

Studies on communicable diseases

Bollag U. **Practical evaluation of a pilot immunization campaign against typhoid fever in a Cambodian refugee camp.** International Journal of Epidemiology 1980, 9(2): 121-2.

Study method

The practicability of a mass immunisation campaign for typhoid fever was tested by carrying out a trial in the smaller, well delineated refugee camp of Pochentong when an outbreak of typhoid fever occurred in the largest refugee camp of the besieged capital of Phnom-Penh, Cambodia.

Findings

Initial acceptance was good, due to a comprehensive service (information, health education and individual care of patients). Attendances by adults and children showed a steady decline with only 20% completing the course

Relevance to emergency relief

It was concluded that multijection immunisation campaigns against typhoid-paratyphoid were not cost-effective in a war-torn situation with an unstable population.

Key words: Cambodia, refugee, typhoid, vaccine

Keittivuti B, D'Agnes T, Keittivuti A, Viravaidya M. **Prevalence of schistosomiasis and other parasitic diseases among Cambodian refugees residing in Bang-Kaeng holding center, Prachinburi Province, Thailand.** American Journal of Tropical Medicine and Hygiene 1982; 31(5): 988-90.

Study method

When isolated cases of schistosomiasis were discovered, stool examinations were conducted on Cambodian refugees residing in Thailand. Further epidemiologic investigations were conducted on a sample of 5,085 Cambodian refugees in the Ban-Kaeng holding center, using the intradermal skin test as a screening device to determine the prevalence of this disease.

Findings

A positive diagnosis of *Schistosoma mekongi* was confirmed in 17 of those examined by recovery of eggs in the stool. The prevalence of schistosomiasis in the Bang-Kaeng camp was 3.3 cases/1,000 population. All positive cases came from geographic areas in Cambodia where schistosomiasis has not been previously reported, indicating that schistosomiasis in Cambodia is currently more widespread than generally believed.

Relevance to emergency relief

In certain areas, screening for schistosomiasis may be needed and if detected, treatment will need to be available

Key words: Cambodian refugees, Thailand, Bang-Kaeng camp, schistosomiasis, stool examinations.

Khan MU, Munshi MH **Clinical illnesses and causes of death in a Burmese refugee camp in Bangladesh.** International Journal of Epidemiology 1983; 12(4): 460-4.

(See Information Management)

Shears P. **Tuberculosis control in Somali refugee camps.** Tubercle 1984; 65(2): 111-6.

Study method

The tuberculosis program in one of the camps in the N W. of Somalia, with a population of 25,000, was evaluated with a view to developing recommendations to improve its effectiveness

Findings

By mid-1981 an estimated 500 000 refugees were living in camps in Somalia. As the temporary camps had become permanent, crowded settlements, tuberculosis had become an increasing health problem. Initial treatment programmes were started in most of the camps, which had no microscopy facilities or active case finding. Fifty per cent of patients started on treatment were lost to the programme in the first year: many had left the camp, others defaulted while remaining there. As microscopy facilities became available it was possible to concentrate the limited resources on sputum positive patients and to attempt active case finding.

Relevance to emergency relief

This paper describes the early recognition of problems associated with implementation of TB control programs in refugee settings. Evaluation of the program highlighted particular problems in management. Recognition of these problems in all refugee settings led to the preparation and publication by WHO in 1997 of 'Tuberculosis Control in Refugee Situations: an inter-agency field manual'. This manual is a tool for the implementation, monitoring and evaluation of TB control programs in refugee situations.

Key words: Somalia, refugees, tuberculosis, treatment, compliance.

Keittivuti B, Keittivuti A, O'Rourke T, D'Agnes T. **Treatment of *Schistosoma mekongi* with praziquantel in Cambodian refugees in holding centres in Prachinburi Province, Thailand.** Transactions of the Royal Society of Tropical Medicine and Hygiene 1984, 78(4): 477-9.

Study method

Eighty-four cases of *Schistosomiasis mekongi* among Cambodian refugees in holding centres in Thailand received praziquantel at 30 mg/kg body-weight orally twice in one day. Those treated were admitted to hospital in order to observe side effects for 24 hours. Assessment of the efficacy of praziquantel was based on cure rates

Findings

Side effects observed consisted primarily of abdominal pain, anorexia, nausea, emesis and headache. These were generally mild and transient. Physical signs revealed mild hepatomegaly and splenomegaly. The cure rate obtained one month after treatment was 97.5% and by 2 to 12 months after treatment reached 100%.

Relevance to emergency relief

Praziquantel is effective treatment for schistosomiasis

Key words Prachinburi Province, Thailand, Cambodian refugees, schistosomiasis, treatment, praziquantel.

- *Spinaci S, De Virgilio G, Bugiani M, Linari D, Bertolaso G, Elo O. **Tuberculin survey among Afghan refugee children. Tuberculosis control programme among Afghan refugees in North West Frontier Province (NWFP) Pakistan.** *Tubercle* 1989; 70(2): 83-92.

Study method

In order to study the prevalence of tuberculous infection among Afghan children a tuberculin survey was carried out in April and May 1985 on a cluster sample of male children attending the first two grades of primary schools in refugee camps in the NWFP. The sample size was 4108 male children with an average age of 8 years. 1358 of them, average age of 7.8 years, had not been vaccinated with BCG.

Findings

An infection prevalence of 13.8% was found when using a transverse diameter of 10 mm induration or more for the tuberculin test as the criterion for infection. The findings were compared with the results of a national sample survey carried out in Afghanistan in 1978: a downward trend of the annual risk of infection (ARI) of 7.8% per year was found in children of the same age group.

Relevance to emergency relief

Since 1982 over 2 million Afghan refugees have settled in the North West Frontier Province (NWFP) of Pakistan. Socio-economical factors, sudden urbanisation and psychological stress may influence the pattern of tuberculosis morbidity and infection among refugees as compared with the original population. Thus, Afghan children living in refugee camps in NWFP showed a lower ARI than was observed in their homeland 7 years earlier. The results suggest that refugees have been provided with better health services than were available for the original population.

Key words: Pakistan, Afghan, refugees, tuberculosis, children.

*Development Co-operation Ministry for Foreign Affairs, Rome, Italy

- *CDC. **Enterically transmitted non-A, non-B hepatitis -- East Africa.** *MMWR* May 01, 1987/36 (16); 241-4.

Study method

Somalia After an outbreak of hepatitis was recognised at Tug Wajale B refugee camp in northwestern Somalia, in January 1985, intensive epidemiological investigation, involving a tent-to-tent survey, and serological tests were begun.

Sudan Knowledge of the outbreak in Somalia led to intensified surveillance in camps in eastern Sudan when jaundice was reported in mid-1985.

Findings

Somalia: Estimates indicated more than 2000 cases of clinical hepatitis in a population of approximately 32,000. Of the 30 people who died, 16 were pregnant women. Results of examination of serum samples and stool samples showed 10% positive for hepatitis B surface antigen and, by exclusion, enterically transmitted non-A, non-B hepatitis was concluded to be responsible for most other cases.

Sudan Total population and total number of cases were not reported. Of the 63 people who died, 11 were pregnant women. Serum samples were taken from 175 patients. Results were similar to those from Somalia with a few cases of Hepatitis B diagnosed.

Caveats

At the time of this study, diagnosis by exclusion was the only means of identification of non-A, non-B hepatitis. It was known there were two types, one similar to hepatitis B and the other a type transmitted by the faecal-oral route. More recent research has identified hepatitis E which is transmitted by the faecal-oral route and can be positively diagnosed. It is now known that the virus responsible for much of the infection in these refugee situation was hepatitis E.

Relevance to emergency relief

Refugee camps represent a fertile setting for transmission of enterically transmitted hepatitis. Inadequate sanitation and overcrowding are contributing factors and in some camps contaminated drinking water may be a contributor although not the case in these two studies. Therefore priority must be given to the provision and maintenance of appropriate sanitation and adequate clean water from the onset of an emergency.

Key words: Somalia, Tug Wajaale, refugees, hepatitis, pregnant women.

* Reported by S Gove, MD, MPH, Ali-Salad, MD, MA Farah, MD, D Delaney, MJ Roble, J Walter, Somalia Ministry of Health. N Aziz, MBBS, Sudan Commission on Refugees Health Unit. International Health Program Office, Hepatitis Br, Div of Viral Diseases, Center for Infectious Diseases, CDC

***Meek SR. Epidemiology of malaria in displaced Khmers on the Thai-Kampuchean border.** Southeast Asian Journal of Tropical Medicine and Public Health 1988; 19(2): 243-52.

Study method

Malaria epidemiology from 1983 to 1985 in displaced Khmers living in camps on the Thai-Kampuchean border was studied for planning and evaluation of control measures.

Findings

Incidence varied by camp according to the suitability of the habitat for the vectors. Camps with high incidence had a higher ratio of *Plasmodium falciparum* to *P. vivax*, a higher mortality rate, especially in young children and sometimes pregnant women, but a lower case fatality rate than camps with low incidence. Transmission occurred year round, but peaked in the rainy season.

Relevance to emergency relief

Epidemiological information was considered more useful for planning than for evaluating control measures. Early consideration of vector control is important in areas where malaria is prevalent. Chemoprophylaxis of at risk groups may be needed.

Key words: Khmers, refugees, malaria, transmission, chemoprophylaxis, vector control.

*United Nations Border Relief Operation, c/o UNDP, Bangkok, Thailand

***Suleman M. Malaria in Afghan refugees in Pakistan.** Transactions of the Royal Society of Tropical Medicine and Hygiene 1988; 82(1): 44-7.

Study method

To test whether malaria in Afghan refugees was higher than among Pakistan residents, a comparison of rates of infection was conducted in both populations in different age groups.

Findings

(i) a comparison of age-specific parasite rates of malaria in Afghan refugees and a nearby local population at Karachi indicated that Afghan refugees were susceptible to malaria even in later age-groups, while infections in the local population were limited to younger age-groups; (ii) a comparison of epidemiological trends of malaria in Afghan refugees and the local population in the North-West Frontier Province from 1979 to 1986 demonstrated that the rate of increase in the prevalence of malaria over the years was much higher in Afghan refugees than in the local population, a manifestation of low herd immunity in Afghan refugees.

Relevance to emergency relief

The most plausible explanation was that Afghan refugees, being more susceptible, were at high risk of malaria infection in Pakistan rather than that they brought a high infection load with them from Afghanistan. Therefore, malaria control in Afghan refugee camps in Pakistan should be primarily based on preventive, rather than curative, measures.

Key words. Pakistan, Afghan, refugees, malaria, control.

* Zoology Department, University of Peshawar, Pakistan

- * Moren A, Stefanaggi S, Antona D, Bitar D, Etchegorry MG, Tchatchioka M, Lungu G
Practical field epidemiology to investigate a cholera outbreak in a Mozambican refugee camp in Malawi, 1988. Journal of Tropical Medicine and Hygiene 1991 Feb, 94(1).1-7.

Study method

An epidemiologic investigation was conducted to identify high-risk groups and potential risk of acquiring the disease when 951 cases of cholera were registered at the cholera treatment centre in a Mozambican refugee camp in Malawi between 15 March and 17 May 1988. A matched-pair case-control study of food and water consumption was performed early in the outbreak

Findings

The epidemic duration was 65 days. *Vibrio cholerae* biotype E1 Tor serotype Inaba was isolated. The epidemic started in the section near the market place and radiated out. Cases were more likely to use shallow wells (surface wells) instead of boreholes compared to controls and cases were more likely to have had contact with the market than controls. None of the food items available at the market was more likely to be preferred by cases than controls.

Relevance to emergency relief

Of all populations affected by cholera, refugees are at particular risk of infection due to overcrowding and poor sanitation. Therefore priority must be given to the provision of appropriate sanitation and adequate clean water from the onset of an emergency. Systems for communicable disease surveillance must be in place and community education should focus on prevention, detection, reporting and management of all diarrhoeal diseases, as well as cholera. If outbreaks occur, temporary measures must include early case finding and treatment, temporary closure of the market, tetracycline prophylaxis of contacts and water chlorination.

Key words. Malawi, Mozambique, refugees, cholera, water, sanitation

* Authors are from Epicentre, Paris, France

*Brown V, Larouze B, Desve G, Rousset JJ, Thibon M, Fourrier A, Schwoebel V. **Clinical presentation of louse-borne relapsing fever among Ethiopian refugees in northern Somalia.** Annals of Tropical Medicine and Parasitology 1988; 82(5): 499-502

Study method

In order to assess the clinical presentation of Louse-borne relapsing fever (LBRF) in an Ethiopian refugee camp in northern Somalia, a referral system was organized for all pyrexias of unknown origin.

Findings

Among the 134 patients referred, 37 showed *Borrelia* in fresh and stained blood smears. Common clinical features were: high fever, headache and general body pain, liver tenderness, petechia, nausea and vomiting, chills and rigors and epistaxis. Jaundice was absent. No fatalities were observed.

Note

The clinical picture was less severe than in previous studies on LBRF. This difference might be due to the fact that the present study was community-based as opposed to the previous studies which were hospital-based.

Relevance to emergency relief

Louse-borne relapsing fever (LBRF) is still endemic among Ethiopian populations. Its presence needs to be identified and assessed by surveillance and clinical appraisal. Appropriate means of vector control are needed as well as disease management.

Key words: Somalia, refugees, louse-borne relapsing fever, vector control

*Medecins Sans Frontieres, Paris, France.

*Candler W, Phuphaisan S, Echeverria P, Liangthorachon B, Bhaibulaya M, Arthur J, Bodhidatta L, Buduan R. **Amoebiasis at an evacuation site on the Thai-Cambodian border.** Southeast Asian Journal of Tropical Medicine and Public Health 1990; 21(4): 574-9.

Study method

Behavioral risk factors were investigated by conducting a case-control study. A questionnaire was administered to 73 families, each having at least one member with confirmed intestinal amoebiasis within the past 3 months, and to 95 randomly selected control families having no individual with diarrhoea for at least 3 months.

Findings

Monthly incidence rates of intestinal amoebiasis were determined to be inversely proportional to cumulative monthly rainfall. The highest incidence of amoebic dysentery was in children 12-23 months old. Individuals from families with greater than 4 members were at higher risk for acquiring intestinal amoebiasis. No significant differences in behavioral risk factors were identified between case and control families. Most water samples drawn from wells where amoebiasis patients obtained their drinking water were contaminated. The main route of transmission of *E. histolytica* was not identified, but was most likely via the faecal-oral route.

Relevance to emergency relief

Provision of a safe water supply is essential, even in a temporary evacuation site. Community health education is important

Key words: Thai-Cambodian border, amoebiasis, diarrhoea, water.

*Division of Preventive Medicine, Walter Reed Institute of Research, Washington, DC 20307-5100

- *Sutter RW, Haeffliger E. **Tuberculosis morbidity and infection in Vietnamese in Southeast Asian refugee camps.** American Review of Respiratory Disease 1990; 141(6): 1483-6.

Study method

To assess the tuberculosis burden among Vietnamese refugees, refugees within 1 or 2 days after arrival in camps were screened in Thailand and in the Philippines. Refugees in camps in Thailand were screened with chest radiographs. Persons with radiographic findings consistent with tuberculosis received microscopic and culture examination of sputum specimens. Refugees in the Philippines were given a tuberculin skin test. An annual risk of infection of 2.2% was calculated for this group.

Findings

The prevalence of bacteriologically confirmed pulmonary tuberculosis was 5.8 per 1,000 refugees. Males had a higher risk of infection than females. The age-specific prevalence of tuberculosis and the tuberculous infection increased with age. A high proportion of refugees with positive tuberculin skin tests were eligible for preventive therapy.

Relevance to emergency relief

Special efforts may be necessary to target Vietnamese refugees, as well as other persons originating from countries of high tuberculosis prevalence, for enhanced diagnostic and preventive intervention against tuberculosis to achieve the national goal of tuberculosis elimination by the year 2010. More consideration is needed concerning treatment of tuberculosis in emergency settings.

Key words: Vietnamese refugees, Thailand, Philippines, tuberculosis

*Intergovernmental Committee for Migration, Geneva, Switzerland

- *Moore PS, Toole MJ, Nieburg P, Waldman RJ, Broome CV. **Surveillance and control of meningococcal meningitis epidemics in refugee populations.** Bulletin of the World Health Organisation 1990; 68(5): 587-96.

Study method

To determine risk of meningococcal meningitis, reference is made to studies in non-refugee populations in refugee prone areas.

Findings

Epidemics of communicable diseases pose a direct threat to refugee and internally displaced populations, and could lead to high mortality rates and a disruption of basic health care services. Several large refugee populations live in regions of high meningococcal disease endemicity and their camps are at risk for outbreaks of meningococcal meningitis. Confirmation of meningococcal disease can be performed under field conditions using simple techniques, such as latex agglutination. Isolates should be obtained for serogroup confirmation and antibiotic sensitivity studies at reference laboratories.

Relevance to emergency relief

Surveillance in camps allows early detection and control of impending outbreaks. Serogroup information is used to determine the risk of widespread epidemic disease and the utility of available vaccines. During epidemics, treatment regimens should be standardized, preferably with an effective single-dose antibiotic. Mass vaccination campaigns should be initiated, the populations at high risk being targeted for vaccination as quickly as possible. When the risk of epidemic disease is deemed to be high, preemptive vaccination may be warranted. The threshold incidence to initiate vaccination is 15/100,00/week for 2 weeks. Daily surveillance using a simple case definition is essential during an epidemic to determine the effectiveness of control measures and to delineate high-risk groups for vaccination or chemoprophylaxis. Many of these recommendations can be applied also to other populations in developing countries.

Key words: refugees, meningitis, epidemics, surveillance, control, vaccination, treatment.

*Centers for Disease Control (CDC), Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA 30333

*Porter JD, Gastellu-Etchegorry M, Navarre I, Lungu G, Moren A. **Measles outbreaks in the Mozambican refugee camps in Malawi: the continued need for an effective vaccine.** International Journal of Epidemiology 1990; 19(4): 1072-7.

Study method

Surveillance was conducted in Mozambican refugee camps in Malawi between November 1988 and January 1989, when measles outbreaks occurred in 11 camps in Malawi with five camps principally affected.

Findings

A total of 1214 cases were reported. Despite the reduction of the age of measles vaccination to six months in 1987, attack rates were highest in children aged 6-9 months; rates were also high in the 0-5 month age group. The case-fatality rate was high among children less than five years old. Children were being inappropriately vaccinated, either being vaccinated at less than six months of age or failing to receive a second dose if vaccinated at six months. With vaccine coverage between 66-87%, vaccine efficacy in children less than five years old was estimated to be more than 90% in the camps principally affected.

Relevance to emergency relief

Reduction of the age of vaccination leads to logistical problems in vaccine delivery in refugee situations. These outbreaks again indicate the need to improve vaccine coverage with the existing Schwarz vaccine, and also highlight the urgent need for an effective single dose measles vaccine for children less than nine months of age. Although measles is a 'single-dose' vaccine, two doses of the currently available vaccine are recommended in refugee settings.

Key words: Mozambique, Malawi, refugees, children, measles, vaccination.

*Epicentre, Paris, France.

*Nosten F, ter Kuile F, Maelankirri L, Decludt B, White NJ. **Malaria during pregnancy in an area of unstable endemicity.** Transactions of the Royal Society of Tropical Medicine and Hygiene 1991; 85(4): 424-9.

Study method

A prospective study of malaria during pregnancy was conducted between September 1986 and December 1989 in an area of unstable (mesoendemic) malaria transmission on the Thai-Burmese border. Antenatal clinics were set up in camps for displaced persons of the Karen ethnic minority and 1358 pregnant women were enrolled at a mean estimated gestational age of 23 weeks and were followed weekly until delivery.

Findings

Malaria developed in more than one third of women; most infections were *Plasmodium falciparum*, less than 20% were *P. vivax*, and a small number were mixed. Primigravidae were infected more commonly than multigravidae. The incidence of malaria declined from the 20th week of gestation towards term. Most infections were detected before symptoms developed, and there were no deaths associated with malaria. Despite this, malaria was associated with an overall 123 g reduction in birthweight. This reduction was largely accounted for by lower birthweights of babies born to infected primigravidae and women in their 2nd and 3rd pregnancies. The incidence of anaemia requiring treatment was higher in women who developed malaria, and was proportional to the number of parasitaemic episodes.

Relevance to emergency relief

Despite regular antenatal clinic attendance with prompt detection and treatment of malaria (the currently employed antimalarial strategy in areas with multidrug-resistant *P. falciparum*), malaria still had a significant adverse effect on pregnancy.

Key words: Karen, refugees, malaria, pregnant women.

*Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

*Decludt B, Pecoul B, Biberson P, Lang R, Imivithaya S. **Malaria surveillance among the displaced Karen population in Thailand April 1984 to February 1989, Mae Sot, Thailand.** Southeast Asian Journal of Tropical Medicine and Public Health 1991; 22(4): 504-8.

Study method

This study was based on analysis of data gathered over a period of five years within a program of patient care based on the coupled laboratory/dispensary set up in April 1984 and using a system of surveillance of morbidity and mortality from malaria.

Findings

During the time of the study, the displaced population increased from 9,000 to 20,000. Analysis of the trends shows a hyperendemic situation with an annual incidence rate of 1,067 per thousand in 1984. This figure was 600 per thousand in 1988. 1,500 blood smears were checked each month and the positive predictive value of clinical suspicion was 45% on average. *Plasmodium falciparum* represented 80% of infections. The malaria case fatality ratio over the course of the last two years of surveillance was 0.3%.

Relevance to emergency relief

Five years observation show that strategies for malaria control in this region can be based on the development of curative services and laboratories and gathering information from these facilities.

Key words: Karen, Thailand, malaria, surveillance

*Médecins Sans Frontières, Paris, France.

- *Tulchinsky TH, Belmaker I, Raabi S, Acker C, Arbeli Y, Lobel R, Abed Y, Toubassi N, Goldberg E, Slater PE. **Measles during the Gulf War: a public health threat in Israel, the West Bank, and Gaza.** Public Health Review 1992-93; 20(3-4): 285-96.

Study method

Surveillance and documentation of measles cases was conducted in Israel, West Bank and Gaza in 1991.

Findings

The epidemic reached its peak during the war in February, continuing into March. There were a total of over 433 reported cases, with 203 hospitalizations and 7 deaths. The epidemic was slowed by curtailment of school and other civilian activities, and a mass vaccination campaign reaching 60,000 children, but was spread by crowded conditions in hospital, and was spread to other parts of the country by internal population migration.

Relevance to emergency relief

An epidemic of a preventable disease occurring during a national emergency adds to the burdens of the health system. The public health system must be prepared to contain epidemics and other public health threats in wartime, employing standard control methods developed and practiced during peacetime. Routine immunization policies should take into account the possibility of a civilian epidemic during national emergencies, and the need to assure protection of both the civilian and military population in preparation for such contingencies.

Key words: Gulf War, Israel, West Bank, Gaza, measles, epidemic, vaccination.

*Department of Preventive Health Services, Ministry of Health, Jerusalem. Israel.

- *Yip R, Sharp TW. **Acute malnutrition and high childhood mortality related to diarrhoea.** Lessons from the 1991 Kurdish refugee crisis. JAMA 1993 Aug 4; 270 (5): 587-90.

Study method

To determine the extent, major causes, and contributory factors of high rates of morbidity and mortality among children at mountain camps along the Turkey-Iraq border during the 1991 Kurdish refugee crisis, a cross-sectional rapid nutrition survey was conducted among children together with a retrospective mortality survey covering a 2-month period from the onset of the crisis. The study was conducted in households of Kurdish refugees at resettlement camp 1 near Zakho in northern Iraq.

Findings

Weight-for-height measurements indicated that children under 2 years of age had suffered significant recent malnutrition. Wasting was present and generalised weight loss was indicated, probably as a result of the high rates of diarrhoea, which still affected 50% of the younger children at the time of survey. The crude mortality rate for all ages was 8.9 per 1000 per month;

two thirds of the deaths occurred among children aged 5 years or younger, and half among infants younger than 1 year. An estimated 12% of all infants died during the first 2 months of the crisis. Most deaths were due to diarrhea, dehydration, and resulting malnutrition.

Relevance to emergency relief

The high rates of malnutrition and mortality related to diarrhea in infants and younger children of Kurdish refugees took place rapidly despite prompt relief efforts and a previously healthy population. This experience underscores the need for early and aggressive public health management of sanitation, water sources, and diarrhoea control programs to augment the traditional focus on food and medical relief during the emergency phase of a refugee crisis.

Key words. Iraq, Kurdish refugees, morbidity, mortality, nutrition, water, sanitation.

* Division of Nutrition, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, US Public Health Service, Atlanta, Ga

Moore PS¹, Marfin AA¹, Quenemon LE², Gessner BD³, Ayub YS⁴, Miller DS⁵, Sullivan KM⁶, Toole MJ⁷. **Mortality rates in displaced populations of central Somalia during 1992 famine.** The Lancet 1993; 341: 935-937.

(This study was also published in MMWR December 11, 1992 / 41(49); 913-917)

Study method

Because the situation was too dangerous to undertake complete cluster surveys in nine central Somali towns to assess causes of death, a stratified survey was undertaken in two Somali population groups - a camp for displaced persons in Baidoa and the town of Afgoi where residents and displaced people were mixed.

Findings

The mortality rates found were among the highest recorded for civilian populations. In Baidoa, mortality rates were about thirty times higher than expected in peacetime and nearly 75% of displaced Baidoa children under 5 years old died between April and November 1992. Deaths peaked during simultaneous epidemics of *Shigella dysenteriae* and measles. Rates for both population sections in Afgoi were lower than those for displaced persons rates in Baidoa and better reflect population based mortality rates in central Somalia which were also extremely high. With the exception of poultry ownership and residence status, no socio-economic risk factors were associated with mortality risk in the survey. Preventable infectious diseases were the main causes of death in this study.

Caveats

There were no reliable census data for Baidoa or Afgoi so population estimates were made by relief agencies working in the towns. People were counted as displaced if they had moved to their present location because of war or famine in the previous 24 months. Because of the limitations of the study, the authors advised caution in projecting the mortality rates across the whole Somali population.

Relevance to emergency relief

Because two common and preventable conditions, measles and diarrhoea were the main causes of death as found in other famine disaster settings, the findings reinforce the need for aggressive prevention and management of common infectious diseases in displaced populations, especially during periods of widespread famine. Public health interventions based on trained community health workers should always be a priority. Implementation of these programs in Somalia was difficult because of the level of fighting and similar difficulties could be encountered in other

war settings. However, high priority should always be given to implementing a simple public health surveillance system to monitor relief efforts.

Key words: Somalia, Baidoa, Afgoi, famine, morbidity, mortality, infectious diseases, public health.

1. Division of Vector Borne Infectious Diseases, National Centre for Infectious Diseases, CDC, Colorado; 2. Division of Environmental Hazards and Health Effects, National Centre for Environmental Health, CDC; 3. Division of Field Services, Epidemiology Division, CDC; 4. Somali Country Office, UNICEF, Nairobi; 5. Division of Cancer Prevention and Control, National Centre for Chronic Disease Prevention and Health Promotion, CDC; 6. Division for Epidemiology and Centre for International Health, Emory University School of Public Health, Atlanta; 7. International Health Programs Office, CDC.

***Sundnes KO, Haimanot AT. Epidemic of louse-borne relapsing fever in Ethiopia. Lancet 1993; 342 (8881): 1213-5.**

Study method

When an outbreak of louse-borne relapsing fever occurred simultaneously in two transit camps in Eritrea, antibiotic treatment was given to patients in both camps but an extra intervention (vector control by delousing) was conducted in one camp only.

Findings

In the camp (Bahr Dar) where there was no vector control, cases increased over 20 days while the number of cases decreased significantly in the other camp (Mekele). Furthermore, there was a significant correlation between the decreasing proportion of camp inhabitants that had not been deloused at Mekele camp each day and the numbers of patients with fever.

Relevance to emergency relief

Taken together, these results confirm that effective control of an epidemic of louse-borne fever is dependent on effective vector control in addition to antibiotic treatment. In camps where inhabitants have come from areas where louse-borne fevers are endemic, epidemics can develop quickly and must be controlled quickly with all appropriate means including vector control.

Key words: Ethiopia, louse-borne relapsing fever, antibiotics, vector control.

*Department of Anaesthesia, Baerum Hospital, Norway.

Marfin AA¹, Moore J², Collins C³, Biellik R⁴, Kattel U⁵, Toole MJ⁶, Moore PS⁷. Infectious disease surveillance during emergency relief to Bhutanese refugees in Nepal. Journal of the American Medical Association August 3, 1994; 272 (5): 377-381.

and

CDC. Surveillance of the health status of Bhutanese refugees -- Nepal, 1992. MMWR January 15, 1993 / 42 (01); 14-17.

Study method

With the assistance of the Centres for Disease Control (CDC), a longitudinal study was conducted from camp administrative records, using simple case-definitions, in six Bhutanese refugee camps in Nepal by personnel from Save the Children Fund - United Kingdom (SCF-UK). To encourage mortality reporting, free funeral shrouds were offered and structured interviews were conducted with families. The aim of the study was to determine cause-specific and age-specific morbidity and mortality trends.

Findings

Mortality rates for children reached levels 2-8 times the levels in the non refugee Nepalese community. Half the deaths were due to ARI and diarrhoea was a common cause. Measles was present. Multiple antibiotic resistant shigella dysentery was a common cause of morbidity and *P. vivax* malaria was confirmed by blood smears. There was only minimal burden on health workers and the data were used to immediately change public health management. Disease control programs were initiated and during the four months after starting disease surveillance and disease control interventions, mortality rates were reduced to below public health emergency levels.

Relevance to emergency relief

This study illustrates the importance of instituting sustainable infectious disease surveillance to guide health planning for refugee populations during the emergency phase of a relief program. Training for rapid identification and response to potential epidemics such as cholera, meningitis or Japanese encephalitis is crucial. In this instance, examples of changes in management included greater emphasis on oral rehydration programs to reduce diarrhoea specific mortality in children under 5 years old, measles immunisation and vitamin A supplementation. These measures are essential in all refugee settings.

To prevent the spread of epidemic diseases to local residents, and the refugee population, screening of newly arrived refugees and surveillance for epidemic diseases in refugee camps is essential.

Key words: Nepal, Bhutanese refugees, surveillance, infectious disease, health workers,

1, 7. Division of Vector-borne Infectious Diseases, National Centre for Infectious Diseases, Centres for Disease Control and Prevention Fort Collins, Co, 2,3,5. Save the Children Fund (UK), 5 WHO, Nepal, 6. Centres for Disease Control and Prevention, Atlanta, Go.

Workneh Feleke¹, Tesfae Shiferaw², Michael Tadesse³, Goshu Abebe⁴, Negussie Yitbarek⁵
Evaluation report of HIV/STD control and prevention, UNHCR/CDC/ARA/MOH Joint Project, Bench Zone of Southern Ethiopia Region, June 11-18, 1994. Report to CDC and UNHCR.

Study method

A cross sectional study was carried out during the period June 12-18, 1994 to evaluate the effects of the 2 year intervention programs in HIV/AIDS control in Bench Zone, southern Ethiopian People's Administration. The study population was a systematic selection of commercial sex workers (CSWs) from the close towns, refugee students and refugees in Dimma camp. A questionnaire covering demographics, knowledge and awareness of HIV/AIDS, STDs, condom use, availability acceptability and STD morbidity assessment was administered by trained health workers from the Bench Zone and refugee camp who spoke the dialects and were familiar with the cultures. In addition STD management practices at health facilities were surveyed.

Findings

Important details of knowledge and behaviour in the 3 target areas were documented. A high level of awareness about HIV/AIDS transmission was found in all 3 groups but there was also a low level of misconceptions, particularly among the CSWs. Communities were open to discussion about HIV/AIDS. The level of willingness to care for people with AIDS was low, especially among the students.

Condom knowledge was high and availability seemed adequate but reported use was low among the students. Although reported knowledge of signs of STDs was good in all groups,

most respondents reported that they did not know whether they had had STDs. Reported treatment and cure rate varied.

In the health centres and hospitals, STDs were theoretically managed according to standard treatment but there was a shortage of pharmaceutical supplies including drugs for STDs and reagents for testing. Morale among staff was low. In Dimma camp, case management and follow up was carried out according to standard protocols and there were adequate medical supplies.

Relevance to emergency relief

HIV/STD prevention and control is feasible in a refugee setting. Evaluation of educational interventions is crucial to identify success and areas where interventions were less successful. It is necessary to consider the activities and interaction between the refugees and the surrounding community. Culturally appropriate interventions, resources and educational programs need to be available for all sections of the community. Specifically targeted interventions may be needed for particular sections and agencies working with refugees must also be prepared to help support staff and upgrade the health services in the surrounding community. From lessons learnt, programs can be replicated in other refugee settings, giving priority to areas which need urgent intervention.

Key words: Ethiopia, Dimma, refugees, HIV, STDs, knowledge, awareness, prevention

1. NACP Ministry of Health, 2. Jimma Health Service, 3. Bench Zone Health Dept., 4. PSI Ethiopia, 5. September 30, 1994 / 43(38),701-3

- * Hatch DL, Waldman RJ, Lungu GW, Piri C **Epidemic cholera during refugee resettlement in Malawi.** International Journal of Epidemiology 1994, 23(6): 1292-9

Study method

When a cholera epidemic occurred in a Mozambican refugee population resettling in southern Malawi in June 1988, a case-control study was conducted to determine possible risk factors for disease. The characteristics of 48 refugee households with any member(s) hospitalised for suspected cholera were compared to 441 randomly sampled refugee households without hospitalisations.

Findings

Vibrio cholerae 01 was isolated from 50% of case-patient stool cultures. Having any water containers with > or = 10 litre capacity was associated with significantly lower odds of suspected cholera in households, as was having metal cooking pots, after adjusting for length of residence and socioeconomic status. Households with two or more children < 5 years old were at markedly increased odds of suspected cholera.

Relevance to emergency relief

The importance of provision of appropriate water containers and cooking pots as part of the early response of relief agencies to emergencies has been highlighted in nutrition studies and other communicable disease studies. The results of this study suggest that water containers and cooking pots served important preventive functions during a cholera outbreak.

Key words: Malawi, Mozambican refugees, cholera, risk factors, water containers.

* International Health Program Office, Centers for Disease Control, CDC/EPO/DFE/International Branch, Atlanta, GA 30333, USA

Mast E¹, Polish L¹, Favorov M¹, Khudyakhova N¹, Collins C², Tukei P³, Koptich P³, Khudyakov Y¹, Fields H, Margolis H². and the Somali Refugee Medical Team²
Hepatitis E among refugees in Kenya: apparent person-to-person transmission, evidence for age-dependent disease expression and new serologic assays. *Viral Hepatitis and Liver Disease* 1994; 375-378.

Study method

To ascertain cases of hepatitis, a census of the entire camp was conducted between October 28 and November 1 1991 using a standardised data collection form

Findings

Seasonal rain catchment ponds were the primary source of water. Primary cases were exposed to this common source. The number of secondary cases due to person-to-person contact were comparatively very few.

Relevance to emergency relief

Provision of a safe water supply is a crucial primary intervention in emergency settlements of refugees. Effective disease surveillance for early detection is essential.

Key words: Kenya, Somali refugees, hepatitis E, water.

1 Centres for Disease Control and Prevention, Atlanta, Ga. 2 UNHCR, Nairobi, Kenya, 3. Kenya Medical Research Institute, Nairobi, Kenya

*Soares JL, Arendt V, Coue JC, Milleliri JM, Philips B, Regis R, Merouze F, Rey JL [**Short-term ciprofloxacin treatment of bacillary dysentery due to *Shigella dysenteriae* type 1 in Rwandan refugees**] *Med Trop* 1994; 54(4): 319-23. [Article in French]

Study method

In 1994, an outbreak of dysentery caused by *Shigella dysenteriae* type I resistant to all public health antibiotics in vitro occurred among Rwandan refugees in Zaire. The only active antimicrobial agent available was ciprofloxacin. It was administered to hospitalized patients in a conventional 5-day schedule. To ration the supply for the benefit of the greatest number, a randomized blinded study was performed to compare the effectiveness of short-term treatment (1 g of ciprofloxacin in a single daily doses for 2 days) with that of the standard treatment (1 g of ciprofloxacin in two daily doses for 5 days).

Findings

The study included 57 refugees over the age of 15 years with dysentery. *Shigella dysenteriae* type I was identified in 26 patients. Except for sex distribution, there was no significant difference in clinical and bacteriologic features of the two populations. Efficacy of ciprofloxacin was not dependent on the mode of treatment, taking into account clinical or bacteriologic criteria.

Relevance to emergency relief

The duration of ciprofloxacin treatment for dysentery caused by *Shigella dysenteriae* type 1 could be shortened to two days. Short-term treatment has several advantages. One is cost-effectiveness since fluoroquinolones are costly and scarce. Others are to allow treatment of a greater number of patients and improving compliance.

Key words: Zaire, Rwandan refugees, shigella dysentery, treatment, resistance, ciprofloxacin,

Bouma MJ, Goris M, Akhtar T, Khan N, Khan N, Kita E **Prevalence and clinical presentation of glucose-6-phosphate dehydrogenase deficiency in Pakistani Pathan and Afghan refugee communities in Pakistan; implications for the use of primaquine in regional malaria control programs.** Transactions Royal Society of Tropical Medicine and Hygiene 1995; 89(1): 62-4.

Study method

Glucose-6-phosphate dehydrogenase (G-6-PD) deficiency surveys in Afghan refugees and a local community in the North-West Frontier Province, Pakistan, were conducted

Findings

Results showed that G-6-PD was most common among Pathan and Uzbek refugees. The prevalence among Pakistani Pathans was much less, and that in Tajik and Turkoman refugees was small. Hospital studies showed that the type of G-6-PD deficiency in Pathans could cause severe haemolytic crises. The potentially fatal side effects of primaquine treatment in the Pathan communities, and the high risk of re-infection, render the anti-relapse treatment policy for *Plasmodium vivax* obsolete.

Relevance to emergency relief

Epidemic conditions of *P. falciparum* malaria may justify the use of primaquine as a gametocidal drug, administered as a single dose, during the transmission season in the study area. These findings necessitate revision of the recommendations for the use of primaquine in the area

Key words: Pakistan, refugees, malaria, G-6-PD, primaquine.

*Medecins Sans Frontieres-Holland, Medical Department, Amsterdam, The Netherlands

* Siddique AK, Salam A, Islam MS, Akram K, Majumdar RN, Zaman K, Fronczak N, Laston S **Why treatment centres failed to prevent cholera deaths among Rwandan refugees in Goma, Zaire.** Lancet 1995; 345(8946). 359-61

Study method

Treatment centres and services established in response to the cholera outbreak in Goma, Zaire, in July 1994 were examined and evaluated

Findings

Mortality from the disease was much higher than expected; the highest reported case-fatality ratio for a single day was 48%. The *Vibrio cholerae* strains were resistant to tetracycline and doxycycline. The slow rate of rehydration, inadequate use of oral rehydration therapy, use of inappropriate intravenous fluids, and inadequate experience of health workers in management of severe cholera are thought to be some of the factors associated with the failure to prevent so many deaths during the epidemic

Relevance to emergency relief

Improvement of training for health workers, treatment by oral rehydration and separation of patients could increase the odds of survival of cholera patients even in a disaster setting

Key words: Rwandan refugees, Goma, cholera, treatment centres, mortality, rehydration, health workers.

* Community Health Division, International Centre for Diarrhoeal Disease Research, Bangladesh.

***Paquet C, Leborgne P, Sasse A, Varaine F. [An outbreak of *Shigella dysenteriae* type 1 dysentery in a refugee camp in Rwanda]. Sante 1995, 5(3): 181-4. [French]**

Study method

A compliance assessment was conducted when all dysentery cases were treated with nalidixic acid for 5 days during the outbreak of dysentery due to *Shigella dysenteriae* type 1 (Sd1) that developed in Nzangwa, Rwanda, a camp hosting some 20,000 Burundese refugees in 1993/94. Prevention measures were also assessed.

Findings

Less than half of the ambulatory patients completed the 5-day regimen. From 35 stool samples obtained from the refugees, seven Sd1 strains were isolated, of which three were multi-resistant to nalidixic acid. These results confirmed the morbidity and mortality of Sd1 outbreaks in the displaced populations of Central Africa.

Relevance to emergency relief

The difficulties in implementing effective prevention measures and appropriate case management strategies in this environment were emphasised. To improve the management of patients in large Sd1 outbreaks with limited resources, a clinical classification of cases according to the risk of dying was devised. Future outbreaks should be avoided by implementation of appropriate water and sanitation services together with health education campaigns. Appropriate antibiotics for treatment need to be determined and supplies need to be readily available. Sufficient attention to education about compliance with treatment is needed.

Key words: Rwandan refugees, shigella, treatment, education.

*Medecins sans frontieres, Paris, France.

***Milleliri JM, Soares JL, Bunzele G, Rey JL. [Collective food poisoning in a camp for unaccompanied refugee children in the city of Goma, Zaire, September 1994]. Sante 1995; 5(4): 253-7. [Article in French]**

Study method

A retrospective study of a group of 440 children following an outbreak of infectious food poisoning in Goma in 1994 was conducted. The study was part of the epidemiological surveillance in a non-accompanied child refugee reception centre.

Findings

There were 11 cases (rate 2.5%) of food poisoning. A problem of hygiene in the food preparation chain was detected. Despite the numerous epidemics in the region (cholera, dysentery) this study demonstrated that they were not responsible. Similarly, the findings removed any existing doubts about the quality of the food supplied as part of the international aid.

Relevance to emergency relief

Training about hygiene and appropriate food preparation needs to be included in health promotional activities in refugee camps. Routine evaluation of practices is important.

Key words: Goma, children, food poisoning, hygiene

*DCSSA, Section epidemiologie, Armees, France.

*Engels D, Madaras T, Nyandwi S, Murray J **Epidemic dysentery caused by *Shigella dysenteriae* type 1: a sentinel site surveillance of antimicrobial resistance patterns in Burundi.** Bulletin of the World Health Organisation 1995, 73(6): 787-91.

Study method

A nationwide, health-centre based, sentinel site survey to check the drug resistance of *Shigella dysenteriae* type 1 (Sd1), was conducted because annual epidemics of bacillary dysentery have been a public health problem in Burundi for the last 14 years. Recent civil unrest, resulting in the displacement of large numbers of people into refugee settlements, has aggravated the situation.

Findings

Shigella spp. (of which 97% were Sd1) were isolated from 73% of the 126 specimens collected from six main sites around the country. There was no difference in culture results from fresh and frozen stool specimens. Overall Sd1 resistance to commonly available antibiotics (sulfamethoxazole + trimethoprim, ampicillin, tetracycline, and chloramphenicol) varied from 77% to 99% and was fairly uniformly distributed over the country. All Sd1 isolates were susceptible to newer drugs, such as ciprofloxacin and ceftriaxone. Resistance to nalidixic acid, the current first line of treatment for bacillary dysentery in Burundi, varied from 8% to 83% in the different sentinel sites; global resistance was 57%.

Relevance to emergency relief

Newer drugs will be needed to treat shigella dysentery but studies would be needed to determine the most cost-effective regimen.

Key words: Burundi, displaced people, *Shigella* dysentery, resistance, treatment, antibiotics.

*Programme for the Control of Diarrhoeal Diseases, Belgian Technical Cooperation, Burundi.

Bisrat F, Berhane Y, Mamo A, Asefa E. **Morbidity pattern among refugees in Eastern Ethiopia.** East African Medical Journal 1995; 72 (11): 728-30

Study method

Using a descriptive cross sectional design, data were collected using a uniform format from all refugee camps in eastern Ethiopia to document the morbidity pattern among refugees.

Findings

Respiratory tract infection and diarrhoeal diseases were identified as the major causes of morbidity, accounting for 31.8% and 27.3% respectively in children under five years, and for 34.9% and 8.5% respectively in the other age groups. The findings were consistent with other studies done in refugee populations elsewhere.

Relevance to emergency relief

Although problems such as those documented here were identified by studies 10 years earlier, they continue to be major problems in emergency situations. A coordinated multidisciplinary primary health care approach to management of the health problems of refugees by local and international relief agencies' staff still needs emphasis.

Key words: Eastern Ethiopia, refugees, morbidity, primary health care

*Seaman J, Mercer AJ, Sondorp HE, Herwaldt BL. **Epidemic visceral leishmaniasis in southern Sudan: treatment of severely debilitated patients under wartime**

conditions and with limited resources. *Annals of Internal Medicine* 1996; 124(7): 664-72.

Study method

During a massive epidemic of visceral leishmaniasis during war in southern Sudan, a cohort study was undertaken to determine the patients treatment outcomes when cared for under wartime conditions and with limited resources and to identify patient characteristics associated with the outcomes. 3076 consecutive patients who had visceral leishmaniasis were admitted to the treatment centre and were treated with the pentavalent antimonial compound sodium stibogluconate.

Findings

The patients had a median age of 15 years and were notably anaemic and malnourished; most had been sick less than 5 months. Although patients could not be monitored after treatment to document cure, most were successfully treated; 10% died during their first admission, and a small number were known to have relapsed. In univariate analysis, young and older age, long duration of illness, markedly low hemoglobin level or body mass index, large spleen, high parasite density, and vomiting at least once during the treatment course were associated with death.

Relevance to emergency relief

Despite the severe debility of the patients and the exceptionally difficult circumstances under which they were treated, most patients fared remarkably well. Treatment of visceral leishmaniasis is feasible under emergency conditions.

Key words: Sudan, visceral leishmaniasis, treatment.

*Médécins sans Frontières-Holland, Amsterdam, The Netherlands

Haelterman E^{1,2}, Boelaert M^{1,3}, Suetens C¹, Blok L⁴, Henkens M¹, Toole MJ⁵. **Impact of a mass vaccination campaign against a meningitis epidemic in a refugee camp.** *Tropical Medicine and International Health*. 1996; 1 (3): 385-392.

Study method

Serogroup A meningococcus epidemics occurred in refugee populations in Zaire in August 1994. At the threshold of 15 cases per 100,000 per week, an immunisation campaign was started and population surveillance to detect and record meningitis in the following period was undertaken.

Findings

Despite rapid institution and high coverage, the campaign had limited impact on morbidity due to meningitis.

Relevance to emergency relief

In the early phase in refugee camps, the relative priorities of meningitis and case management need to be better defined.

Key words. Zaire, refugees, meningitis, surveillance, treatment

1 Médecins Sans Frontières, Belgium 2 Department of Epidemiology and Social Medicine, School of Public Health, Free University of Brussels, Belgium 3 Epidemiology Unit, Prince Leopold Institute of Tropical Medicine, Antwerpen, Belgium 4 Médecins Sans Frontières, Holland, Amsterdam, The Netherlands. 5. Macfarlane Burnet Centre for Medical Research, Melbourne, Australia.

*Rey JL, Cavallo JD, Milleliri JM, L'Hoest S, Soares JL, Piny N, Coue JC, Jouan A. **[Fever of unknown origin (FUO) in the camps of Rwandan refugees in the Goma region of in Zaire]**. Bull Soc Pathol Exot 1996; 89(3). 204-8 [Article in French]

Study method

To explore the possible aetiologies of fevers of unknown origin which occurred after the outbreaks of cholera, dysentery and meningitis in Rwandese refugees in August and September 1994 in the camps of the Goma's area (Zaire), a case control study was conducted

Findings

Clinically, the cases occurred more frequently than controls: headache, splenomegaly and neutropeny. Serologically, there was no significant difference between cases and controls, but prevalence of HIV-1 infections and arbovirus infections were very high. Arbovirosis could explain, partially or associated with HIV and tuberculosis, the presence of these fevers more than the malaria or typhus epidemic.

Relevance to emergency relief

It is important to try to determine the aetiology of fevers of unknown origin so that appropriate response can be implemented.

Key words: Goma, refugees, fever

*Service de biologie medicale, Hopital des armees Begin, Saint-Mande.

Rowland M, Bouma M, Ducornez D, Durrani N, Rozendaal J, Schapira A, Sondorp E. **Pyrethroid-impregnated bed nets for personal protection against malaria for Afghan refugees**. Transactions of the Royal Society of Tropical Medicine and Hygiene 1996; 90(4). 357-61

Study method

A field controlled trial of permethrin-impregnated bed nets (PIBs) was conducted in 2 Afghan refugee villages in Pakistan. Trial families were encouraged to attend the village health centres if they fell ill.

Findings

An initial survey showed that most household heads were aware that malaria was transmitted by mosquito bites, but only 2% had used bed nets before. Microscopy records showed that, between July and December 1991, 22.4% of the control group became infected with *Plasmodium vivax* and 13.0% contracted *P. falciparum* while in the intervention group only 9.9% contracted *P. vivax* and only 3.8% contracted *P. falciparum*. A single treatment of the nets with permethrin remained protective throughout the 6 months' transmission season. Most families claimed to use their nets every night; members of families who claimed to use nets less regularly showed an incidence similar to that of the control group. There was no sex or age difference in net use or protective efficacy. Headlouse infestation rates were reduced in PIB users. Few nets were washed, given away or sold.

Relevance to emergency relief

The prospect for PIBs as personal protection appears good, despite people's lack of previous experience.

Key words: Pakistan, refugees, malaria, permethrin-impregnated bed nets (PIBs).

*HealthNet International, University Town, Peshawar, Pakistan.