Rates of Infectious Diseases and Nutritional Deficiencies in newly arrived African Refugees

Dr David Johnson

January 2007

Acknowledgements

This research project was funded by the Central Northern Adelaide Health Service. The author also undertook this project whilst a Primary Health Care Research Evaluation and Development bursary holder and assistance received through this program was greatly appreciated.

The author would also like to thank the following people for their generous help in reviewing drafts of this report:

Carine Saison

Teresa Burgess

Dan Haller

David Scrimgeour

Nick Williams

Government of South Australia
Central Northern Adelaide
Health Service

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Key messages

- Refugees from Africa arrive in Australia with high rates of certain infectious diseases and nutritional deficiencies many of which will be asymptomatic on arrival. These health problems are mostly the result of the poor living conditions endured in protracted refugee situations combined with previously limited access to health services.
- The main concern with these health conditions is at the individual level where current or future reduced health status may lead to greater long term community health care costs. The risk of communicable disease transmission to the Australian public is extremely small and it is important, therefore, that this information is not used to stigmatise refugees from Africa or fuel fear campaigns about distorted health risks to the general public.
- Performing the necessary health checks to detect and manage these conditions is time consuming and requires knowledge of health conditions rarely seen in Australia.
- Many newly arrived refugees to Australia receive initial health care via general practitioners (GPs) in private practice. The capacity of GPs in private practice to perform effective initial health screening is uncertain.
- Many of the medications required to treat common infectious diseases and nutritional deficiencies in newly arrived refugees are expensive and not available on the Pharmaceutical Benefits Scheme. Many refugees do not have the financial resources to meet the costs of these medications.
- The resettlement of refugees from situations of protracted conflict by Australia is an important international humanitarian contribution. It is important, however, that health services are adequately resourced to provide appropriate and effective care for refugees to ensure that they enjoy the same health status as other Australians.

Summary

Background

Over the past five years the Australian Humanitarian Program has increasingly focussed on the resettlement of refugees from Africa. There is currently only limited data, both in Australia and internationally, documenting the health issues faced by newly resettled African refugees. The aim of this study was to document the rates of infectious diseases and nutritional deficiencies in African refugees attending the Migrant Health Service (MHS) in 2005. This is important for the following reasons:

- To provide evidence, or not, for the routine pathology screening of *all* newly arrived African refugees – at the MHS and other specialist refugee health services, as well as in private general practice;
- If routine screening is supported, to assist identification of those conditions which should be routinely screened for;
- To evaluate the screening guidelines used at the MHS to inform internal planning and delivery of health services;
- To contribute to the limited national data available documenting the health conditions faced by resettled African refugees.

Methods

Newly arrived refugees who attended the MHS for an initial health assessment between 1 January and 31 December 2005 were included in the study. Pathology results were sent electronically from the pathology laboratory where the tests were performed to the researcher (DJ). A casenote audit was also performed to obtain further demographic data and any additional pathology results not included in the electronic data received from the pathology laboratory. Disease rates were calculated using the Microsoft Excel software program.

Results

Four hundred and forty two newly arrived African refugees attending the MHS were included in the study. More than 50% originated from Sudan with Liberia (16%) being the next most frequent country of origin. High rates of the following conditions were detected: *Schistosomiasis*, 24% (100/413); Hepatitis B surface Antigen positivity, 16% (69/421); intestinal parasite infection other than *Schistosomiasis*, 24% (101/415); and anaemia, 12% (52/419). The rate of malaria was 5% (21/420) with the majority of cases being *Plasmodium Falciparum* malaria (19/21).

High rates of a number of other conditions were also detected although tests for these conditions were initially only selectively applied (based on initial screening results) becoming routine midway through the study period. These included very high rates of low 25-OH Vitamin D levels, 62% (151/242) and high rates of iron deficiency, 34% (65/189). Whilst only a small number of participants were selectively tested for haemoglobinopathies, a high percentage, 52% (33/64) were found to have an abnormality, the most common being Alpha thalassaemia trait.

Conclusion

High rates of a number of infectious diseases and nutritional deficiencies were detected in newly arrived African refugees in this study. This supports other Australian evidence and the experience of health service providers that refugees from Africa carry a high burden of ill health. This report recommends the routine voluntary screening of all newly arrived African refugees and a list of suggested tests is included. It is also important that organisations such as the MHS continue to collect data to contribute to a better understanding of the health status of newly arrived refugee groups and to ensure that routine screening remains relevant.

1. Background

Australia accepted 13,000 refugees under the Humanitarian Program in 2004-05. The majority were resettled from Africa (70%) with the remainder from the Middle East and South West Asia (26%). This represents a significant shift in the pattern of resettlement to Australia where, in 1998-99, approximately 50% entering Australia under the Humanitarian Program were from Europe, 30% were from the Middle East and South West Asia and only 16% were from Africa.[1] The pattern of resettlement in South Australia similarly reflects a shift toward resettlement of Africans where 78% of the 1,372 refugee arrivals in 2005 were of African origin.[2]

Refugees carry a high burden of ill health when compared to other migrants and the Australian population in general, which is usually the result of their refugee experiences. Whilst this applies to refugees generally, the experiences of refugee health service providers in Australia is that refugees from Africa, whilst not a homogenous group of people, carry an even greater burden of ill-health and have even more complex health needs on arrival to Australia. This is in part due to the fact that they are more likely to have spent long periods in refugee camps, some 10 years or more, in environments that are extremely unsafe, with poor sanitation and where the risk of exposure to infectious diseases is high and access to a nutritional diet is low.[3] Further, they are more likely to have originated from regions of very low socio-economic development where they have had limited access to health services, including screening services and immunisation programs. [4]

Prior to their arrival in Australia, refugees undergo only a limited health assessment which, for the majority, includes a medical examination, an X-ray for those 11 years and over and an HIV test for those 15 years and over.[5] Further, these tests are often conducted six to twelve months prior to departure. Although, more recently, some African refugees have received an additional 'fitness to fly'[a] health check immediately prior to departure, this still falls well short of a comprehensive health screen and it is not a system that facilitates the follow-up of health problems detected on pre-arrival health checks (other than for Tuberculosis). Importantly, post-arrival health screening is not routinely offered to newly arrived refugees in most Australian states and territories.

In view of this, the MHS, a State funded community health service for newly arrived refugees to Adelaide, began offering, in 2004, routine pathology screening to refugees arriving from Africa for infectious diseases and nutritional deficiencies thought to be common in these groups (specific tests are outlined in the method). It was felt that these

[a] This includes screening for malaria, measles-mumps-rubella vaccine and empirical treatment for intestinal parasites.

conditions were important to screen for because of their often chronic and asymptomatic nature combined with the fact that they could be easily treated if detected at an early stage. There was concern that if left untreated these conditions could result in chronic ill health and later presentation involving more difficult and costly treatments. Since this screening began high rates of many of these conditions have been detected anecdotally at MHS but no formal evaluation has been conducted to date.

A number of screening guidelines have been written to assist health practitioners when assessing newly arrived African refugees.[6,7,8,9,10] Their use is supported by some international studies which have found high rates of infectious diseases including Hepatitis B, Tuberculosis, malaria, syphilis and intestinal parasites infection such as *schistosomiasis* in African refugees resettled in the United States, Israel and Europe.[11,12,13,14] In Australia, data is now emerging documenting similarly high rates of infectious diseases as well as nutritional problems including vitamin D and iron deficiency in recently resettled African refugees.[15,16,17,18,19,20.]

This data, however, is still limited and so the aim of this study was to document the rates of infectious diseases and nutritional deficiencies in African refugees attending the MHS in 2005 for the following reasons:

- To provide further evidence, or not, for the routine screening of *all* newly arrived African refugees for infectious diseases and nutritional deficiencies – not just those presenting to specialist refugee health services such as the MHS. At the moment in South Australia and some other Australian states and territories, most newly arrived refugees are referred to private general practitioners for an initial health assessment where there is uncertainty about which pathology screening, if any, is undertaken;
- If routine screening is supported, to assist identification of those conditions which should be routinely screened for – at the MHS and other specialist refugee health services, as well in private general practice;
- To evaluate the screening guidelines used at the MHS to inform internal planning and delivery of health services;
- To contribute to the limited national data available documenting the health conditions faced by resettled African refugees.

2. Method

Newly arrived African refugees attending the MHS for an initial health assessment between 1 January 2005 and 31 December 2005 were included in the study.

Participants were identified using the Institute of Medical and Veterinary Science (IMVS) database of results (all initial screening pathology from MHS was sent to this laboratory).

Data collection

Data on any newly arrived refugee who underwent pathology screening at the MHS during the study period was sent by the IMVS via secure email in the form of an Microsoft Excel spreadsheet to the researcher (DJ). This included identifying data such as name, DOB, sex as well as pathology results.

For technical reasons, not all the pathology results requested were able to be included on the Excel spreadsheet sent by the IMVS. In addition, a number of young children were sent to the Women's and Children's Hospital (WCH) for blood collection and some of their results were carried out in the WCH pathology laboratory. As a result, a case note audit was also undertaken to include these results in the study. The case note audit was also used to obtain further demographic data including country of birth and refugee camp location and to cross check that pathology results received were those from the initial screening visit.

Pathology tests undertaken

Routine pathology results at the beginning of the study period included a complete blood picture, malaria film and *Plasmodium* antigen testing, Hepatitis B and C serology, *Schistosomiasis* serology, and stool microbiology. Additional tests were added depending on initial results. These included iron studies if the blood film was microcytic or hypochromic and haemoglobin (Hb) electrophoresis if the subsequent iron studies were normal. Vitamin D (25-OH Vitamin D) levels were also added if the liver enzyme alkaline phosphotase was raised or if muscular aches were reported. *Strongyloides* serology was subsequently tested if there was eosinophilia and *Schistosomiasis* serology was negative. Midway through the study period it was decided to routinely perform iron studies, Hb electrophoresis, Vitamin D levels and syphilis serology. *Strongyloides* serology was also performed on any refugee with an eosinophilia, regardless of other results.

Stool microbiology included general microscopy, culture and sensitivity as well as specific analysis for cysts, ova and parasites. Stools were collected in two containers – one for culture and one with an acid formalin fixative to increase the likelihood of finding an abnormality on microscopy. Most samples were sent to the IMVS laboratory at the Queen Elizabeth Hospital because of their particular expertise in tropical faecal microscopy.

Calculation of results

Disease rates were calculated using the functions of the Microsoft Excel software program. Disease rates for a number of conditions were also calculated by region. As with a study carried out in Melbourne by Tiong *et al*,[16] these regions were grouped into East, West and Central Africa. The statistical significance of regional differences were calculated using chi-square tests with a p value of less than 0.05 indicating significance.

Ethics

Ethics approval for this study was granted by the University of Adelaide Human Research Ethics Committee on August 15, 2006.

3. Results

Four hundred and forty two newly arrived African refugees attending the MHS for an initial health assessment between 1 January 2005 and 31 December 2005 were included in the study. During the same time period 1076 African refugees arrived in Adelaide,[21] meaning that approximately 40% underwent an initial health assessment at the MHS.

Demographics

Fifty four percent of the sample (239/441[b]) were male and 46% (202/441) were female. They ranged in age from 1 to 68 years with a median age of 18.5 years. The age distribution is shown in Figure 1. The country of origin[c] of participants is shown in Figure 2 (overleaf). More than 50% of refugees included in the study originated from Sudan with the next most frequent country of origin being Liberia (16%).

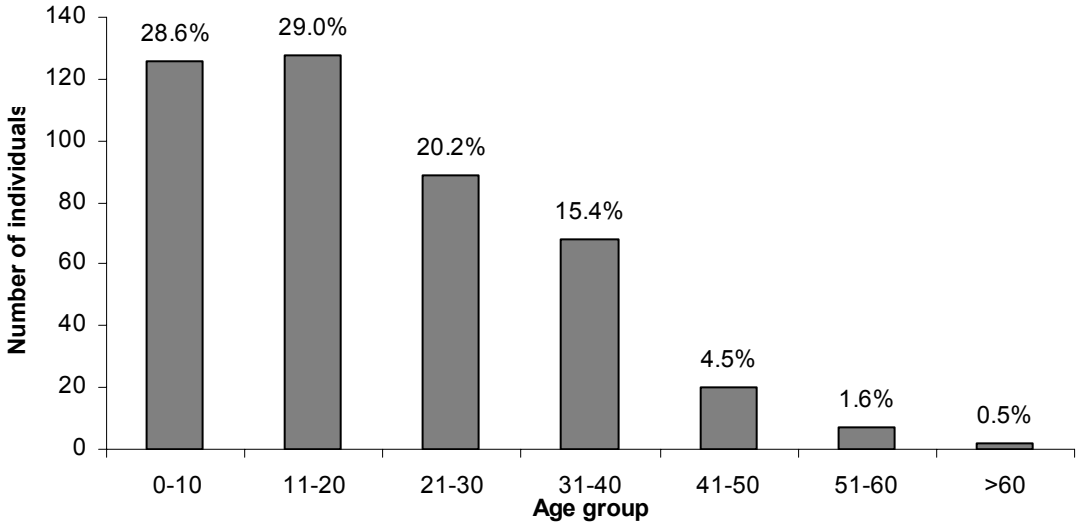

Figure 1. Age distribution of study participants (N=441).

[b] The sex of one individual was not identifiable from the pathology results or case notes.
[c] Where children were born in refugee camps, their country of origin was listed as their parents.

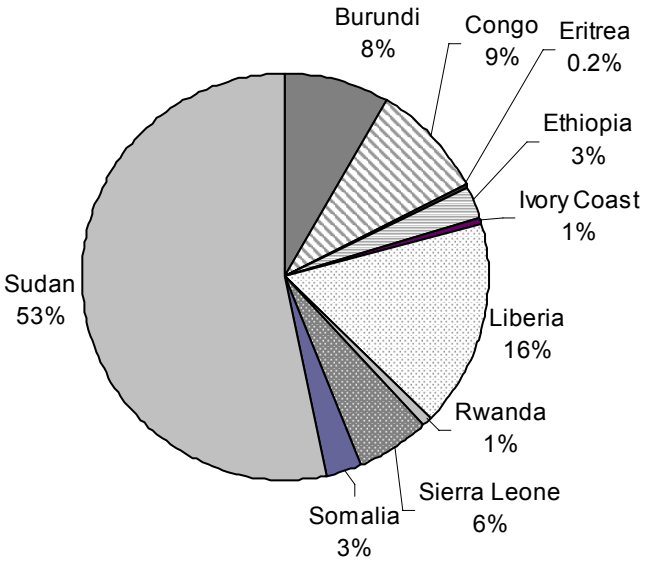

Figure 2. Country of origin of study participants.

N=422* Country of origin could not be identified for 20 study participants.

Table 1 (overleaf) shows region of origin of participants divided up into East, Central and West Africa. Given that the majority originated from Sudan, not surprisingly the region most represented was East Africa (59%). A large number of refugee transit countries were identified for the study participants and these are represented in Appendix 1. The most common transit country identified was Kenya (37%), where the majority of Sudanese seek refuge, with the second most common being Guinea (11%), the most common country of refuge for those fleeing Liberia. Where participants had transited through more than one country, the last transit country prior to arrival in Australia was recorded.

Table 1. Study participants grouped by region.

Region	Country of origin	Number (%) N=422*
East Africa	Sudan	225 (53)
	Somalia	12 (3)
	Ethiopia	11 (3)
	Eritrea	1
Total		249 (59)
West Africa	Liberia	69 (16)
	Sierra Leone	25 (6)
	Ivory Coast	2
Total		95 (23)
Central Africa	Congo	39 (9)
	Burundi	35 (8)
	Rwanda	3 (1)
Total		77 (18)

* Country of origin could not be identified for 20 study participants

Pathology results

Although 442 participants were included in the study there was some variation in the results obtained for the following reasons:

- Pathology requested was not always collected. Whereas most new arrivals had blood taken at the MHS, occasionally they were referred to the IMVS or the WCH for collection and small numbers failed to present for this. Similarly, whilst most new arrivals had stools collected at the time of initial assessment at the MHS, occasionally this needed to be collected at home and returned to the MHS and in a small number of cases this did not occur;
- There were a small number of instances where only some of the routine screening pathology tests were requested by the treating doctor;

- As outlined in the method, some pathology tests were initially selectively applied only becoming routine midway through the study period;
- *Strongyloides* serology was only ever selectively applied and so numbers tested were very low.

Hepatitis B

Hepatitis B surface antigen (HepBsAg) was tested in 421 participants and 69 (16%) were found to be positive. When calculated by region, the prevalence rates for Hepatitis B were higher in West Africa than for Central and East Africa (see Table 2). These differences, however, were not statistically significant ($p>0.05$).

Table 2. Hepatitis B surface antigen positive rates by region.

Region	Number positive/ number tested *N= 409	%
West Africa	22/93	23.7
East Africa	38/243	15.6
Central Africa	8/73	11.0

*12 participants were tested for HepBsAg but their country of origin not recorded. One of these was HepBsAg positive.

Hepatitis C

Four hundred and twenty participants were tested for Hepatitis C virus antibody and 13 were found to be positive. Results of subsequent Hepatitis C PCR (Polymerase Chain Reaction) RNA testing were available in 11 of the 13, with three recording a positive PCR result indicating current infection. The PCR status of the other 2 antibody positive participants could not be determined from the case notes.[d] Therefore, less than 1% (3/420) of participants were truly identified as Hepatitis C positive.

[d] Of these one has been referred for further investigation and attempts are being made to ensure appropriate follow-up is arranged for the other.

Malaria

Thick and thin films and immunochromography for malaria were performed on 420 participants with 21 (5%) testing positive. Nineteen of these were identified as *Plasmodium falciparum* malaria, with one mixed *Plasmodium falciparum* and *Plasmodium vivax* infection and one where the malaria parasite was unspecified. There was a significant difference in prevalence rates ($p<0.01$) between the regions most likely the result of the higher rates in West Africa. (see Table 3).

Table 3. Malaria rates by region.

Region	Number positive/ number tested N= 407*	%
West Africa	11/94	11.7
East Africa	7/243	2.9
Central Africa	3/70	4.3

*13 participants were tested for malaria but their country of origin not recorded. None of these were positive for malaria.

Syphilis

Only 89 of the 442 participants were tested for syphilis. Three of these were reactive but two of these were reported as probable false positives.

Schistosomiasis

Schistosomiasis serology was performed on 413 participants. Seventy-eight had positive serology[e] defined by a titre of >1:80. Thirty-six had what was classified as equivocal serology with a titre of 1:80. Of these 36, twelve had *schistosoma mansoni* eggs detected in their stools.[f] Further, *schistosoma mansoni* eggs were found in ten of the participants who

[e] As per the IMVS laboratory

[f] Whilst it was recommended that urine was also tested for shistosomes, this was not always clear from the case notes. It is standard practice now for all new arrivals to undergo urinalysis and where blood is present the sample is sent for microscopy.

had negative serology (299/413). The prevalence rate of *Schistosomiasis* infection in the sample was therefore calculated to be 24% ((78+12+10)/413).

When a comparison was made by region there was no significant difference ($p>0.05$) in the rates of *Schistosomiasis* for East, West and Central Africa (see Table 4).

Table 4. *Schistosomiasis* rates by region.

Region	Number positive/ number tested N= 399*	%
West Africa	27/91	30
East Africa	57/236	24
Central Africa	15/72	21

* For 14 participants country of origin was not recorded. None of these were positive for schistosomiasis

Schistosomes were detected in 52 of the 415 participants who underwent stool testing. In addition to the ten who were stool positive and serology negative and the twelve who were stool positive and serology equivocal, 28 were both stool positive and serology positive, and two were stool positive with no serology result recorded.

Strongyloides

Only 21 participants were screened for *Strongyloides*. Seven (33%) were found to be positive.

Vitamin D

The level of 25-OH Vitamin D was tested in 242 of the study participants. Of these, 62% (151/242) were found to have levels below 60nmol/L.[g] Further, 7% (16/242) had levels below 25nmol/L which is generally considered to indicate vitamin D deficiency.

When rates of Vitamin D levels below 60nmol/L were calculated by region, a significant difference ($p<0.01$) was found most likely the result of the large number of East African refugees with low levels (see table 5).

[g] The IMVS laboratory defines vitamin D levels under 60nmol/L to be low. Other laboratories use 50nmol/L as a cut off.

Table 5. Participants with low vitamin D levels by region.

Region	Number with 25-OH vit D levels below 60/ number tested *N= 236	%
East Africa	110/142	78
West Africa	19/43	44
Central Africa	20/51	39

* 6 participants were tested but country of origin not recorded

Anaemia

Full blood count analysis was performed on 419 of the study participants. Twelve percent (52/419) recorded haemoglobin levels below 110g/L and 5 % (24/419) recorded levels below 100g/L.

In those with an Hb below 110g/L, the majority were iron deficient (37/52, 71%)[h], two had impaired iron metabolism, one had alpha thalassaemia trait and one sickle cell trait. Eleven either had no cause identified or no cause specified for their anaemia.

When calculated by region there was no significant difference ($p>0.05$) in the rates for anaemia between West, East and Central Africa (see table 6).

Table 6. Rates of anaemia by region.

Region	Hb level below 110g/L/ number tested. *N= 406	%
East Africa	32/240	13
Central Africa	8/72	11
West Africa	10/94	11

* 13 participants were tested but country of origin not recorded

[h] This included clear iron deficiency in 31, borderline iron deficiency in four and evolving iron deficiency in two.

Iron deficiency

Iron studies were performed on 189 participants. Thirty four percent (65/189) were found to have iron deficiency.[i]

Haemoglobinopathy

Only 64 study participants underwent Haemoglobin Electrophoresis. A haemoglobin abnormality was detected in 52% (33/64). The most common abnormalities were alpha thalassaemia trait and sickle cell trait (see Table 7). Whilst differences in the rates of haemoglobinopathy between the regions were statistically significant ($p<0.01$) with much lower rates in refugees from East Africa, it must be noted that the sample size was extremely small.

Table 7. Types of haemoglobin abnormalities detected.

Haemoglobin abnormality (N=33)	Number
Alpha thalassaemia trait	16
Sickle cell trait	11
Beta thalassaemia trait	3
HbC mutation	1
Alpha thalassaemia and Sickle cell trait	1

[i] This was based on the interpretation of the reporting IMVS haematologist rather than the serum iron levels and included twelve who were borderline iron deficient and three who had evolving iron deficiency.

Intestinal parasite infection (other than *Schistosomiasis*)

As mentioned, 415 participants underwent stool analysis. Parasites other than *Schistosomiasis* were isolated in 24% (101/415). Most of these were potentially pathogenic parasites with the most common infection being *Giardia lamblia* (see Table 8).

Table 8. Rates of intestinal parasite infections.

Organism	Number (%). N=415
Pathogenic	
Giardia lamblia	45 (11)
Hookworm	15 (4)
Hymenolepsis spp.	13 (3)
Ascaris lumbricoides	3 (<1)
Trichuris trichuria	2
Strongyloides	1
Non-pathogenic	
Blastocystis hominis*	6 (1)
Dientamoeba fragilis*	3
Entamoeba histolytica/dispar complex+	20 (5)

* May be pathogenic

+ Whilst most of these participants also underwent antigen testing to exclude E. Histolytica this could not always be established from the case notes.

Summary of results

The main results are summarised in table 9 (overleaf).

Table 9. Summary of rates of main conditions.

Condition	Number positive/number tested (%)
HepBsAg positive	69/421 (16)
Malaria	21/420 (5)
Schistosomiasis	100/413 (24)
Vitamin D <60nmol/L	151/242 (62)
<25nmol/L	16/242 (7)
Anaemia Hb <110g/L	52/419 (12)
<100g/L	24/419 (5)
Iron deficiency	65/189 (34)
Haemoglobinopathy	33/64 (52)
Intestinal parasite infection (other than *Schistosomiasis*)	101/415 (24)

4. Discussion

High rates of a number of infectious diseases and nutritional deficiencies were found in this study which supports previous research and the experiences of refugee health service providers in Australia that refugees from Africa carry a high burden of ill health.

The country of origin for greater than 50% of the newly arrived refugees in this study was Sudan, the median age was very young (18.5 years) and that there was an even gender spread. The number of participants included in this study represents approximately 40% of African refugees who arrived in South Australia in 2005. Of the other 60%, some were referred to the Parks and the Port Adelaide Community Health Centres where they underwent similar routine pathology screening. The remainder, however, were referred to general practitioners in private where there is uncertainty which pathology screening, if any, was undertaken.

Hepatitis B

The prevalence rate of study participants who were positive for HepBsAg was high at 16%. Rates from previous studies both in Australia and the United States in newly resettled African refugees ranged from 6.5% to 14%.[11,12,15,16,17.] This is compared to a prevalence rate in the Australian population of less than 1%.[22] The reason for the higher rate in this study is not clear. This could be accounted for by the higher rate of Hepatitis B recorded in West African refugees (24%) or the fact that there is not sufficient data available yet to accurately describe the prevalence rate of Hepatitis B in resettled African refugees.

The natural history of Hepatitis B virus infection is related to the age at which the infection is acquired. When acquired as an infant (the most common time of infections in Africa), there is a 90% chance that chronic Hepatitis B will result. Further, there is a lifetime risk of greater than 25% of death from chronic liver disease or hepatocellular carcinoma. The high rate of African refugees in this study who were HepBsAg positive combined with the fact that it is usually asymptomatic on arrival, demonstrates the importance of routine on-arrival screening for this condition. Early detection of those who are HepBsAg positive enables regular monitoring for active liver disease and early antiviral treatment where there is active liver disease present. It also minimises the small communicable disease risk of this infection being passed on to non-immune household or sexual contacts.[23]

Hepatitis C

The rate of hepatitis C infection from this study is inconclusive although the rate is most likely to be very low (<1%). The rate of Hepatitis C from two previous studies in Australia was also low at <1%[16] and 2%[17] whilst estimates of prevalence rates in Africa are 3%.[24] Whilst further data is needed to clarify the rate of Hepatitis C in newly arrived African refugees, it continues to be an important condition to screen for given the availability of treatment.

Malaria

The prevalence rate of 5% for malaria in this study was slightly lower than that found previously in Australian studies where rates ranged from 8 to 10%.[15-17] This lower rate may be explained by the fact that early on in the study period there were long waiting times for appointments at the MHS and symptomatic new arrivals were either taken to a GP or hospital emergency department and so would not have been included in this study. This is supported by the fact that, anecdotally, there were a number of malaria cases presenting at the Women's and Children's Hospital at this time. It is also possible that pre-departure malaria treatments contributed to this reduced rate although they were introduced late in the study period and the actual numbers given this treatment is uncertain. The efficacy of this treatment is also unproven with a number of children recently presenting in Perth with *Plasmodium falciparum* malaria despite receiving pre-departure antimalarial medications.[25]

When compared by region the rate of malaria was significantly higher in West Africa than for the other two regions. Malaria, however, was still detected in East and Central Africa and is known to be endemic in all of the countries represented in this study.[26]

Whilst the mosquito required for person-to-person transmission is not present in SA and most infections were asymptomatic, a rate of 5% is still high, particularly given that 19/21 of the cases were *Plasmodium falciparum,* which poses a significant potential risk to the individual infected.[27] These results, therefore, support the routine screening of all newly arrived African refugees for malaria.

Schistosomiasis

The prevalence rate of *Schistosomiasis* infection in this study was high at 24%. Rates in previous studies from both Australia and Europe ranged from 12% to 38%.[14,16,17]

Given the high number of African refugees infected with *Schistosomiasis*, the high morbidity associated with this infection, [28] the fact that the majority will be asymptomatic on arrival and the ease with which it can be treated in the early stages, routine screening of newly arrived refugees from Africa for *Schistosomiasis* is an extremely important activity to prevent costly illness and premature death in the long term.

The 10 participants in this study who recorded positive stool results for *Schistosomiasis* but who were also serology negative indicates there may be a lack of sensitivity with the serology test for *Schistosomiasis* which is most likely due to the antigen system used in the test. As a result, *Schistosomiasis* serology is not necessarily reliable on its own for detecting current *Schistosomiasis* infection. It is still, however, a useful tool in the diagnostic process when combined with stool and urine analysis.[29]

Syphilis

Only 89 participants were screened for syphilis as this test only became routine towards the end of the study period. Only one true infection was identified and bearing in mind the small number screened, these rates are much lower than those from previous Australian studies where rates ranged from 4 to 8%.[15-17]

Given the prevalence rates from these other studies, however, the consequences of infection, the small communicable disease risk and the usually easily treatable nature of this condition, it is important that newly arrived African refugees aged 15 years and over are offered routine screening for syphilis.

Strongyloides

Similarly, only a small number of participants were screened for *Strongyloides* so the results from this study are inconclusive. Previous Australian studies, however, have documented rates of 8%[17] to 11%.[19] Given the serious consequences of this infection in those who are immunocompromised and the simplicity of treatment, routine serological testing for *Strongyloides* should be considered for newly arrived African refugees. Whilst some African refugees receive a single dose of Albendazole prior to departure for Australia it is important to note that this is not an effective treatment for *Strongyloides*.

Vitamin D

The number of participants with low levels of vitamin D (62%) was extremely high in this study. Further, 7% had levels below 25nmol/L which is generally considered to indicate vitamin D deficiency. Whilst these results should be viewed with caution, as initially those tested in this study were selectively screened, previous studies have also shown low vitamin D levels and vitamin D deficiency to be extremely common in newly arrived African refugees to Australia. One previous study from Australia found the rate of African refugees with vitamin D levels below 37 nmol/L to be 30%[16] whilst another found those with levels below 50 nmol/L to be 84%.[17] Possible factors contributing to vitamin D deficiency in newly arrived African refugees to Australia include gender, cultural background, diet and length of time in Australia. It was beyond the scope of this project, however, to specifically test for the influence of these factors. Interestingly, the rate of those with low Vitamin D levels in East Africa was double that for West and Central Africa although differences in the rates by region should again be viewed with caution because of the initial selectivity of testing for Vitamin D in this study. These differences, however, could be partly explained by the fact that 100% (20/20) of those who transited through Egypt (included in the East Africa group) were found to have low vitamin D levels. An explanation for this, as was noted in the study by Tiong *et al*,[16] is that refugees who spend time in Egypt are more likely to have reduced exposure to sunlight as a consequence of living in apartments where they are forced to stay in doors because of fear of physical harm.

Vitamin D deficiency is associated with osteomalacia in adults, which results in brittle bones and an increase risk of bone fracture, and rickets in children, which results in growth abnormalities and bone deformity. Given the high rates in this and previous studies, and the potential consequences of low vitamin D levels, it is important that the vitamin D levels of all newly arrived refugees are assessed to both treat those individuals affected and to contribute to a better understanding of this condition.

Anaemia

The rate of anaemia in this study was 12% and this is compared to rates from previous Australian studies which range from 10 to 19%.[16,17,19] Rates were similar in all three African regions. Prevalence rates of anaemia in children in refugee camps in Africa have been found to range from 13 to 73%.[30]

The majority of anaemia (71%) was caused by iron deficiency and importantly, 5% of those screened had a haemoglobin <100g/L indicating more severe anaemia.

Iron deficiency was recorded in 34% and, once again, whilst some caution should be exercised when viewing these results given that this test was initially applied selectively to the sample, these rates compare with rates from previous Australian studies.[16,17]

Anaemia and iron deficiency can lead to a failure to thrive in children and, more generally, chronic fatigue, lack of energy, dizziness and an inability to concentrate. This can result in a reduced ability to study, work, undertake recreational activities and generally be a healthy and productive member of society.

Given the high rates of anaemia and iron deficiency in this and previous studies, and the consequences of these conditions, it is important to screen for anaemia and iron deficiency in all newly arrived African refugees.

Haemoglobinopathy

Only a small number of participants underwent haemoglobin electrophoresis (64/442) and, as mentioned, this was only performed on those with microcytic and/or hypochromic blood films and normal iron levels. The rate of abnormal haemoglobin detected, however, was high (52%). Rates from a previous study in Australia found alpha thalassaemia trait and sickle cell trait to be 11% and 7% respectively in newly arrived refugees from sub-Saharan Africa.[15] The problem with only performing haemoglobin electrophoresis on refugees whose blood films are microcytic and/or hypochromic is that many sickle cell traits will be missed as most uncomplicated forms of this condition have normal haemoglobin and red cell indices.[31]

Haemoglobin abnormalities are important to screen for to identify those who require genetic counselling to prevent more serious haemoglobinopathy syndromes in the offspring of newly arrived refugees.

Rates of haemoglobin abnormalities are known to be high in regions where malaria is endemic because of the survival advantage they convey. More data is needed to accurately document the rates of haemoglobin abnormalities in newly arrived refugees and to prevent more serious manifestations of these conditions. For these reasons it is important to routinely screen for haemoglobin abnormalities in newly arrived refugees.

Intestinal parasite infection

The rate of intestinal parasite infection was also high at 24% in this study. These rates are comparable to those from previous studies in Australia and the United States.[11,16,17] Given that the most infections were pathogenic, particularly the high rate of Giardia (11%), that

these infections can lead to chronic malabsorption and ill health and that most infections will be low grade or asymptomatic, continued routine stool analysis is an important activity for newly arrived African refugees. It is acknowledged that there can be practical difficulties with collection and transport of stool samples. Staff at the MHS, however, report extremely high compliance rates with stool testing in African refugees.

Other tests not routinely screened for at the MHS

Currently, the MHS does not routinely screen for Tuberculosis (TB), HIV and other sexually transmitted infections such as Chlamydia and Gonorrhoea.

The rates of TB infection in Africa are high.[32] Pre-arrival screening involves a chest X-ray which will identify active cases of pulmonary TB. The current practice at the MHS is to refer any new arrival with symptoms possibly representing TB to the State Tuberculosis service. There is currently a lack of consensus in Australia as to the most effective way of screening newly arrived refugees – mass or selective, and which test – Mantoux or Quantiferon Gold test.

Whilst HIV serology is a routine test for refugees prior to their arrival in Australia there are concerns about the reliability of testing overseas and the fact that there is often a long delay between having the test and arriving in Australia. In one Australian study, previously undetected HIV infection was found in 2 newly arrived African refugees out of the 1,989 refugees screened.[15] As with TB, there is currently no consensus in Australia on the value of retesting for HIV in newly arrived African refugees.

Unfortunately, a large percentage of newly arrived refugee women have been subject to gender based violence and sexual assault – both prior to fleeing their country of origin and in their first country of refuge. This is particularly the case in refugee camps. At present, the MHS does not routinely screen for chlamydia and gonorrhoea infection. Most women of reproductive age, however, are referred to an onsite well women's clinic run by nurses where, as well as being provided with information about contraception and women's health screening more generally, the need for further STI screening is discussed in a sensitive environment. Given the high rates of chlamydia and gonorrhoea in Africa,[33] however, routine screening for these infections with urinary PCR should be considered in all women who are sexually active.

The focus of this study on newly arrived African refugees does not deny the importance of building a health profile for refugees from other regions. The MHS commenced limited routine pathology screening on newly arrived non-African refugees presenting for a health

assessment at the end of 2005 to assist in this process. When assessing the need to routinely screen as well as which tests should be routinely undertaken, factors that need to be taken in to account include the condition of and length of time spent in refugee camps, geographical location of country of origin and refugee camps and previous access to health services.

Finally, it is important to remember that routine pathology screening should be seen as only one part of a more comprehensive health assessment for newly arrived refugees. Such a health assessment should also include a full history and physical examination; initiation of treatments for conditions identified; assessment of immunisation status and initiation of catch up vaccination; and referrals as necessary such as for counselling/psychology, social work and specialist medical and dental services.

5. Limitations

Many newly arrived African refugees were referred to the MHS from the Early Health Assessment and Intervention (EHAI) service provider in SA during this time period[j] - see Appendix 2 for referral criteria. It is possible that, as a result, new arrivals included in this study experienced a lower health status than other African new arrivals to SA. Most refugees arriving from Africa, however, would fit this high risk/high need criteria.

As already mentioned, rates of infectious diseases and nutritional deficiencies were also affected by the fact that some tests were selectively applied, many of which then became standard tests part way through the study period. There was also some variability in the uptake of the revised screening guidelines by GPs at the MHS. Even where sample numbers were small, however, results were generally comparable to those from previous studies and were also usually sufficient to either guide screening recommendations or indicate the need for further evaluation.

It is also possible that not all newly arrived refugees who attended the MHS in the study period were included in the study. This is because occasionally new arrivals (mainly young children) were referred to the IMVS or the WCH for pathology collection which, usually for logistical reasons, the refugee may have failed to attend.

[j] The former EHAI program was part of the Integrated Humanitarian Settlement Services program which was administered in SA by the Survivors of Torture and Trauma Rehabilitation Service (STTARS).

6. Conclusion/recommendations

High rates of a number of infectious diseases and nutritional deficiencies were detected in newly arrived African refugees in this study. This supports other Australian evidence and the experiences of health service providers in Australia that refugees from Africa carry a high burden of ill health. The following recommendations apply to both health services generally, where care is provided to newly arrived refugees, and specifically to the MHS:

- The routine voluntary pathology screening of all newly arrived African refugees to Australia is recommended. Appendix 3 provides a list of suggested routine pathology screening tests. Screening for these conditions not only benefits the individuals affected but also the community both in terms of a decreased need for costly medical treatments at a later stage and an increased ability of refugees to participate fully in their community. Further, the small risk of communicable disease transmission can be minimised.
- The current situation in South Australia and some other Australian states and territories is that most newly arrived refugees are referred directly to private general practitioners for an initial health assessment. It is recommended, therefore, that these screening guidelines are not only followed by specialist refugee health services such as the MHS but are also followed by GPs in private practice who are performing initial health assessments on newly arrived African refugees.
- It is recommended that MHS continue to evaluate the results of its pathology screening of newly arrived African refugees for the following reasons:
    - To ensure that the tests routinely screened for remain relevant for these population groups;
    - To continue to provide data that will assist in building a health profile of African refugees which in turn will guide the planning and delivery of health services for these population groups;
    - To further explore the aetiology of conditions such as vitamin D deficiency and the potential future impacts of this.
- To facilitate data collection at MHS, and a more detailed analysis of this data, it is recommended that a more systematic approach be adopted. The regular entering of new arrival data into a Microsoft Access database is one possible way this could be achieved. Further, to ensure a consistent approach is adopted with screening, consensus needs to be reached amongst all doctors as to what pathology tests constitute routine screening.

- Whilst it is possible that African refugees carry a disproportionate disease burden (at least physically) when compared to refugees from other regions it is still important to build a health profile for refugees from other regions. The MHS has begun to do this and it is recommended that this continue. It is important that the value of screening non-African refugees is also evaluated in the ways already mentioned for African refugees.

Appendix 1. Transit countries of participants

Country of origin (N=398)	Transit country (no.)
Sudan (210)	Kenya (149)
	Egypt (29)
	Uganda (29)
	Ethiopia (2)
	Zimbabwe (1)
Liberia (64)	Guinea (44)
	Ivory Coast (15)
	Sierra Leone (5)
Congo (39)	Malawi (18)
	Tanzania (9)
	Uganda (6)
	Zambia (6)
Burundi (35)	Tanzania (25)
	Malawi (6)
	Zambia (4)
Sierra Leone (22)	Ghana (21)
	Guinea (1)
Somalia (12)	Malawi (5)
	Ethiopia (3)
	Jordan (3)
	Iraq (1)
Ethiopia (7)	Sudan (7)
Rwanda (3)	Congo (3)
Ivory Coast (2)	Liberia (2)
Eritrea (1)	Sudan (1)

Appendix 2. IHSS EHAI service criteria for initial referral to mainstream or specialist medical services

High Need/High Risk (Mainstream via Specialist)	Low Need (Mainstream)
Poor English Poor literacy Extended stay in refugee camps Lack of urban experience Likelihood of exposure to exotic disease Multiple/complex medical problems Untreated/under treated injuries Sole parents Unaccompanied minors Lack of family/community support	Adequate English Basic literacy Urban experience Good family/community support

Appendix 3. Recommended routine screening pathology tests

Routine

- FBC
- Hb electrophoresis
- Malaria thick and thin films
- *Plasmodium* panspecific Ag
- U&E, LFTs
- *Schistosomiasis* serology
- 25-OH Vitamin D level
- Iron studies
- Hepatitis B and C serology
- Syphilis serology – in those aged over 15 years
- Stool – M/C/S and COPS
- Urinalysis
- Consider also:
  - o *Strongyloides* serology
  - o Urinary PCR for Chlamydia and Gonorrhoea if sexually active

Additional tests as required (not assessed by this study)

- Helicobacter Pylori serology – if clinical suspicion
- Entamoeba Histolytica serology if liver function tests abnormal and Hepatitis B and C serology are negative
- If blood on urinalysis – microscopy and *Schistosomiasis* ova

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