia group and 41% from the Americas group (*P* = 0.001).

Of those referred to primary care services, 50% were referred to health support services. Twenty-one percent were referred to developmental services and 14% had specific follow up with a primary care physician.

Sixteen secondary services were consulted. Of the secondary services, the most common referrals were to the TB clinic (33%), pediatric surgery (10%) and a pediatrician (9%). For those referred to secondary services, 31% required only 1 review whereas 51% required ongoing follow up.

TABLE 1. Immunity to Vaccine Preventable Diseases in Refugee Children (<5 Years Old) Arrivals in New Zealand 2007 to 2011

Disease	Total Tested	Immune	GAVI-assisted Country	Non-GAVI–assisted Country	*P*
Rubella (excludes <1 yr olds)	174	87 (50%)	48%	56%	0.32
Measles (excludes <1 yr olds)	197	117 (59%)	62%	53%	0.27
Hepatitis B	207	141 (68%)	64%	77%	0.13

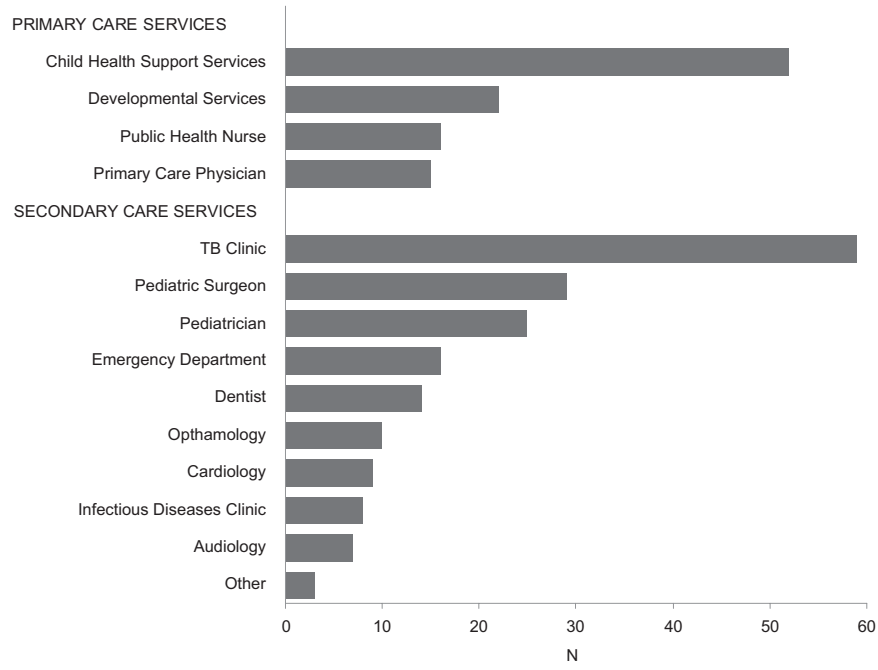

FIGURE 1. Distribution of healthcare referrals in refugee children (<5 years old) arrivals in New Zealand 2007 to 2011.

DISCUSSION

Refugees represent a highly vulnerable and often traumatized population.[6] Screening identifies the health needs of otherwise asymptomatic newly arriving refugee children.[8,9] This study found that overall 98% (n = 335/343) of children had a medical finding that required attention. Over half the children needed referral to another health service with a fifth requiring more than 1 service. All the children at the MRRC received an informal verbal developmental and mental health screen. This approach may not be sufficient to detect subtle problems in this area.[10]

Infectious diseases were a major cause of disease with latent TB, as in other studies, being the most common (15%).[11,12] TB reactivation in the first 5 years after migration is high and more so in younger children making it necessary to screen for this treatable condition.[13] Similarly to previous research there were very few cases of hepatitis B and C with no cases of HIV or syphilis.[9,11]

Parasitic infections were common with giardia being the most prevalent. Although direct microscopy of fecal specimens was used in this sample, recent advances suggest that direct immunofluorescence assays (DIF) or enzyme immunoassays (EIA) are more accurate, rapid and cost-effective.[14] Direct microscopy has poor sensitivity when a single sample is analyzed. This can be due to low parasite density, insufficient microscopic quality, intermittent excretion of cysts or poor parasite visibility.[12] To increase sensitivity 3 stool samples are often obtained but this can lead to compliance issues and may delay the diagnosis.[4] A recommended approach would be initial direct microscopy with the addition of DIF/EIA when there is clinical suspicion but negative microscopy. This approach may eliminate the need for multiple specimens.[12] Another advantage of immunoassays is combined antigen testing, for example, giardia with cryptosporidium.[14]

Refugee children were at risk of vaccine preventable diseases due to incomplete vaccinations.[6,15,16] Since 1999, the main global vaccination program has been GAVI, which includes vaccination against polio, diphtheria, TB, pertussis, measles, tetanus, hepatitis B and yellow fever. Many refugees have lived in GAVI-assisted countries.[16] There was no evidence of improved immunity rates in GAVI-assisted countries, but the reasons for this were unclear.

Nearly half the sample was immune to rubella and measles with two-thirds immune to hepatitis. In an earlier study at the MRRC, immunity to rubella was found in 84% of those tested.[1] A recent Australian study showed similar results.[17] In Australia, there is a requirement for predeparture administration of the MMR vaccine. This was not the case for refugees arriving in NZ at the time of the study and may explain the low immunity rates found. Refugee children are at risk of other vaccine preventable diseases as well. Accordingly, vaccinations for hepatitis A, varicella, hemophilus influenza B and the pneumococcal polysaccharide conjugate should be considered.[18]

Documentation and verbal recounts of prior vaccinations are often unreliable.[18] In this study, a complete vaccination certificate was available for only 66% of children with 73% requiring additional vaccinations at the MRRC. As such the current practice at the MRRC is to restart the NZ vaccination schedule in all those without complete vaccination certificates.

Treatable noninfectious conditions were common. Iron deficiency was present in a third which is higher than described in NZ children (13%–23%).[8,19,20] Iron is essential for immune function through its roles in enzymatic reactions and cytokine production. As such, iron deficiency impairs innate and cell-mediated immunity, which can lead to susceptibility to infection.[21] Low ferritin levels are often used as a marker of iron deficiency but can be misleading.[19] Ferritin is an acute inflammatory marker and can be raised in refugee children due to infection, which artificially normalizes the reading.[9] An alternative to ferritin is the reticulocyte hemoglobin content. This is a more accurate marker of iron deficiency than ferritin and is routinely measured in the analysis of full blood counts.[8,22,23]

Vitamin D deficiency, as in other studies, was common (15%).[8,9,24] The current guidelines recommend testing those with risk factors for deficiency, which thereby includes all refugees. Treatment consists of daily or high-dose intermittent supplementation,

but compliance can be a problem especially if not accompanied with appropriate education. So, trained interpreters are needed for successful treatment in refugee children.[4] Vitamin D is a topical subject, and recent studies report an association between low vitamin D status and a higher risk of TB infection or latent TB.[25,26] This association was not seen in this study.

Internationally, other tests have been included in refugee screening.[9] Malaria screening is one of these. In Western Australia, 3.5% of asymptomatic adult African refugee migrants were diagnosed with malaria.[27] Screening for asymptomatic malaria is relevant in Australia where the mosquito vector is still present creating a significant risk of dissemination.[3] A recent NZ study found that of the 36 cases of malaria diagnosed in Auckland over a year, 11 were in recently arriving refugees.[28] The authors recommended that all refugees be screened for malaria on arrival to NZ.[29] Despite this, malaria is anecdotally rare among refugees in NZ and was only present in 1 child in this 5-year study.

Helicobacter pylori is not currently screened for at the MRRC. Other studies report a prevalence between 21% and 80% in refugee children.[3,30] *H. pylori* can be detected by serology, urea breath testing and specific antigen detection in stool. Serology is convenient, but its sensitivity and specificity is dependent on the test used and it can be less reliable in children.[3] Furthermore, serology cannot distinguish between current and past infection. The urea breath test is very sensitive and specific but is time-consuming, requires specialized equipment and is difficult to perform in children. Fecal monoclonal EIA are growing in use. They are highly sensitive, specific and convenient.[3,28] Guidelines on *H. pylori* screening have yet to be established but symptomatic colonization appears uncommon.[31] Currently, appropriate management of symptomatic children includes the use of serology or immunoassays or referral to a specialist service.

Refugee children have often had little access to medical care. In NZ, as in other countries, over half the children were referred to secondary services with the TB clinic and pediatrics being the most common.[8] When children leave the MRRC they are enrolled with a primary care physician but there are still many barriers to access.[18] These include cost, transport, and an understanding of health and health services. For under 5-year olds, NZ has a no-fees, established service called "Plunket," which supports the development, health and wellbeing of children.[32] For these and other health services to be effective professional interpreting services need to be readily available.[6]

As this study was retrospective in nature, there were a number of limitations that includes the accuracy of data entry. The outcomes of referrals to primary healthcare services and for those who had been relocated outside of the Auckland area were not available. As well as this vaccination certification on arrival, developmental status and interpreter use were not routinely recorded in MedTech.

The screening tests currently used at the MRRC for under 5-year olds are appropriate. Despite this it is important to regularly review screening programs in view of evolving diagnostic tools and research. As such thought needs to be given to the use of DIF/EIA for Giardia, routine screening for malaria and *H. pylori* serology or immunoassays for symptomatic individuals. Furthermore, while catch-up vaccines are administered to children with incomplete vaccine certificates consideration needs to be given to appropriate vaccines for high-risk children. In terms of noninfectious diseases, the use of a reticulocyte hemoglobin content may be a more accurate indicator of iron deficiency than ferritin.

This study identified the health needs of refugee children and also showed that a proportion of refugee children required more intensive support by health services. It may thus be necessary to provide an adequately resourced, comprehensive pediatric service that meets the complex needs of this group.[8,11]

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Erratum

Seasonal Respiratory Syncytial Virus Prophylaxis Based on Predetermined Dates Versus Regional Surveillance Data: ERRATUM

In the article on page e360, volume 32, issue 9 of *The Pediatric Infectious Disease Journal* there are several errors. The legend for Figure 2 should read "Comparison of RSV season duration to RSV prophylaxis periods, City of Hamilton area (2007 to 2008 to 2010 to 2011 seasons)." In the fifth paragraph of the Discussion, the reference cited for the IMpact trial should be reference 6. The sentence should read "With regard to the number of estimated doses provided per patient during the entire RSV season, the current provincial method and the local fixed-date method consistently estimated 6 injections per season, which is higher than the cutoff of 5 prescribed doses as evidenced in the IMpact randomized trial.[6]" In the second to last paragraph of the article both reference citations are incorrect, the first sentence should read "The strengths of our study are that RSV isolate data were confined to children 0–18 years of age, which reduces the testing pattern effect on the percent positivity estimate, thereby providing more accuracy for the pediatric population compared with available reports which incorporate positive RSV tests across all age groups.[11,12]" And the third sentence should read "The selected periods of immunity after the respective doses were carefully derived from the pharmacokinetic analyses of palivizumab[6–10] and utilized constructively to calculate the number of doses required per RSV season." The reference list at the end of the article also requires updates to references 5 through 12. Please see the corrected reference list below:

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