ORIGINAL ARTICLE

Fever in returned travellers: a prospective review of hospital admissions for a 2½ year period

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Aim: To identify causes of fever, treatable diseases, and the most helpful investigations in febrile children, who had travelled to the tropics or subtropics in the preceding year.

Methods: Prospective observational study of all admissions to children's wards in a district general hospital in Birmingham between January 1997 and July 1999. Children with fever $>37.5^{\circ}\text{C}$ and a history of travel to the tropics or subtropics in the preceding 12 months were included. Data were available on 153/162 children; median age was 5 years (range 0.1–15). A total of 133 (85%) children had visited South Asia; only 18/135 had received malarial prophylaxis. Median time to presentation after travel was four weeks. Children were investigated with full blood count, blood film, and stool culture. Other investigations were performed at the discretion of the admitting paediatrician.

Results: Diarrhoeal illness ($n = 41$) and malaria ($n = 22$) were the most common diagnoses. A treatable cause for the febrile illness was identified in 70 (46%) children. One or more investigations were positive in 60% of children. Stool culture (17% positive) and blood film (14% positive) were the most helpful investigations. Platelet counts greater than $190 \times 10^9/\text{l}$ had a negative predictive value of 97% for malaria in this population.

Conclusions: Children who present with fever and have travelled to the tropics or subtropics in the preceding year, often have a treatable infection. They should have a full blood count, blood film for malarial parasites, stool culture, blood culture, and chest x ray.

Imported infections are of increasing importance in the UK as the number of travellers visiting the tropics escalates.¹ Although children travel to the tropics infrequently, they constitute a quarter of all travel associated hospital admissions.² We have previously reported the imported infections found in children admitted to hospital; diarrhoea, hepatitis, and malaria being the most common.³ This study did not, however, include all children returning from the tropics with fever, some of who will have cosmopolitan infections such as pneumonia or urinary tract infections.

Most previous studies of fever in the returning traveller have concentrated on adults presenting to tertiary care centres.^{4–6} The one study of children only included those children who had returned in the previous four weeks.⁷ This time period is likely to have missed a considerable number of cases.^{8–9} With the vast diversity of potential diagnoses in this group of children it is helpful to highlight the investigations with the highest yields.

The aim of this study was to identify causes of fever, treatable diseases, and the most helpful investigations in children presenting with fever to a district general hospital, who had travelled to the tropics in the preceding year.

METHODS

All children (0–16 years) admitted to the paediatric wards at Birmingham Heartlands Hospital from January 1997 to July 1999, with a febrile illness (axillary temperature $>37.5^{\circ}\text{C}$) and who had travelled to the tropics or subtropics in the preceding 12 months were enrolled. Children meeting these criteria were investigated with a minimum of full blood count, blood film for malarial parasites, and stool culture and microscopy for pathogens (as per hospital protocol). Other investigations were performed at the discretion of the admitting paediatrician.

Birmingham Heartlands Hospital is in the east of Birmingham. The catchment area includes a large South Asian community, constituting a third of the population.

The admitting paediatrician collected patient details prospectively on a centrally accessed list. Data from the hospital case notes were collected on a standardised proforma recording demographics, clinical signs, final diagnosis, and investigation results.

Definitions

A diagnosis of viral/non-specific illness was given to children who recovered spontaneously and in whom all investigations were negative. "Travel-associated diarrhoea" was diagnosed in children with diarrhoea within 10 days of return to the UK in whom no pathogen was identified in the stool. Tests for enterotoxigenic *Escherichia coli*, the commonest cause of traveller's diarrhoeas, were not performed.

RESULTS

Demographics

A total of 162 children met our inclusion criteria on hospital admission; data were available on 153 (80 (52%) male) children. Median age was 5 years (range 0.1–15); 137 (90%) were South Asian in origin.

Travel history

Children presented a median of 4 weeks (range 1–52) after return to the UK and had been overseas for a median of 9 weeks (range 1–470). Children visited the Indian subcontinent ($n = 133$), the Middle East ($n = 10$), Africa ($n = 7$), and South East Asia ($n = 3$). Only 18/135 had received malarial prophylaxis; this was completed in four children (one of whom developed malaria). Only 16/108 had received recommended pretravel vaccinations. Data were incomplete in the remaining children.

Diagnoses

Table 1 shows the final diagnoses of the children. Diarrhoeal illness ($n = 41$) and malaria ($n = 22$) were the commonest defined diagnoses. Cosmopolitan infections accounted for 54%

Table 1 Final diagnosis of 153 children admitted to Birmingham Heartlands Hospital with fever and who had travelled to the tropics or subtropics in the preceding 12 months

Diagnosis	No. patients (%)
Viral illness	52 (34%)
Diarrhoea	41 (27%)
"Travel associated diarrhoea"	15
Campylobacter	8
Shigella*	5
Giardia*	5
Salmonella	3
Rotavirus	3
Cryptosporidium	2
Malaria*	22 (14%)
<i>P. vivax</i>	19
<i>P. falciparum</i>	3
Pneumonia *	13 (8.5%)
Hepatitis A	8 (5%)
Urinary tract infection*	6 (4%)
Enteric fever*	5 (3%)
RSV positive bronchiolitis	5 (3%)
Tonsillitis*	5 (3%)
Meningococcal disease*	2
Pulmonary tuberculosis*	2
Abscess*	1
Cellulitis*	1
Kawasaki's†	1
Lymphadenitis*	1
Osteomyelitis*	1
Rickettsial infection*	1
Others	3

*Diseases usually treated with antibiotics or antimalarials.

†Disease treated by other medication.

of admissions. A treatable cause for the febrile illness was identified in 46% of children. Nine children had more than one diagnosis.

Investigation and clinical examination findings

The most helpful clinical findings were hepatomegaly (13/153); five had hepatitis A and splenomegaly (12/153), eight had malaria, and two had enteric fever. Six of 153 patients were clinically jaundiced; five had hepatitis A. The median maximal temperature was 39°C (range 37.5–41.3°C).

Stool culture was the most useful investigation with a positive yield of 17%, followed by blood film, positive in 14%. Some children had more than one positive investigation and 40% had no positive investigations. Other investigations which helped identify treatable infections were: chest x ray (n = 15), serology (n = 11), blood culture (n = 5), and urine culture (n = 6). These were only performed at the discretion of the admitting paediatrician and their predictive value cannot be calculated.

The median (range) platelet count was 284 (48–799) × 10⁹/l. The median platelet count in children presenting with malaria was 114 × 10⁹/l; only three children with malaria had a platelet count greater than 190 × 10⁹/l. A platelet count greater than 190 × 10⁹/l had a negative predictive value of 97% for malaria versus all other causes of fever in the population studied.

White cell count was generally unhelpful with a median of 9.8 (2.1–34.3) × 10⁹/l. Eleven children had a total white cell count of less than 5 × 10⁹/l, including seven of the malaria cases. Haemoglobin, neutrophil, and eosinophil counts were not diagnostically specific.

DISCUSSION

This study represents the largest prospective series of febrile children returning from the tropics. We have identified a high proportion of treatable conditions, and highlighted the importance of common cosmopolitan infections as well as

exotic illnesses presenting with fever in this population. The majority of diagnoses requiring medical treatment were made using simple investigations.

Previous studies of imported infections have concentrated on adult travellers presenting to tertiary centres,⁶ often returning from Sub-Saharan Africa.^{4,5} Our study population, being largely South Asian, is therefore very different. Most imported malaria from the Indian subcontinent is caused by *Plasmodium vivax*, as in our study.⁹ Only 30% of children with this type of malaria present within a month of return.⁹ Imported malaria from Africa is mostly *P. falciparum*, a potentially life threatening infection. This mostly presents within one month of return.⁹

Many new arrivals from Africa will stay in the South East of England. Our population is likely to be more representative of that seen by general paediatricians in the UK not working in South East England.

Adult studies have shown higher rates of malaria infection and lower rates of cosmopolitan illnesses.^{4–6} The only previous prospective paediatric study reported a low rate of cosmopolitan infections and absence of traveller's diarrhoea. This may reflect the short "incubation" period studied, but would suggest that some children were either missed or omitted from the study.⁷

Most treatable infections were diagnosed by appropriate history and physical examination, combined with stool culture, blood film, chest x ray, or blood culture. Other diagnostic investigations should be directed as appropriate and have been described in detail elsewhere.^{10–12} Physical examination was often unhelpful in children with malaria; only 36% had splenomegaly. However, thrombocytopenia was often present in those with malaria, as reported previously.^{2,9} We would additionally suggest that a platelet count above 190 × 10⁹/l is a useful determinant of the absence of malaria infection in children.

This study is likely to underestimate the morbidity due to imported infections in children, since it only included those requiring hospital admission. Prospective data collection has enabled us to identify conditions such as traveller's diarrhoea, but some imported infections may have been missed. A community based study would be useful to delineate the true scale of the problem of imported infections in children.

The poor uptake of malarial prophylaxis and pretravel vaccination is disappointing, but similar to previously reported data.^{3,6} Studies of improved education and awareness of travel advice are needed in the South Asian community, to see whether these can improve preventive measures.

Many paediatricians see returning travellers infrequently. We would emphasise the importance of taking a full travel history in all children presenting with fever. In those children who have travelled to the tropics or subtropics in the preceding year, we would strongly recommend the minimal investigations of full blood count, blood film for malarial parasites, stool culture, and chest x ray. For children who have travelled in the preceding month, a blood culture for enteric fever should also be taken.¹¹ Although the gamut of imported infections can be intimidating, a diagnosis in the majority of cases can be made with an appropriate history, clinical examination, and directed investigations.

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IMAGES IN PAEDIATRICS.....

Jejunal haemorrhage in Henoch-Schönlein syndrome

A 14 year old boy presented to the paediatric department with a two week history of severe recurrent colicky abdominal pain, anorexia, and weight loss. On examination he had localised tenderness in his epigastrium, no guarding, normal bowel sounds, and normal urine dipstick. A petechial rash was noted on extensor surfaces of the distal portions of his upper and lower extremities. His pain deteriorated on day 5 of admission despite a morphine infusion. A computed tomographic (CT) scan of the abdomen and pelvis with contrast showed a doughnut shaped mass of high attenuation (see arrows in fig). This represents an axial section of jejunum with gross mural thickening consistent with intramural haemorrhage. A diagnosis was made of Henoch-Schönlein purpura (HSP) complicated by jejunal vasculitis. The patient was treated conservatively and went on to make a full recovery.

CT is an excellent means of assessing the gastrointestinal complications of HSP as it is rapid and non-invasive. Other findings that CT can show include dilated intestinal loops, regional lymphadenopathy, and free air in the case of intestinal perforation.¹

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