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Editor's Choice

This issue has a healthy mixture of items. There are three papers that we were unable to squeeze into the leprosy elimination campaign (LEC) issue. The paper from West Bengal (p. 71) in which 8000 new cases were detected in an 8-day LEC is a striking example of how many undetected cases there are in some parts of India. It will require considerable effort for many years to continue detecting and treating new cases. By contrast, a LEC in Amazonas, Brazil (p. 77) did not reveal large numbers of undetected cases. Amazonas still has a high leprosy prevalence rate and I wonder what the differences are between Amazonas and West Bengal that produce such different results in their LEC campaigns. We conclude the LEC material with a colourful account of the media activities in the Nepal LEC (p. 62). A wide range of activities were used to raise awareness about leprosy including using celebrities as well as people affected by leprosy and talking about leprosy with humour. I hope readers enjoy the campaign theme song. It will be interesting to go re-survey people in Nepal to see whether the campaign has had a lasting effect.

Do we need a label for patients who have had leprosy? Wim van Brakel and P. K. Gopal (p. xx) argue against the notion and especially that we should not be using the term Pal as shorthand for person affected by leprosy. For many people with disabilities the origin is irrelevant.

Detecting exposure to leprosy remains a challenge. Joe LeMaster and Paul Roche (p. xx) discuss the possibilities and difficulties of producing and assessing the new skin test antigens. In Ethiopia, the detection of patients by health care workers is a priority and Paul Saunderson and Guido Gronen (p. 34) show that the presence of any two of five cardinal signs of leprosy can be used. These suggestions are however probably very location specific and other countries should be encouraged to produce their own diagnostic criteria.

We also publish another report from the Bangladesh Acute Nerve Damage Study. These results show much nerve damage continues to occur, 36% of patients had an episode of acute nerve function impairment. Of these, 86% were silent. This is a very salutary reminder of the need for regular nerve function testing if nerve damage is to be detected at a stage when it is still treatable.

Last year the topic for the Lepra medical student essay competition was 'A woman with leprosy is in double jeopardy'. We had such good entries that we awarded a joint first prize. We plan to publish both essays to keep women's issues at the forefront and you can find the essay by Mathew Shale on p. 5.

DIANA N. J. LOCKWOOD

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Editorials

ARE WE ANY CLOSER TO BEING ABLE TO MEASURE LEPROSY EXPOSURE?

As we reach the end of the 20th century, the goal of eliminating leprosy as a public health problem is in sight. However, case detection rates in highly endemic countries appear to remain stable. This may partially be due to changes in case ascertainment and an improved health delivery system. However, there is still no way to assess the prevalence of exposure in an endemic community. If we are to make progress towards eradication and assess the impact of MDT as it is actually delivered *in situ*, such a test will be needed.[1] If it were possible to develop a test that would allow us to measure total exposure in a community, this could help us eventually to predict mathematically the relationship between exposure and the incidence of leprosy, and also to assess whether the risk of infection in the community is changing over time (the 'trend in the annual risk of infection').[2] Such a test would need to be highly specific (i.e. non-exposed persons from non-endemic countries should be non-responsive); there should be some way to differentiate a response due to exposure to *M. leprae* from that due to other mycobacteriae; an increase in the proportion of the population testing 'positive' for the test should predict (at least in a subset of those 'positive') an increase in the risk of acquiring disease; and finally, a 'positive' test result should be more common in sub-groups of the community known to be at higher risk of disease (i.e. household contacts, especially the very young contacts of smear-positive MB patients).[3]

In tuberculosis, the other mycobacterial disease that affects millions worldwide, exposure has been assessed through use of a delayed hypersensitivity (DTH) skin test reaction using a purified protein derivative (PPD). The PPD skin test's sensitivity in identifying infected persons has made it the accepted measure for assessing the incidence of infection in endemic communities, despite the fact that PPD has significant cross-reactivity with other mycobacterial antigens, especially BCG.[4] There are many parallels between tuberculosis and leprosy: the number of exposed persons far exceeds those who actually develop clinical disease; there is a significant lag time between exposure and disease; both organisms engage cell-mediated immunity; and in both instances, the immune systems of a high proportion of 'exposed' individuals control the organisms soon after contact.[5]

The search for a skin test for leprosy is not new. Skin test reactivity to Rees' or Convit's cytosolic *M. leprae* antigen (called Leprosin A or MLSA) does not predict an increased risk for the development of clinical leprosy, rather the opposite. In longitudinal studies conducted in Malawi, any degree of skin test reactivity to soluble antigen was associated with decreased

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subsequent risk of developing leprosy.[6] Further, extensive skin test surveys using MLSA in India have shown that there is no appreciable difference in reaction size distributions between leprosy patients, contacts and other persons in the endemic community.[7,8] Fractionation products of *M. leprae* (MLSA produced from purified *M. leprae* from armadillo tissues minus the immunosuppressive lipid lipoarabinomannin (LAM), called MLSA-LAM, and *M. leprae* cell wall antigen from the same source, called MLCwA) have now been developed and produced in the USA under FDA-approved manufacturing (GMP) conditions.[9] In 6-day whole blood assays, stimulation by MLSA-LAM and MLcWA led to the production of significantly more interferon-gamma (IFN) than by Rees' antigen in leprosy patients. There was also good concordance in that study between Lepromin A skin test positivity (Mitsuda reaction) and production of IFN. However, in these 6-day assays, using T cells from presumably non-exposed individuals from non-endemic countries, stimulation by the fractions also led to IFN production. This has been accepted as evidence that the fractions have poor specificity.[10] However, the 6-day assay may not be the appropriate approach to evaluate this. A high correlation has been found between IFN production in a 24-h whole blood assay and 48 h DTH reactivity to PPD in tuberculosis.[11]

IFN is a cytokine produced by 'armed effector' T-cells already circulating in the blood of exposed individuals and IFN produced in 24-h cultures is from these cells.[12] Further, IFN is vital in the initiation of a DTH response: IFN-producing cells can be demonstrated in skin test sites (where they make up approximately 33% of cells by 48 h after *in vivo* inoculation).[13] It therefore seems that the correct approach to evaluate new potential skin test antigens should use the 24 h assay. Twenty-four hour whole blood assays in Nepal have recently shown that the T-cells of both household contacts of leprosy patients and paucibacillary leprosy patients, when stimulated by MLSA-LAM and MLCwA, produce significantly greater amounts of IFN than the T-cells of other persons in endemic communities (so-called 'endemic controls'). T-cells of tuberculosis patients when stimulated by the same antigens do not have this response. This suggests a lesser degree of cross-reactivity with *M. tuberculosis* than has been found using ordinary MLSA. In the same study, on 24-h MLSA stimulation there was no difference in IFN production between 'endemic controls' and household contacts, paucibacillary leprosy patients or tuberculosis patients.[14] (This MLSA was the parent substance produced in Colorado, prior to removal of LAM.) Phase I clinical safety trials in the US have further shown that these fractions are non-toxic and do not elicit a skin test reaction in individuals from non-endemic countries who have not been exposed to leprosy.[15] A phase II skin test trial, which will also take place in Nepal in 2000, will investigate the appropriate dose, immunological dynamics, sensitivity and specificity of the fractions in a country with high leprosy endemicity.

From our observation of a specific IFN response to MLSA-LAM and MLCwA, we would predict that there will be larger and more frequent skin test reactions in leprosy-exposed individuals compared to 'endemic controls'. Will these antigens be 'good enough' to use in further investigations of the exposure dynamics of leprosy? The search for a highly specific leprosy skin test antigen has led the WHO TDR to fund multi-centre immunological screening of a pool of *M. leprae*-specific peptides (identified from the *M. leprae* genome sequencing project). Immunological responses to these peptide pools have been highly variable in different continents, related to the different frequency of HLA subtypes in each population.[16] New, presumably specific peptides or even whole *M. leprae*-specific proteins will probably be identified and need to be tested *in vitro* in the coming few years. But even should the ideal antigen be identified, and the costly and time-consuming process of

producing it under GMP conditions be undertaken, such a highly specific antigen is likely to be less sensitive than the current fractionation antigens (since an increase in specificity is usually accompanied by a decrease in sensitivity).[9] The current fractionation products may thus be our best practical hope for a skin test, and it seems important to ensure that proper trials are done to evaluate their usefulness in countries with high leprosy endemicity, where they will need to be used eventually by control programmes. Should the current fractionation products described here prove inadequate, it will still be important to establish a reliable method to screen new potential skin test antigens: the 24-h whole blood IFN assay seems an approach worth confirmation prior to testing out an antigen in a skin test trial. The eventual development of a useful leprosy skin test will provide new opportunities for leprosy control, for rational targeting of leprosy resources and a tool to investigate the remaining epidemiological conundrums of leprosy.

Reference

[1] Smith WCS. We need to know what is happening to the incidence of leprosy. *Lepr Rev*, 1997; **68**: 195–200.
[2] Sutherland I. On the risk of infection. *Bull Int Union Tuberc Lung Dis*, 1991; **66**: 189–191.
[3] Ponnighaus JM, Fine PEM, Sterne JAC, Bliss L, Wilson RJ, Malema SS, Kileta S. Incidence Rate of Leprosy in Karonga District, Northern Malawi: patterns by age, sex,. BCG status and classification. *Int J Lepr*, 1994; **62**: 10–23.
[4] Rieder HL. Methodological issues in the estimation of the tuberculosis problem from tuberculin surveys. *Tubercle Lung Disease*, 1995; **76**: 114–121.
[5] Fine P. Leprosy and tuberculosis. *Tubercle*, 1984; **65**:137–153.
[6] Fine PEM, Sterne JAC, Pvnnighaus JM, Rees RJW. Delayed-type hypersensitivity, mycobacterial vaccines and protective immunity. *Lancet*, 1994; **344**: 1245–1249.
[7] Gupte MD, Anantharaman DS, Kannan S, Vallishayee RS. Experiences with *Mycobacterium leprae* soluble antigens in a leprosy endemic population. *Lepr Rev*, 1990; **61**: 132–144.
[8] Krishnamurthy P, Rao PS, Subramanian M, Suresh Kumar SK, Neelan PN. *Mycobacterium leprae* soluble antigen (Rees) skin test responses in an endemic population in India. *Ind J Lepr*, 1993; **65**: 49–57.
[9] Brennan PJ. TerLouw SM. New skin test antigens for the diagnosis of leprosy. Transactions of the 15th International Leprosy Congress. *Int J Lepr*, 1998; **66**: 96A.
[10] Weir RE, Brennan PJ, Butlin CR, Dockrell HM. Use of a whole blood assay to evaluate in vitro T-cell responses to new leprosy skin test antigens in leprosy patients and healthy subjects. *Clin Exp Immunol*, 1999; **116**: 263–269.
[11] Streeton JA. Desem N. Jones SL. Sensitivity and specificity of a gamma interferon blood test for tuberculosis infection. *Int J Tuberc Lung Dis*, 1998; **2**: 443–450.
[12] Janeway CA. Travers P. *Immunobiology: the immune system in health and disease*, 2nd edn. Churchill Livingstone, Edinburgh, 1996; 9:40–9:42.
[13] Chu CQ, Field M, Andrew E, Haskard D, Feldmann M, Maini RN. Detection of cytokines at the site of tuberculin-induced delayed-type hypersensitivity in man. *Clin Exp Immunol*, 1992; **90**: 522–529.
[14] Manandhar R, LeMaster J, Roche P. Interferon gamma responses to candidate leprosy skin test reagents detects exposure to leprosy in an endemic population. *Int J Lepr*, 1999 (in press).
[15] Higgins JA, Lazar CL, Brennan PJ, TerLouw SM. *Two new leprosy skin test antigens: MLSA-LAM and MLCwA. Final report of phase I testing.* BB-IND 7938, Report to US Federal Drug Administration, 1999.
[16] Dockrell HA, Hussain R, Shahid F, Chiang T, Roche P, Butlin R, Pessolani C, Sampaio E, Sarno E, Gebre N, Hunegnaw M, Negesse Y, Amare G, Britton S, Murrillo L, Guzman F, Robertson B, Thole J, Young D, Fruth U. WHO synthetic peptide skin test antigens. Transactions of the 15th International Leprosy Congress. *Int J Lepr*, 1998; **66**: 95A.

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REVIEW

Women with leprosy
A woman with leprosy is in double jeopardy

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Introduction

Leprosy is a major public health problem in much of the developing world, and is the subject of intense effort to reduce this threat. Men and women may be affected in different ways, be they biologically or socioculturally.[1] Leprosy is a visible disease, and carries fear and stigma. It is suggested that women, already socially inferior to men in many societies, suffer greater problems than men in such matters as receiving health education, access to treatment and mobility. Hardship resulting from the disease is probably felt more by women than men, with greater social and marital rejection and loss of self esteem. The following is a discussion of the biological (sex) and sociocultural (gender) aspects of the disease in women, and tries to assess whether the female leprosy patient really is in greater jeopardy than her male counterpart.

The disease

Leprosy is a chronic inflammatory disease, caused by *Mycobacterium leprae.* The period between infection and development of symptoms is often between 2 and 10 years.[2,3] The presenting features of the patient depend mainly upon ability to generate and maintain a suitable immune response, particularly cell-mediated immunity (CMI). The clinical spectrum[4] ranges from tuberculoid leprosy (TT) at the one extreme, to lepromatous leprosy (LL) at the other. Between these forms lie the immunologically unstable boderline forms. Tuberculoid leprosy represents a strong CMI response by the host. Visible signs are usually limited to one skin lesion; smears or biopsies reveal few if any bacilli.

Lepromatous leprosy arises from the relative failure of cell-mediated responses, and is a generalized condition involving many systems; particularly skin, nerves, testes, eyes and nasal mucosa.

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Sex related patterns of leprosy incidence

Sex differences in the incidence of leprosy are influenced by the population studied, with various Indian studies reporting male:female ratios from 2:1 to 1:1.[5,6,7] In Africa, there is a similar ratio of 2:1 observed in Ethiopia[8,9] but a reversal of this is reported in Malawi (61% females),[10] Chad (59% women),[11] and Burkina Faso (a ratio of 1:1.5).[12] In Venezuela, the ratio is 1.8:1,[3] and in Turkey almost 3:1.[13] Many of these figures represent the number of patients registered for treatment, and as discussed below, women are less likely voluntarily to report for treatment. Women are up to twice as likely to develop TT leprosy than LL in many studies around the world,[8,14] and since TT patients are often treated for shorter periods, are less likely to be on registers of active cases. Women are more likely to develop sub-clinical leprosy on exposure to *M. leprae*, shown by the increased reactivity to skin testing in female contacts of leprosy patients.[3,14,15]

Reactions

A key feature of leprosy is the occurrence of reactions; immunologically mediated events occurring with changes in CMI. Type 1 reactions (reversal reactions, RR) occur mainly in non-lepromatous patients and present as scaly, swollen erythematous skin lesions and neuritis. The reaction lasts from days to months, and represents an upgrading of CMI. Type 2 reactions (erythema nodosum leprosum, ENL) occur in LL patients and present as crops of erythematous papules with systemic features such as neuritis, arthritis, iritis and orchitis. Due to reasons discussed below, reactions are more common in female patients.[16]

Endocrine factors have been shown to affect the immune response, and testosterone is immunosuppressive of CMI responses.[17] Oestrogen, shown to increase the antibody response, remains unproven as a promoter of CMI.

Deformity and disability

Deformity is a greater problem amongst men, who suffer more moderate and severe deformity than women,[10,11,18] related in part to their greater risk of developing LL and lower compliance rates. Deformity occurs when nerves become damaged either by the disease or during a reaction. Deformity in women tends to be of the hands, possibly due to damage from household work with anaesthetized hands.[13,19] In Chad, it is noted that women are less likely to have deformity at the time of diagnosis, so that with proper treatment they may avoid disability.[11]

Fertility

In many leprosy-endemic societies, childbearing is an important activity for women, and large families are prized. The association of leprosy with female infertility is not as clear as in males, where scarring of the testes by the disease is acknowledged as often causing infertility.[20] A study in India has reported lower numbers of children to leprosy mothers,[5]

but uses a cohort from a leprosarium, making the effect of infertility hard to differentiate from the effects of associating only with potentially infertile males, and the increased use of contraceptives in hospital settings. There is little evidence of women's knowledge about the effect of leprosy upon prospective children, and since many societies still believe it to be a disease of heredity, some women may avoid pregnancy.

Pregnancy

There is a paucity of contemporary data on leprosy and pregnancy. Lockwood and Singha[20] have recently reviewed all published data on leprosy and pregnancy.[21] Most of the available studies were done in pre-MDT days with inappropriate controls and is thus difficult to interpret. Pregnancy results in depression of CMI by the fetoplacental unit,[22] thus the pregnant patient may be postulated to be at risk of new disease, relapse and reactions.[2,23–26] An Ethiopian study[26] of 120 pregnancies in 154 patients suggested that reactivation of leprosy does occur during pregnancy whilst a recent Venezuelan[3] study in 54 pregnancies did not find this.

There is a clear temporal association between parturition and the development of type 1 reactions, when CMI returns to pre-pregnancy levels.[25] In the Ethiopian study 60% of type 1 reactions occurred during the post-partum and lactation phase with 42% of BL patient pregnancies being complicated by a type 1 reaction. In the same study LL patients experienced ENL reactions throughout pregnancy and lactation.[27] ENL in pregnancy is associated with early loss of nerve function compared to non-pregnant individuals.[28] Neuritis is an important complication of pregnancy and parturition, since significant numbers of women may develop nerve damage associated with pregnancy and lactation.[29] Thus pregnant and newly delivered women should have regular neurological examination.[30,31] Without appropriate treatment the patient risks developing nerve damage and disability. Educating women and their carers about the complications of leprosy in pregnancy should be a priority. A unique danger to women is that even after release from treatment they may be vulnerable to reactivation of persisting bacilli due to the depression of CMI during pregnancy. There is an urgent need for a prospective cohort study of women of childbearing age with leprosy so that the risks of leprosy complications in pregnancy can be documented and patients advised on the basis of current good evidence.

Offspring

When a leprosy patient does get pregnant, babies are affected in accordance with the mothers leprosy. Placental function is reduced by leprosy, and intrauterine growth retardation occurs commonly in babies of LL mothers.[32,33] Respiratory defects are the commonest cause of neonatal mortality associated with lepromatous mothers.[33] Passage of the disease to offspring is a controversial topic, with several studies finding for and against placental transfer of bacilli.[34] The reduced birth weight of babies born to leprous mothers combined with an increased susceptibility to neonatal gastrointestinal infections may lead to failure to thrive.[2] Death of infants is usually the trigger for further pregnancy, and multiple pregnancies have the same detrimental effects on general health as they do in non-leprous mothers, as well as the multiple effects of reactivation of the disease on nerve damage.

Medication

Since 1982, due to the increased emergence of dapsone resistance, the World Health Organisation (WHO) has recommended that leprosy treatment should consist of three drugs, including dapsone, (multi-drug therapy, MDT).[35] The MDT regimen for multi-bacillary (MB) patients is daily self-administered dapsone and clofazimine, together with monthly supervised rifampicin and clofazimine. There treatments are continued for a minimum of 2 years for MB patients, and 6 months for PB patients. These drugs are powerful, and may occasionally have side-effects of which women are rarely warned. Rifampicin has the effect of turning urine, tears and breast milk reddish brown, and may (uncommonly) induce jaundice initially.[36] Clofazimine produces reddish brown skin pigmentation and may lead to discontinuation of the treatment, and wariness of western medicine.[36,37] There seems to be little warning of these effects to patients.[14] Common side-effects of both treatments include gastrointestinal upset, especially diarrhoea, a serious risk to generally undernourished females in the developing world. Both dapsone[36] and rifampicin can occasionally cause haemolytic anaemia, which may be of increased significance in already anaemic, menstruating women and dapsone can affect folate metabolism, and in chronically undernourished patients, may be significant in the development of anaemia. Despite the lack of proof of teratogenicity, some women stop taking their medication in pregnancy, and this may contribute to downgrading phenomena, and the evolution of secondary dapsone resistance. The commonly used treatments for reactions are prednisolone, clofazimine and thalidomide. The use of prednisolone in pregnancy and lactation must be closely supervised, and the use of thalidomide is problematic in pre-menopausal female patients. Effective drugs for the treatment of reactions and proper supervision are not always available in control programmes.

Persisting female inequalities

In general, women are socially disadvantaged, with cultural and economic problems, and female leprosy patients suffer increased stigma.[3,6,11,13,30,38–40] Education for women is a low priority in many societies, and rates of illiteracy amongst females range from 74% (44% for males in same study) to 100% in various leprosy endemic regions.[6,11,13,14] In India, around 80% of women, regardless of class or education, engage in household work, causing dependence on husbands for economic support.[40] Leprosy, due to stigma and deformity, makes women unable to continue household work, and they may lose status in the family and end up leaving their homes.[5,6,40] Women are expected to put their family before themselves, and may fail to seek help early in the disease, being unable to find time to leave their family.[1] Women are less able to travel for treatment,[6,40,41] and seldom do so alone, usually accompanied by a male companion.[40,42] The health of a female relates to the number of other women in the family, and when there are two or more female family members, their health is generally better.[42] A common complaint, particularly amongst Muslim women, is of a generalized syndrome of 'body pains', explained by some observers as being the result of oppression, fatigue, and general health issues including malnourishment, vitamin deficiency, and anaemia.[14] Males rarely perceive the inequalities in health care faced by women, and since policy decisions are made by men, women's concerns are unlikely to be acted upon.[6,38] It is clear that 'just being a woman' is a danger in some parts of the world, even without the problems of leprosy.

Disease knowledge

The patients knowledge of their disease is influenced by factors including the effectiveness of public health education programmes, the ability of patients to grasp (and accept) concepts presented, and the access patients are given to such information (women may not be allowed access by their husbands). In many cultures there are ancient beliefs regarding diseases such as leprosy. Some reject the concept of germs as causative agents, and view disease as divine punishment or an inherited problem.[6,14,30,43–45] The Hindu religion views deformity as a divine punishment, and there is a strong association in many peoples' minds between leprosy and poverty.[30] Lack of belief or confidence in conventional medicine, which often conflicts with their traditional world view, leads to patients seeking primary treatment from local healers. In Pakistan it is noted that only 3/41 primary consultations by females were to qualified conventional physicians[37] and that up to 22 years had being wasted on ineffective folk cures in some cases.[14] Illiteracy contributes to problems understanding the messages of western health beliefs. It is easier to accept an explanation that is understood and accepted culturally, such as evil spirits. Data from Pakistan have shown that only 5/128 patients (of both sexes) accepted the germ theory of disease, including 69 hospital inpatients with long-standing disease, and 73% saw their leprosy as a punishment from God.[14] Studies in India have shown changing health beliefs between established and newly diagnosed patients, with fewer new patients relating leprosy to past 'sins'. Females show a greater change in this knowledge than men.[6] With respect to the delay in seeking western medical treatments after the first appearance of skin lesions, a larger change was noted amongst females (from 5 years amongst established patients, to just over 2.5 years in new patients) than males (from over 3 years to 2 years), but males are still more likely to seek early western treatment. The period between identifying the skin changes as leprosy, and seeking western treatments is reduced for newer patients of both sexes, to around 1 year, although all females first sought traditional advice.[6] This is compounded by the problem of health personnel rarely being aware of the disease's earliest manifestations.[14,31,39] Delay in seeking conventional medical assistance has been shown elsewhere to influence prevention of deformity and sensory loss.[46] In Pakistan 52% of patients initially sought help from folk healers.[14] These figures suggest that health education is increasingly reaching women but that they still do not, or cannot act upon it appropriately. Regardless of women's knowledge of disease, their access to treatment relies upon male sanction.[38] Men, whilst less willing to accept health education messages are more likely to act upon the advice given, perhaps due to their higher educational status and greater freedom. Regardless of the success in imparting information, it must be backed up with easily available facilities, for if they are hard to obtain patients will turn to traditional healers.

Case detection

Women are less likely to come forward for medical assessment and treatment than males, and benefit from the implementation of active case finding programmes.[39] In both India and Pakistan, contact surveys and general surveys yielded more female cases than did self reporting or referral.[6,39] Part of the problem in detection may stem from cultural attitudes to examination of females, particularly young unmarried girls, who keep themselves covered and may hide the signs of disease. Many hospitals and clinics are exclusively male staffed,

and this is a problem for many women in trusting, and confiding in men, who elsewhere are so above females, that women may not even be allowed to talk in front of them.[38] Many women are put off western clinics by disparaging attitudes of male staff not encountered in traditional healing settings.[14,37] In many societies, primary health care is provided by village housewives, and thus a woman risks stigma and discrimination within the community if she seeks treatment for her disease.

Compliance

Studies have variously shown similar, and greater levels of compliance amongst female leprosy patients than male patients.[6,11,14] Compliant behaviour relates to factors such as acceptance of the condition and the need to treat it, beliefs about the value of treatment, including the speed of improvement and lack of side effects, and the quality of the relationship with the doctor.[14] This model fails in application in the developing world, due to multiple and opposing beliefs regarding medication, and the common reliance upon and compliance with traditional remedies. In females, far more so than men, their low social status and greater conformity to behaviour expected by others increases their acceptance of doctors orders,[6,14] without understanding the reasons for treatment. The major barriers to compliance, regardless of gender, include denial of actually having leprosy, reliance upon traditional treatments, and undesirable side effects.[3,14,51] Denial may be an attempt to avoid the negative social effects of such a diagnosis, and often leads to consulting traditional healers for primary help, and reappearing at clinics when this approach fails. In Nepal,[41] increased levels of clinic attendance and compliance relate to increased distance of habitation from the clinic, showing that fear of being recognized by the society in which they live has negative effects on acceptance of diagnosis of treatment. Greater levels of compliance in females may relate to social status, since a study in Venezuela[3] of a more prosperous group of patients than the slum dwellers of the Pakistan study, reveals no significant difference in compliance between sexes. This observation may reflect religious differences in the different study areas. Much of Asia is Hindu or Muslim, religions that offer many traditional treatments, while South America has a stronger Christian base, and Christianity does not offer so many alternative treatments. Other studies confirm compliance is reduced when there are alternative treatments to turn to if one medication seems slow acting or has side effects.[6,14,37,47] Studies examining the patients understanding of their treatment reveal that women often misunderstand the side effects of their drugs, and education measures are hampered by a similar lack of knowledge amongst health workers.[5,14,38] The danger of this educational void is highlighted by the prescribing of prednisolone, which has such a rapidly noticeable effect, that patients demand and receive repeated doses from health workers who know no better. Its immunosuppressive function can cause a detrimental effect in the longer term.[5] Thus women are at risk from a lack of knowledge of their specific needs as opposed to men in prescribing situations. This situation is compounded by the private health system in many countries, where patients will swap physician readily if they are not given the treatment they want, and the availability in some regions of antibiotics and corticosteroids without prescription.[14,37] There is an enormous lack of understanding of medicines in general, illustrated by women's beliefs that large, coloured vitamin tablets have a more beneficial effect than small plain dapsone tablets, which are obviously biologically far more effective.[5] Female compliance may also be negatively affected by the use of blister packs, to aid regular treatment, since

many interpreted these as similar to contraceptive tablets, which are frowned upon in many societies. Without blister packs, however, treatment is difficult, since MDT as recommended is now available free of charge from WHO, exclusively in blister packs for PB and MB patients. In the same way that acceptance of the diagnosis is required for compliant behaviours, so is an acceptance of western beliefs about disease, before acceptance of western treatments occurs. Data on rates of compliance measure only compliance with western medications, ignoring the rates of compliant behavior in those taking traditional remedies.[14] Male control of family money means that if women are to get treatment, they must inform their husbands of their illness, risking the repercussions, and their choice of treatment may thus be male influenced.[14,37,38] Since free treatment is increasingly available, it is more likely that beliefs about disease and availability of treatment reasonably near the house are the biggest barriers to compliance amongst women; for example, 36% of Indian women face problems in affording travel to clinics.[40] Acceptance of western theories of disease does not necessarily lead to acceptance of western remedies, since some patients believe such treatments cause other problems rarely encountered in traditional remedies, and are thus less keen to take them.[37] Misunderstanding the purpose of the medication leads to lower levels of satisfaction and reduced compliance. In India, up to 24% of women are not satisfied by the response to medication, especially since it cannot reverse deformity, and does not seem to have 'visible' effects. Patients are apparently rarely told of either the function or effect of the drug, or the long-term nature of treatment, and tend to cease taking the drug when symptoms are reduced, leading to recurrent disease, and drug resistant infection.[5,14,47] Patients often combine several treatments, making personal assessments of their efficacy very subjective. Despite greater compliance, the greater delay in starting treatment means women may not avoid the problems of deformity.[6]

Social effects

Leprosy carries an enormous stigma, mainly attached to the dermatological problems and limb deformity it can cause.[6,30,40,48] Other factors including the widespread view of the disease as one of poverty, the belief that it is a disease of the 'unclean', and the view amongst healthcare workers that it is a disease apart, only for dedicated specialists, leads to an atmosphere of fear and confusion regarding the disease and its victims. Due to the widespread interpretation that leprosy results from sin or religious indiscretion it has social repercussions in many communities, regardless of education, affluence or religious factors.[3,5,6,40,45] The very diagnosis induces negative attitudes, and patients with few obvious signs of disease suffer as much ostracism and stigma as those with deformities. Unsurprisingly, females with their lower social status are more affected by their disease than males. In Indian patients[6] females are up to 3 times more likely than men to find restrictions on activities such as going out, travelling, and attendance at festivals. These exclusions are imposed and accepted by men, and women tend to comply. Widespread social discrimination explains the relatively low levels of female patients informing the community of their disease (around 30%)[40], and of these, almost half faced abuse directly related to their disease. Most of these were allowed to maintain community contact with others, but around a third reported restrictions on using community places. Other studies have looked at social effects on mixed sex groups, and these show that leprosy patients in general are shunned by neighbours, lose their jobs, become ostracized and face abuse directly relating to their condition.[13,14,31,43,45,49]

Marriage and family life

In much of the developing world child bearing is both expected and admired by society, and large families are more desirable and respected than small ones. Men marry, often by arrangement, women who are likely to bear many healthy children. A stigmatizing disease such as leprosy is not a desirable attribute in a prospective partner, especially in societies that still see leprosy as inherited. Tanzanian men seek wives who are industrious, obedient and above all fertile.[38] Problems with subfertility are widely reported in female leprosy patients, as discussed above. In Ethiopia,[50] 97% of respondents would not permit marriage of a family member to a leprosy patient, and marriage rates amongst female leprosy patients are low. The chance of a female patient's marriage surviving her diagnosis appears related to several factors,[5] i) a strong marriage prior to diagnosis, and support from the husband in seeking treatment (whether this support reveals a more accepting attitude, and consequently less compulsion to eject the wife is unclear), ii) early detection and consequent low deformity and iii) good fertility, and multiple children (and therefore higher social status); only 6% of the group of non-dehabilitated patients were childless. In surviving families, up to a quarter of female patients suffer strained relationships, unrelated to socioeconomic or educational status.[40] In India there is a marked decline in case reporting amongst females, between the ages of 10–19 years, when most marriages are being arranged, and a large increase above the age of 20, far above the rise amongst males.[39] This appears to be a cultural effect, since this age group records the greatest incidence of new disease in South American women.[3] This may be due to the fear that diagnosis before marriage of leprosy would spell disaster for both patient and family, a less likely outcome in more developed countries. It might also relate to the cultural unacceptability of full examination of girls in this age group by doctors, and the consequent hiding by patients of outward signs of disease. Leprosy contracted after marriage has a serious effect upon the patient, borne out by high rates of negative attitudes to wives with leprosy from husbands.[5,40] Women are more likely to tell their families of their disease than men. This prejudice seems to be one that cannot be solved by education, since there is no difference in attitude according to educational status. Harsh treatment from husbands, and divorce are not only common occurrences, but widely expected ones. Under Muslim, Hindu and Indian law, leprosy was grounds for divorce, and in Saudi Arabia 14.4% of divorces are attributed to leprosy.[51] A quarter of Indian female patients fear divorce, regardless of their husbands' apparent attitudes.[40] Even if the female remains with her husband, she may find herself segregated to a greater extent than a male patient would. Despite lower rates of deformities compared to males, and few women finding difficulties with their household tasks, female patients suffer up to 5 times higher rates of restriction on everyday activities than male counterparts. (Table 1).

Intimacy within marriage appears as unavailable to female patients as marriage is, with females more likely than men to be denied sexual attention. This may relate to the female subservience within a relationship, that she is less likely to (be able to) deny her partner sexual relations.[5] Being so likely to be 'spurned by her husband is an enormous insult, and to women expected to be wives and mothers, this removes much of her purpose for being. Being prevented from engaging in typical female activities such as cooking leads to further loss of self worth, and a raised likelihood of choosing to leave the marital home (dehabilitation). Amongst dehabilitated patients, 68% of males chose to leave, but only 49% of women took this decision themselves; 31% were made to go by their family, compared to 20% of males. Women who remain are more likely to encounter negative attitudes from their partners than men. Fear of deformity (63% of

females, 49% of males), and future forceful dehabilitation, was a concern that led to females voluntarily leaving the household, despite similar rates of actual deformity. Another factor in deciding to leave was to avoid prejudicing the chances of future marriage for their relatives, expressed by 35% of this cohort, and by patients in other studies.[5,14] The type of family in which the patient lives can affect the impact of the disease; patients face less hardship in nuclear rather than extended families.[6,40] There is no significant difference in disease understanding, but negative reactions are more likely in joint families, and some families split up as a result of leprosy.[52] Some observers report a change from joint family status at the time of diagnosis, to nuclear families later in the study.[5,6] This effect may be due to the major differences in status within the family of females, with women up to 10 times less likely to be heads of their family, either when diagnosed or followed up. Curiously, there does not appear to be a significant effect of the disease barring women (or men) from attaining status as head of the household,[6] highlighting the fact that the status of the patient when they are diagnosed influences future events. It is possible that it reflects the breakup of families due to the disease, with women being abandoned to head what remains of the family. In families where there are two or more females, the patient is at risk of losing status within the female 'pecking order', especially if she is unable to or barred from completing household tasks. In many households, the female is responsible for health care for her whole family,[38,53] and despite greater rates of telling their husbands, many are left to cope with their disease and treatment alone. Family awareness and help with treatment is seen to increase with increasing standards of education.[40] In many families, the decision to consult a doctor is taken by the husband, removing her autonomy to seek healthcare.[37,38] Amongst leprosy patients, females find it harder to marry than males, and appear less 'choosy' about partners. Marriage figures from many studies are misleading, since more detailed questioning often reveals that the partner has changed since diagnosis, or that the patients may not necessarily still keep contact with their spouse. Regardless of deformity, female patients are more likely to marry male leprosy patients,[5] who are often deformed. In this Indian study, although some male leprosy patients had married non-leprosy females, the opposite was true for one woman who married a man handicapped in a road accident.

Employment effects

Studies show female patients are less likely to be in employment, and have lower incomes than

Table 1. Restrictions on everyday activities experienced by male and female leprosy patients

Activity	Study A6		Study B5	
	Males	Females	Males	Females
Touching others	17.7%	84%	15%	25%
Eating with others	48%	63%	18%	39%
Sleeping together	20%	85.8%	20%	30%
Sexual relations	22%	71%	9%	24%
Cooking	29%	80%	–	–
Fetching water	–	–	15%	38%
Attending family festivals	–	–	9.6%	21%

both male patients, and healthy females.[6,7,40] In an Indian study the data for unemployment and income were compared to controls from the same region matched for age, education and sex. Figures revealed that whilst leprosy patients in general had lower employment rates than control groups, females experienced greater employment problems than males, being 61% less likely to be employed than controls, with male counterparts only 30% less likely. Those females able to take work received 4 times less income annually than controls, whereas men earned only 1.7 times less.[7] The area under study appears to affect rates of employment, and a separate study in a different area of India[6] revealed 75% of male patients to be employed, with 49.5% of females finding work. These figures reinforce the fact that females are generally less employed than males, perhaps a sign of lower social status, but the unavailability of employment figures for some of the control groups prevents further analysis of gender influences on the impact of the disease on employment opportunities. Studies in Ethiopia[50] have identified both an unwillingness to employ and work with leprosy patients, regardless of gender. In some regions of Africa, there is also a growing trend for men to leave their family and seek better pay in employment elsewhere. Non-deformed male leprosy patients can escape local stigma in this way to find work, an option unavailable to most women. Analysis of the effects of deformity on the employment of patients is difficult to approach, since gender differentials are rarely considered.

Psychological and psychiatric effects

Psychiatric effects reported amongst leprosy patients include increased depression and anxiety, attributed to the disease and its social effects.[40,54] Given the already greater incidence of these conditions in non-leprosy females, one can surmise that females with leprosy are in greater danger of depressive illness than male patients. These risks are highlighted by observed figures of greater suicide rates in leprosy patients,[40] although no differentiation by sex is made. Women with leprosy are at risk of stigmatization not only from the community, but also from their own (mis)conceptions about their disease. In a study in India,[40] half the sample feared transmitting their disease to others, and some acted on this, distancing themselves from others. Educated women are more likely to fear transmission of the disease to others, but less likely to act upon it than less educated subjects. This may relate to the illiterate believing sin to be the cause of leprosy, being less likely to fear spreading their illness. Diagnosis of leprosy is noted to increase the anxiety of subjects, and many report a lower threshold of anger and upset over trivial matters whilst social maladjustment appears in 30%, who preferred to be alone since diagnosis. There is no discussion of factors responsible for this, be they fear of infecting others, fear of judgement by others or simply part of a general coping strategy. With the occurrence of deformities or disabilities, almost all women express feelings of self-repulsion and embarrassment. The greatest fear noted in the study was fear for the future progress of the disease, future loss of function, and divorce, regardless of family attitudes towards them.

Discussion

The overall picture of women with leprosy is worrying. Women with leprosy face inequalities due to their sex and their disease. Healthy women are a vulnerable group, due to the expectations on them as carers and mothers. They live in a climate of fear and oppression and

many suffer physical and mental morbidity. Literacy is virtually non-existent, as is the ability to travel, or access to money for whatever purpose. These restrictions mean that access to and comprehension of, health education is limited, and women are unlikely to come forward for suitable treatment. This leads to the disease progressing unchecked for longer, and the development of avoidable problems such as deformity.

Leprosy increases women's vulnerability due to misconceptions and stigma about the disease within society. The religious leadership in many leprosy endemic regions contributes to this, with teachings on the meaning of the disease and deformity. In westernized societies, gender differences are less clear. Female patients share societies' feelings and misconceptions, becoming reclusive and psychiatrically damaged after diagnosis. Women are more likely to seek traditional healing, and are unable to access effective treatment for longer than males. Due to the stigma and cultural restrictions on examination of females, they suffer lower levels of voluntary detection than men, and need to be actively sought for treatment. When treated, women are more compliant than men, due to their subordinate conditioning, but are vulnerable due to lower levels of understanding of disease and western medication in general. In both society and home life, female patients face restrictions on their activities, and significantly higher rates of divorce and forced dehabilitation; often accepted without question, such is their inferiority to men. Women are often denied physical stimulation, sexual relations, and the right to continue with household tasks, leading to depression and mental pain. Most men are unaware of inequalities faced by women, and do not act to limit this gap.

Physically, women are more fortunate than men, with lower rates of LL and deformity. This advantage is lost in pregnancy, and immunologically they are left vulnerable to the disease. Many societies expect women to have multiple children, risking repetitive episodes of nerve damage.

Conclusions

The female with leprosy does indeed face a double jeopardy; her socially inferior status and her highly stigmatized disease result in greater social and mental problems, even if the disease is often less severe (physically) in women than in men. Many societies where leprosy occurs have such different views about the world, and illness that greater attention should be paid to understanding these beliefs, including attitudes to women on drug treatment. Whilst women are socially vulnerable, they are also more responsive if targeted correctly, and are responsible for the care of their family's health. Improved education of women about the disease can produce progress towards making leprosy the minor public health problem it should be. Further requirements for achieving disease control are raised levels of literacy for all, and greater education of health workers about the disease, to allow greater dissemination of information within the community. Misconceptions and misunderstanding exist about the disease in many non-leprosy specialists, and this also needs to be addressed. In summary, if leprosy is to be conquered, consideration must be given to a detailed study of the varying social conditions in leprosy-endemic countries, including attitudes to the disease and to women. Education of all about the disease, in terms they understand, and that do not dismiss or ridicule their beliefs or the teachings of their religions, is the key to success. Whilst women *are* in double jeopardy, given time and the correct measures, this need not be the case.

References

[1] Manderson L, Jenkins J, Tanner M. Women and tropical diseases *Soc Sci Med*, 1993; **37**: 441–443.
[2] Duncan ME. An historical and clinical review of the interaction of leprosy and pregnancy: a cycle to be broken. *Soc Sci Med*, 1993; **37**: 457–472.
[3] Ulrich M, Zulueta AM, Caceres-Dittmar G *et al.* Leprosy in women: characteristics and repercussions. *Soc Sci Med*, 1993; **37**: 445–456.
[4] Ridley DS, Jopling WH. Classification of leprosy according to immunity: a five-group system. *Int J Lepr,* 1966; **34**: 255–273.
[5] Vlassof C, Khot S, Rao S. Double jeopardy: women and leprosy in India *WHO Statistics Quarterly*, 1996; **49**: 120–126.
[6] Rao S, Garole V, Walawalkar S, Khot S, Karandikar N. Gender differentials in the social impact of leprosy. *Lepr Rev*, 1996; **67**: 190–199.
[7] Max E, Shepard DS. Productivity loss due to deformity from leprosy in India. *Int J Lepr*, 1989; **57**: 476.
[8] De Rijk AJ *et al.* Field evaluation of WHO-MDT of fixed duration at ALERT, Ethiopia: the AMFES project – I. *Lepr Rev*, 1994; **65**: 305–319.
[9] Berhe D *et al.* Epidemiological pattern of leprosy in Ethiopia: a review of the control programmes. *Lepr Rev*, 1990; **61**: 258–266.
[10] Ponnighaus IM. Disabilities in leprosy patients ascertained in a total population survey in Karonga District, Northern Malawi. *Lepr Rev*, 1990; **61**: 366–374.
[11] Schäfer J. Leprosy and disability control in the Guera Prefecture of Chad, Africa: do women have access to leprosy control services? *Lepr Rev*, 1998; **69**: 267–278.
[12] Tiendrebeogo A *et al.* A survey of leprosy impairments and disabilities among patients treated by MDT in Burkina Faso. *Int J Lepr*, 1996; **64**.
[13] Cakiner T et al. Women and leprosy in Turkey. *Ind J Lepr*, 1993; **65**: 59–67.
[14] Mull JD, Wood CS, Gans LP, Mull DS. Culture and 'compliance' among leprosy patients in Pakistan. *Soc Sci Med*, 1989; **29**: 799–811.
[15] Ulrich M *et al.* IgM antibodies to native phenolic glycolipid I in contacts of leprosy patients in Venezuela: epidemiological observations and a prospective study of the risk of leprosy. *Int J Lepr*, 1991; **59**: 405.
[16] Scollard DM, Smith T, Bhoopat L, Theetranont C, Rangdaeng S, Morens DM. Epidemiologic characteristics of leprosy reactions. *Int J Lepr*, 1994; **62**: 559–567.
[17] Ansar Abmed S *et al.* Sex hormones, immune responses and autoimmune diseases. *Am J Pathol*, 1985; **121**: 531.
[18] Reddy BN, Bansal RD. An epidemiological study of leprosy disability in leprosy endemic rural population of Pondicherry (S.India). *Ind J Lepr*, 1984; **56**: 191–199.
[19] Le Grand A. Women and leprosy: a review *Lepr Rev*, 1997; **68**: 203–211.
[20] Akhtar M *et al.* Lepromatous leprosy presenting as orchitis. *Am J Clin Pathol*, 1980; **73**: 712.
[21] Lockwood DNJ, Sinha HH. Pregnancy and leprosy. A comprehensive literature review. *Int J Lepr*, 1999; **67**: 6–12.
[22] Loke YW, King A. Recent developments in the human maternal-fetal immune interaction. *Curr Opin Immunol*, 1991; **3**: 762–766.
[23] Saha SP, Das KK. Study of the characteristics and causes of relapse amongst leprosy cases in an urban area (Calcutta). *Ind J Lepr*, 1992; **64**: 169–178.
[24] Lyde CB. Pregnancy in patients with Hansen's disease. *Arch Dermatol*, 1997; **133**: 623–627.
[25] Duncan ME, Pearson JM, Ridley DS, Melsom R, B june G. Pregnancy and leprosy: the consequences of alterations of cell-mediated and humoural immunity during pregnancy and lactation. *Int J Lepr*, 1982; **50**: 425–435.
[26] Duncan ME *et al.* The association of pregnancy and leprosy I; new cases, relapse of cured patients and deterioration in patients on treatment during pregnancy and lactation – results of a prospective study of 154 pregnancies in 147 Ethiopian women. *Lepr Rev*, 1981; **52**: 245.
[27] Maurus JN. Hansen's disease in pregnancy. *Obstet Gynaecol*, 1978; **52**: 22–25.
[28] Duncan ME, Pearson JMH. The association of pregnancy and leprosy III. erythema nodosum leprosum. *Lepr Rev*, 1984; **55**: 129.
[29] Duncan ME, Pearson JM. Neuritis in pregnancy and lactation *Int J Lepr*, 1982; **50**: 31–38.
[30] Jopling WH. Editorial – leprosy stigma. *Lepr Rev*, 1991; **62**: 1–12.
[31] Van den Broak J, O'Donoghue J, Ishengoma A, Masao H, Mbega M. Evaluation of a sustained 7-year health education campaign on leprosy in Rufiji district, Tanzania. *Lepr Rev*, 1998; **69**: 57–74.
[32] Duncan ME, Oakey RE. Estrogen excretion in pregnant women with leprosy: evidence of diminished fetoplacental function. *Obstet Gynecol*, 1982; **60**: 82–86.
[33] Duncan ME. Babies of mothers with leprosy have small placentae, low birth weights and grow slowly. *Br J Obstet Gynaecol*, 1980; **87**: 471–479.
[34] Duncan ME. The placenta in leprosy. *Placenta*, 1984; **5**: 187.
[35] WHO Study Group on Chemotherapy of Leprosy for Control Progranunes. *World Health Organisation Technical Report Series,* 1982 No 67. WHO, Geneva.

[36] *Monthly Index of Medical Specialties,* March 1998; 209.
[37] Hunte PA, Sultana F. Health-seeking behaviour and the meaning of medications in Bolochistan, Pakistan. *Soc Sci Med*, 1992; **34**: 1385–1397.
[38] McCauley AP, West S, Lynch M. Houshold decisions among the Gogo people of Tanzania: determining the roles of men, women and the community in implementing a trachoma prevention program. *Soc Sci Med*, 1992; **34**: 817–824.
[39] Rao S. Gender issues in the elimination of leprosy. Quoted in *TDR News,* 1997; **52**.
[40] Kaur H, Ramesh V. Social problems of women leprosy patients – a study conducted as 2 urban leprosy centres in Delhi. *Lepr Rev*, 1994; **65**: 361–375.
[41] Pearson M. What does distance matter? Leprosy control in West Nepal. *Soc Sci Med*, 1988; **26**: 25–36.
[42] World Bank Development Indicators, 1998.
[43] Myint T, Thet AT, Htoon MT, Win M. A comparative KAP study of leprosy patients and members of the community in Hlaing and Laung-Lon townships. *Ind J Lepr*, 1992; **64**: 313–324.
[44] Opala J, Boillot F. Leprosy among the Limba: illness and healing in the context of world view. *Soc Sci Med*, 1996; **42**: 3–19.
[45] Kumaresan JA, Maganu ET. Socio-cultural dimensions of leprosy in North-western Botswana. *Soc Sci Med*, 1994; **39**: 537–541.
[46] Bekri W, Gebre S, Mengiste A, Saunderson PR, Zewge S. Delay in presentation and start of treatment in leprosy patients: a case-control study of disabled and non-disabled patients in three different settings in Ethiopia. *Int J Lepr*, 1998; **66**: 1–9.
[47] Gopalakrishnan S. Dropouts during treatment for leprosy (a study in the ELEP leprosy control project, Dharmapuri district, Tamilnadu during 1975–77). *Ind J Lepr*, 1986; **58**: 431–440.
[48] Brieger WR, Oshiname FO, Ososanya OO. Stigma associated with onchocercal skin disease among those affected near the Ofiki and Oyan Rivers in Western Nigeria. *Soc Sci Med*, 1998; **47**: 841–852.
[49] Kushwah SS, Govila AK, Upadhyay S, Kushwah J. A study of social stigma among leprosy pateints attending leprosy clinics in Gwalior. *Ind J Lepr*, 1981; **53**: 221–225.
[50] Tekle-Haimanot *et al*. Attitudes of rural people in central Ethiopia towards leprosy and a brief comparison with observations on epilepsy. *Lepr Rev*, 1992; **63**: 157.
[51] Eidarons AH. Divorce among Saudi female leprotic patients; and experience at Ibn Sina Hospital – letter to the editor. *Lepr Rev*, 1993; **64**: 166–169.
[52] Ramu G *et al*. Social reactions to leprosy in a rural population in Chingleput District (Tamil Nadu). *Lepr India*, 1975; **47**: 156–149.
[53] Vlassoff C. Gender inequalities in health in the third world: uncharted ground. *Soc Sci Med*, 1994; **37**: 1249–1259.
[54] Mhasawade BC. Leprosy – a case for mental health care. *Lepr India*, 1983; **55**: 310–313.

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Incidence rates of acute nerve function impairment in leprosy: a prospective cohort analysis after 24 months (The Bangladesh Acute Nerve Damage Study)

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Summary In this paper, the incidence rates and cumulative incidence of nerve function impairment (NFI) and leprosy reactions over 24 months follow-up of the prospective cohort of 2664 new leprosy cases are presented. Graphs showing the cumulative incidence of NFI relative to time since registration are presented. Hazard ratios (HRs) for the development of NFI for four variables are given. The majority of patients who developed NFI after registration did so in the first year (67% of multibacillary (MB) patients, and 91% of paucibacillary (PB) patients who developed NFI). Thirty-three percent of all MB patients who developed NFI after registration did so in the second year of follow-up. No PB patients developed NFI for the first time in the last 6 months of follow-up. However, seven NFI events occurred amongst PB patients in that period, amongst those who had already had one NFI event. The incidence rate (IR) of NFI amongst MB patients was 24/100 person-years at risk (PYAR), and amongst PB patients was 1.3/100 PYAR. The HR for the development of NFI amongst MB patients compared with PB patients was 16 using univariate analysis. Amongst patients who had long-standing NFI present at registration, the IR was 27/100 PYAR compared with 1.7/100 PYAR amongst those who did not have long-standing NFI. The HR for developing acute NFI amongst those with long-standing NFI present at registration compared with those without was 14 using univariate analysis. When multivariate regression analysis is applied, the apparently significant univariate HRs for sex and age disappeared. The resultant multivariate HR for leprosy group is 8.8, and 6.1 for the presence/absence of long-standing NFI at registration. In all, 142/166 (86%) of all new NFI events were silent, underlining the need for regular nerve function testing. IRs are presented for the four 6-month periods of the 24-month follow-up. They show a clear stepwise reduction over the total period. The IRs amongst MB patients and those with long-standing NFI present at

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registration are very high at 34 and 41/100 PYAR, respectively, for the first 6 months of follow-up. Even during the final 6-month period, the IR is maintained at a moderately high level (18 and 15/100 PYAR, respectively).

Introduction

Nerve function impairment (NFI) in leprosy is the key outcome of the pathological processes involved in infection by *Mycobacterium leprae*. In order to understand more clearly the epidemiology of NFI and its incidence, risk factors and response to treatment, a prospective cohort study has been initiated at the Danish Bangladesh Leprosy Mission (DBLM), and its design, methodology and intake status have been described in an earlier paper.[1]

NFI results from a variety of pathological and immunological processes taking place in peripheral nerves. These include the presence of *M. leprae* in the nerve, trauma, oedema causing increased intraneural pressure, vascular changes and hypersensitivity granuloma.[2] Reactive states, including type 1 and type 2 reactions, are widely accepted as common causes of NFI and of these, type 1 or reversal reaction is regarded as the leading cause.[3] However, nerves are often functionally impaired without developing obvious symptoms such as skin reactions or nerve pain, and this condition is variously called 'silent neuritis',[4] 'silent neuropathy'[5] or 'quiet nerve paralysis'.[6] Van Brakel has suggested that epidemiologically silent neuropathy is not equivalent to a 'reversal reaction expressing itself in the nerves', but has multiple aetiologies.[5]

In this paper, the incidence rates (IRs) and cumulative incidence of NFI and other reactive phenomena amongst patients in the BANDS cohort are presented for different risk variables (or categories of risk factor) including leprosy group (PB/MB), sex, age and presence or absence of long-standing NFI at registration. Cox's proportional hazards regression analysis has been carried out to determine the HRs of the four variables using both univariate and multivariate methods.

Follow-up of patients included in the cohort is continuing for up to 3 years from the time of registration in the case of paucibacillary (PB) patients, and for up to 5 years for multibacillary (MB) patients. This analysis presents the results at 24 months of follow-up.

Materials and methods

THE PATIENT COHORT AND FOLLOW-UP

The study group is the cohort for the Bangladesh Acute Nerve Damage Study (BANDS).[1] The 2664 patients recruited over a 12-month period comprise 1481 males (56%) and 1183 females (44%). In all, 2220 (83%) of the patients were PB, and 444 (17%) were MB. Amongst the PB group, 14 patients were reclassified as MB during the course of follow-up, and they were started on MB/MDT. In these patients, a reversal reaction caused skin patches that had been invisible at the time of registration to become visible, thus making reclassification of these patients into the MB group necessary, since classification was based on a count of patches combined with the number of palpable enlarged nerves and skin smear results (>10 skin patches and enlarged nerves and/or skin smear positive = MB). However, since these cases were correctly diagnosed as PB according to the diagnostic tools available at the time of registration, they have been considered as PB for the purposes of analysis. In other words, the initial classification of PB or MB was 'fixed' for subsequent analysis.

Details of follow-up procedures have been described.[1] Patients have completed at least 24 months of follow-up after registration, and all analysis in this paper is based on that 24-month period.

Analysis will focus on the incidence of new nerve function impairment (NFI) during follow-up as the main outcome. The definition of NFI used is as follows:

Sensory NFI: reduction by ≥ 2 points in the sensory distribution of any one nerve, as tested by ballpoint pen using the standard test sites described.[1] The following nerves were tested for sensory function: ulnar, median and posterior tibial.

Motor NFI: reduction by ≥ 2 in the MRC grade of the movement tested of any one nerve as described earlier. The following nerves were tested for motor function: facial, ulnar, median, radial and lateral popliteal.

Full details of testing and other outcome definitions such as type 1 reaction are described in the earlier paper.[1] The testing methods have been validated in a separate publication.[7] In this paper, a patient is said to have developed an 'NFI event' (positive outcome) if he or she has had either sensory or motor NFI, or both, unless stated otherwise.

STATISTICAL METHODS

IRs have been calculated using the number of patients developing NFI or reactions as the numerator, and cumulative person-years at risk as the denominator, expressed as 100 person-years at risk (PYAR).

Patients who were lost to follow-up, died or who were transferred out of the project were included in the denominator for as long as follow-up was possible, up to 24 months from the time of registration. Patients were censored from the denominator as soon as they developed an event of the type for which the IR was being calculated (i.e. NFI or reaction).

Graphs showing the cumulative incidence of NFI against time since registration amongst the cohort patients are shown. These curves show the probability of developing NFI at any given time, and are the inverse of survival curves. The log rank test has been carried out to assess the significance of differences between the curves at the mid-points in follow-up, i.e.12 months, and the *P*-value has been given on the graphs. The cumulative incidence at 24 months is also given numerically in the tables.

Cox's proportional hazards regression analysis (using a backward stepwise method) has been carried out to determine the hazards ratio for the four variables.[8] Univariate analysis shows the HR for each variable considered separately, and multivariate analysis has been used to build a model fitted to the data in order to determine the prognostic strength of each variable for the development of NFI. The univariate HR is more accurate than a simple relative risk calculated using a 2×2 table, since it makes allowance for censoring of patients from the calculation once they develop an event. However, the HR may be interpreted in the same way as relative risk.

NUMBER OF AT-RISK CASES USED IN CALCULATIONS

The number of at-risk cases (which appears in the denominator of the incidence calculation, to determine the number of person-years at risk) is the total number of patients in the BANDS cohort (2664), *less* the number of patients who had an episode of NFI or reaction that needed prednisolone treatment at registration (119), *less* the number of other patients who received prednisolone treatment at the time of registration for any other reason (e.g. those who did not

strictly fulfil the standard treatment criteria, but who still received prednisolone) (35), leaving the total number of patients entering the denominator at the beginning of the study as 2510.

RISK FACTORS CONSIDERED FOR ANALYSIS

Four variables have been selected for analysis. They are: sex, leprosy group (MB/PB), age (adult/child) and the presence or absence of long-standing NFI at registration (i.e. >6 months duration). These four have been selected because they are fundamental to the assessment of a leprosy patient at registration, and can be carried out without difficulty in any control programme. Classification into MB and PB for treatment purposes is usually carried out using either the WHO method of counting skin patches[9] or a similar procedure such as the Bangladesh system of counting patches and enlarged nerves,[10] in combination with skin smear results.

As already mentioned, all patients with acute NFI/reaction (≤6 months duration) needing treatment at registration have been excluded from analysis, since it is difficult to be certain of whether a subsequent 'NFI event' truly represents a new episode or a continuation of the first. In addition, this group of patients' outcome will have been modulated by having received prednisolone therapy, and therefore a comparison with patients who did not receive prednisolone is not possible. However, it was felt important to consider whether patients who had long-standing NFI at registration (>6 months duration) are or are not at increased risk of developing another episode.

The reliability of long-standing NFI present or absent at registration as a predictive variable for NFI outcome was tested by carrying out a Cox's multivariate regression analysis using sex, leprosy group and age as dependent variables, to see whether there was a significant difference between the two groups with long-standing NFI present or absent.

Proportions and rates have been expressed using two-digit precision.

Results

STATUS OF THE COHORT AT 24 MONTHS, AND TREATMENT COMPLETION RATE

Table 1 shows the status of the BANDS cohort patients at 24 months from the time of registration. Patients were considered to be lost to follow-up if their date of expected contact with DBLM staff was more than 3 months overdue despite active attempts at tracing.

Out of 2220 PB patients, 14 were reclassified as MB during treatment, leaving 2206. Of these, 2127 completed PB/MDT within 9 months, a treatment completion rate of 96%. It is not possible to calculate treatment completion rates for the MB group since 36 months has not yet elapsed for all MB patients. Relapse rates have not been presented since 2 years of follow-up is not long enough to assess this in the standard way.

PROPORTION OF PATIENTS DEVELOPING ACUTE NFI FOR THE FIRST TIME DURING FOLLOW-UP, AND TOTAL NUMBER OF NFI EVENTS OCCURRING IN THE COHORT.

Figure 1 shows the number of patients who had developed NFI by the time of registration and during 24 months of follow-up, divided into 6-month periods, and broken down by leprosy group. Ten percent (7.6–14) of all MB patients had NFI present at the time of registration, and a further 25% (21–30) went on to develop NFI during the first 24 months of follow-up

Table 1. Status of BANDS cohort patients at 24 months from registration. Fourteen patients who were originally classified PB at registration were reclassified as MB during follow-up (see text)

Status at 24 months	Patients who were classified MB at registration	Patients who were classified PB at registration	Total
Continuing regular follow-up	398 90%	2061 93%	2459 92%
Lost to follow-up	33 7.4%	102 4.6%	135 5.0%
Died	11 2.5%	28 1.3%	39 1.5%
Transferred to other project	2 0.5%	29 1.3%	31 1.2%
Total	444 100%	2220 100%	2664 100%

(rounding up the hidden decimal places), which is a total prevalence of acute NFI of 36% (31–40) amongst MB cases from registration to the end of 24 months follow-up. Amongst PB cases, 2.0% (1.5–2.7) had acute NFI present at registration, and a further 2.4% (1.8–3.2) went on to develop an episode of NFI during follow-up, which is a total of 4.4% (3.6–5.4). In 35% (29–41) of all patients with acute NFI, the event took place before registration. Conversely,

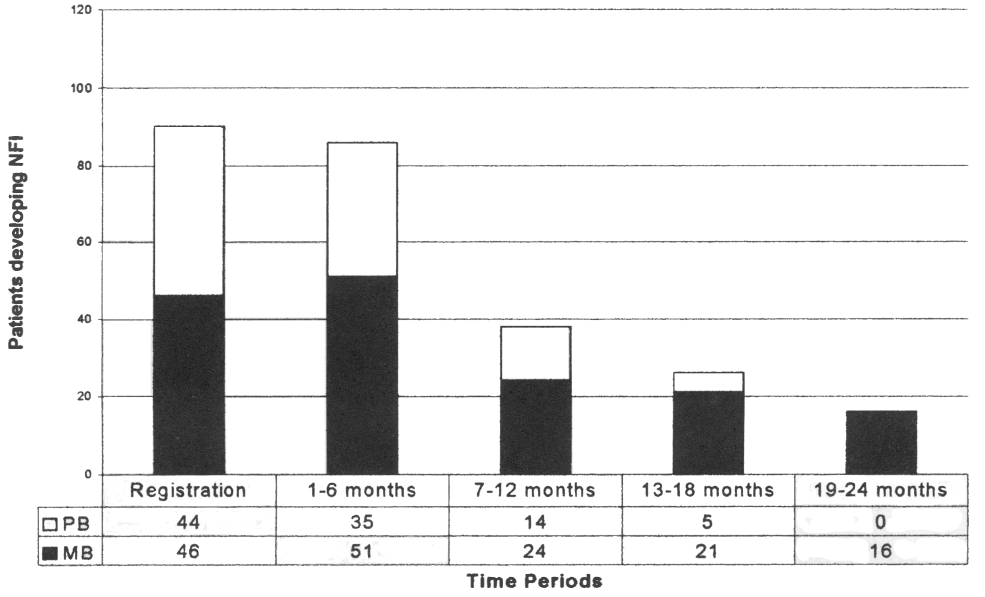

Figure 1. Bar graph and table showing number of patients developing NFI by registration time and during 24 months of follow-up (first NFI event only).

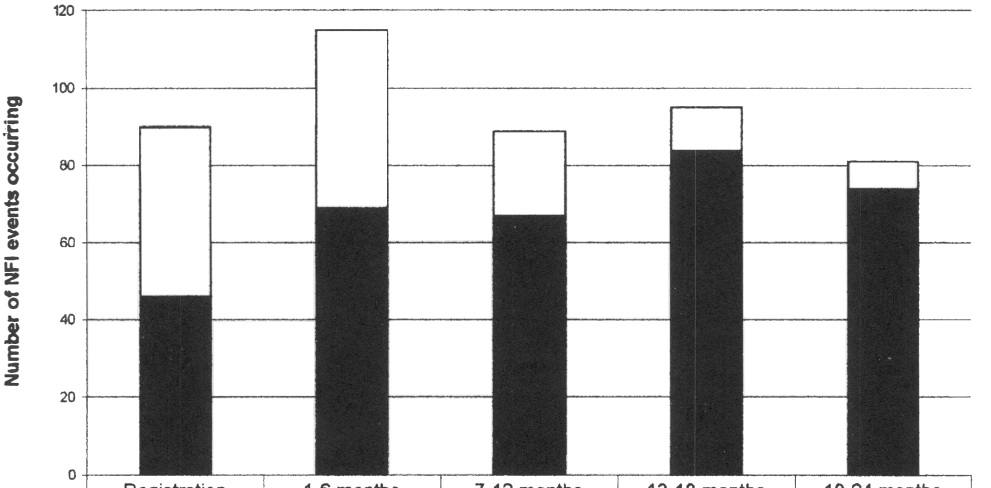

Figure 2. Bar graph and table showing total numbers of NFI events occurring in BANDS cohort by registration and during 24 months of follow-up.

68% (59–71) of all acute NFI events took place after registration. Amongst PB patients who had acute NFI, the proportion who had their NFI event before registration [45%, (35–55)] is higher than for MB patients [29% (22–37)]. The majority of patients developing NFI after registration did so in the first year [75%, (67–81)], around half of them in the first 6 months [52%, (44–60)]. No new PB patients developed NFI after 18 months of follow-up. However, new MB patients continued developing NFI after the first year, although the number reduced. In all, 9.6% (5.8–15) of all patients who developed NFI during follow-up did so in the final 6 months, all of them MB patients.

Although most MB patients who developed NFI during treatment did so in the first year after registration, a third did so in the second year [33%, (25–43)]. For the PB group, 9.3% (3.5–21) of those who developed NFI during follow-up did so in the second year, all of those in the first 6 months of that year. Of the total cohort, 8.3% (6.0–11) of the MB patients developed new NFI in the second year of treatment, compared with 0.2% (0.1–0.6) of the PB patients.

Figure 2 shows the total number of NFI events (Figure 1 shows *patient* numbers developing NFI) occurring during the 24-month follow-up period, again presented in 6-month blocks with breakdown by leprosy group. The pattern is quite different from that of Figure 1, and is due to the number of patients who developed repeated NFI events. Whilst Figure 1 shows that the number of *patients* developing NFI for the first time diminishes over 2 years, the total number of NFI events does not diminish to the same extent, the numbers being sustained by a core of patients who suffered repeated events of NFI. Indeed, the number of NFI events amongst MB patients is nearly *constant* over the 2 years. The number of events amongst PB patients is smaller, but seven events [8%, (3.6–17)] occurred in the last 6 months, during a time when no new patients developed a new NFI event.

Table 2. Incidence rates and cumulative incidence of NFI amongst BANDS cohort patients for 4 risk variables over 24 months follow-up period

Type of NFI	Category	Risk factors	Total cases	Case with events	Incidence rate (events per 100 PYAR)	Cumulative incidence at 24 months
All NFI	None	All	2510	166	3.7	0.069
	Sex	Male	1371	113	4.7	0.087
		Female	1139	53	2.5	0.049
	Group	MB	357	112	24.4	0.369
		PB	2153	54	1.3	0.026
	Age	≥15 (adult)	2049	155	4.3	0.079
		≤14 (child)	461	11	1.3	0.025
	Long-term NFI at registration	Present	264	96	26.6	0.392
		Not present	2246	70	1.7	0.033
SensoryNFI	All	None	2510	123	2.7	0.052
	Sex	Male	1371	83	3.5	0.064
		Female	1139	40	1.9	0.037
	Group	MB	357	85	18.5	0.292
		PB	2153	38	0.9	0.018
	Age	≥15 (adult)	2049	118	3.3	0.061
		≤14 (child)	461	5	0.6	0.012
	Long-term NFI at registration	Present	264	78	21.6	0.333
		Not present	2246	45	1.1	0.021
Motor NFI	All	None	2510	60	1.3	0.026
	Sex	Male	1371	41	1.7	0.032
		Female	1139	19	0.9	0.018
	Group	MB	357	43	9.4	0.162
		PB	2153	17	0.4	0.008
	Age	≥15 (adult)	2049	52	1.4	0.027
		≤14 (child)	461	8	0.9	0.018
	Long-term NFI at registration	Present	264	27	7.5	0.129
		Not present	2246	47	0.8	0.016

RELIABILITY OF LONG-STANDING NFI AS A PREDICTIVE VARIABLE

A Cox multivariate analysis showed no significant difference between the two groups of patients defined by the presence or absence of long-standing NFI at registration. *P*-values for interaction were 0.14 for sex, 0.18 for leprosy group and 0.63 for age. It was concluded that the presence/absence of long-standing NFI at registration is acceptable to use in analysis.

INCIDENCE RATES AND CUMULATIVE INCIDENCE OF NERVE FUNCTION IMPAIRMENT, TYPE 1 REACTION AND SILENT NFI DURING FOLLOW-UP

Table 2 shows the IRs expressed per 100 person-years at risk (PYAR) of NFI, and the cumulative incidence at 24 months. Results are shown for all episodes of NFI (including 'silent' NFI, and NFI occurring as part of a type 1 or type 2 reaction), and for sensory and motor NFI separately. The definition of NFI used strictly follows the definitions given in the

Table 3. Incidence rates and cumulative incidence of type 1 reaction amongst BANDS cohort patients for four risk variables over 24-month follow-up period

Category	Risk factors	Total cases	Cases with events	Incidence rate (events per 100 PYAR)	Cumulative incidence at 24 months
All	None	2510	62	1.4	0.026
Sex	Male	1371	41	1.7	0.032
	Female	1139	21	1.0	0.020
Group	MB	357	49	10.7	0.169
	PB	2153	13	0.3	0.006
Age	≥15 (adult)	2049	54	1.5	0.028
	≤14 (child)	461	9	1.1	0.021
Long-term	Present	264	11	3.1	0.051
NFI	Not present	2246	51	1.2	0.024

earlier paper.[1] For all NFI events, the IR amongst MB cases of 24/100 person-years at risk (PYAR) compares with 1.3/100 amongst PB cases. For the risk factor of presence of long-standing NFI at registration, the IR is even higher at 27/100 PYAR compared with 1.7/100 PYAR amongst those without NFI at registration. The IR amongst males (4.7/100 PYAR) is approximately double that amongst females (2.5), and that amongst adults (4.3) over three times that amongst children (1.3). The cumulative incidences parallel the IRs.

Overall, the incidence rate of sensory NFI (SNFI) is double that of motor NFI (MNFI) (IR = 2.7/100 PYAR cf. 1.3/100 PYAR) in the cohort. The IR of SNFI amongst patients with long-standing NFI is proportionately higher compared with that for MNFI , the rate being triple rather than double (22/100 PYAR for SNFI, cf. 7.5/100 PYAR for MNFI).

Table 3 shows the same statistics for type 1 reaction. type 1 reaction as defined for Table 3 means patients with a skin reaction with or without NFI. The overall IR for type 1 reactions is nearly a third of the rate for NFI, 1.4/100 PYAR compared with 3.7/100 PYAR. There is an interesting contrast in IRs between the type 1 reaction patients and the NFI patients. There is a 15-fold difference between the IRs for development of NFI amongst the patients in the presence/absence of NFI at registration category (27 versus 1.70); but only a 2-fold difference in the same category for the development of type 1 reaction (3.1 versus 1.2).

Table 4 shows IRs and cumulative incidences for patients with silent NFI (silent neuropathy). The pattern for silent NFI is very similar to that for NFI in general, which is not surprising since the majority of NFI cases were in fact silent (142/166, 86%). The IR for silent NFI is 3.2/100 PYAR.

TYPE 2 REACTIONS

Only eight patients developed a type 2 reaction during follow-up, an IR of 1.6 events per 100 PYAR amongst the MB leprosy group.

GRAPHS SHOWING CUMULATIVE INCIDENCE OF DEVELOPING NFI

Figures 3, 4, 5 and 6 show the cumulative incidence of NFI over the 24 months of follow-up. The four graphs show curves for the respective variables of sex, leprosy group, age, and

Table 4. Incidence rates and cumulative incidence of silent NFI amongst BANDS cohort patients for 4 risk variables over a 24-month follow-up period

Category	Risk factors	Total cases	Cases with events	Incidence rate (events per 100 PYAR)	Cumulative incidence at 24 months
All	None	2510	142	3.2	0.060
Sex	Male	1371	95	4.0	0.074
	Female	1139	47	2.3	0.043
Group	MB	357	93	20.3	0.322
	PB	2153	49	1.2	0.023
Age	≥15 (adult)	2049	135	3.7	0.070
	≤14 (child)	461	7	0.8	0.016
Long-term NFI	Present	264	86	23.9	0.363
	Not present	2246	56	1.4	0.026

presence or absence of long-standing NFI at registration (i.e. >6 months duration). All four curves show significant differences between the four pairs of risk factors, which are most marked for leprosy group and the presence/absence of long-standing NFI at registration. The log rank test shows the difference between survival probabilities at 12 months to be statistically significant with a P-value of <0.001 for all four curves (χ^2 with 1 df for male/female = 14; for MB/PB = 265; for adult/child = 14; for long-standing NFI present/absent at registration = 326).

INCIDENCE RATES OF NFI DURING 6-MONTH BLOCKS OF FOLLOW-UP

Table 5 shows the IRs for development of the first event of NFI, expressed for the four 6-month periods comprising the 24 months of follow-up. The number of events occurring

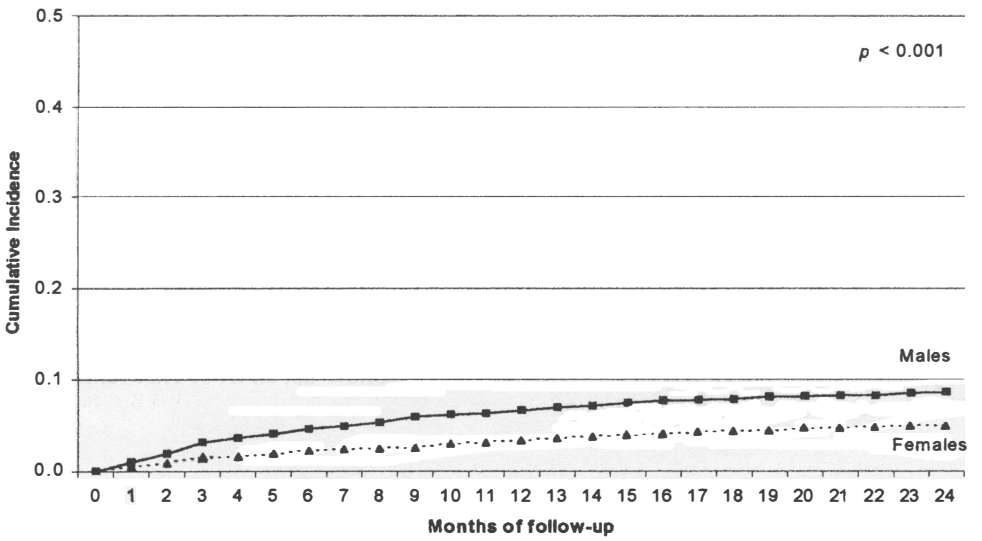

Figure 3. Cumulative incidence of NFI amongst 1371 males and 1139 females during 24 months of follow-up.

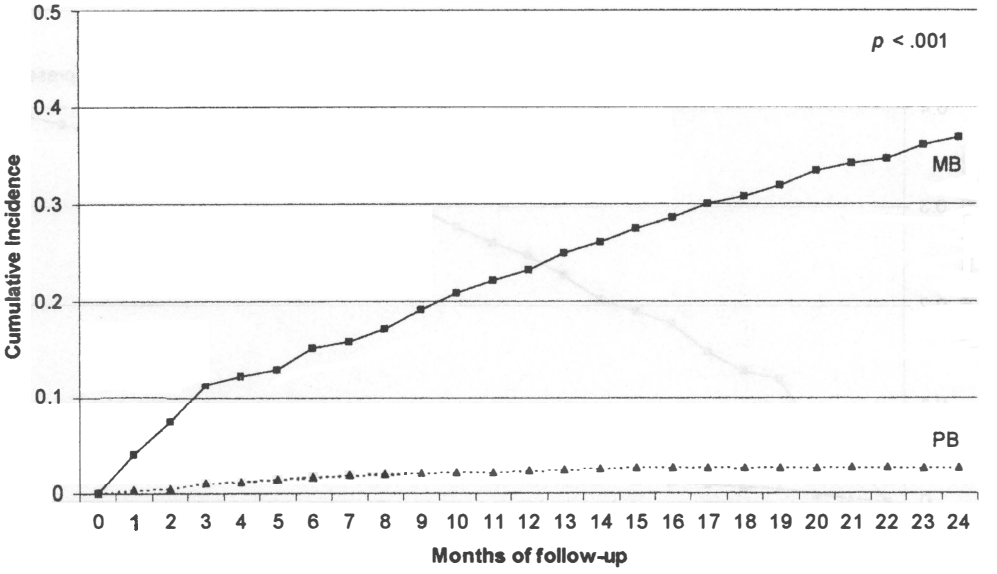

Figure 4. Cumulative incidence of NFI amongst 357 MB and 2153 PB patients during 24 months of follow-up.

during these 6-month periods have been summed to produce the numerator, and the number of days at risk during that period only used for the denominator. These IRs have been calculated for the four different risk variables of sex, leprosy group, age, and presence or absence of long-standing NFI at registration. For each variable there is a stepwise reduction in IR for successive 6-month periods. The IR amongst MB patients during the first 6 months

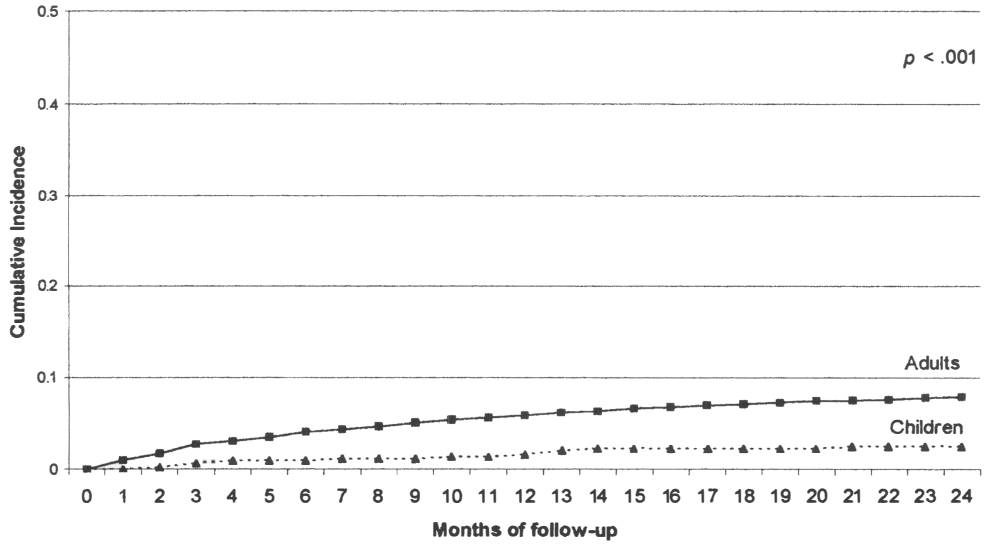

Figure 5. Cumulative incidence of NFI amongst 2049 adults and 461 children during 24 months of follow-up.

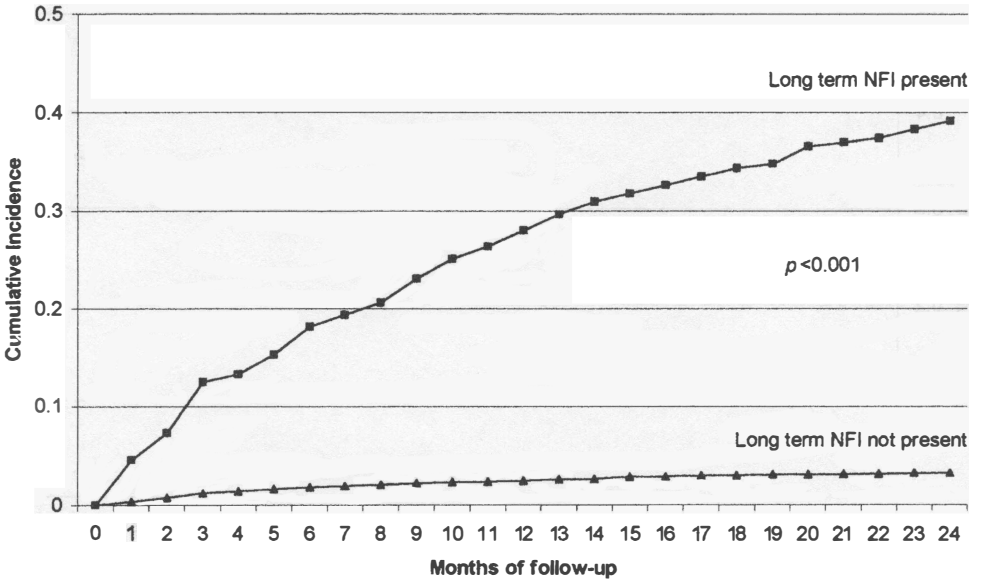

Figure 6. Cumulative incidence of NFI amongst 264 patients with long-standing NFI present at registration and 2246 patients without.

after registration is very high at 34/100 PYAR, and this has only halved to 18/100 by the last 6 months of follow-up. However, for the PB group the low IR of 3.3/100 PYAR has reduced to zero by the last 6 months of follow-up. Amongst patients with and without long-standing NFI at registration, a similar but even more marked pattern exists. Here, the IR amongst patients

Table 5. Incidence rates for NFI by 6-month period amongst BANDS cohort patients, for four risk variables over 24-month follow-up period

			Cases with events				Incidence rate (events per 100 PYAR)			
			Months of follow-up				Months of follow-up			
Category	Risk factor	Total cases	1–6	7–12	13–18	19–24	1–6	7–12	13–18	19–24
All	None	2510	86	38	26	16	7.2	3.3	2.4	1.5
Sex	Male	1371	62	26	15	10	9.5	4.3	2.6	1.8
	Female	1139	24	12	11	6	4.36	2.26	2.16	1.20
Group	MB	357	51	24	21	16	33.8	20.00	20.9	18.3
	PB	2153	35	14	5	0	3.3	1.4	0.5	0.0
Age	≥15 (adult)	2049	82	35	23	15	8.4	3.8	2.6	1.8
	≤14 (child)	461	4	3	3	1	1.78	1.4	1.4	0.5
Long-term NFI	Present	264	46	24	15	11	40.61	25.44	18.8	15.1
	Not present	2246	40	14	11	5	3.68	1.34	1.1	0.5

Table 6. Univariate and multivariate regression coefficients and hazard ratios for NFI outcome amongst BANDS cohort patients calculated for four risk variables

	Univariate analysis			Multivariate regression model		
Variable	Regression coefficient	Hazard ratio	(95% CI)	Regression coefficient	Hazard ratio	(95% CI)
Sex	0.066	1.8	(1.3–2.5)	0.012	1.3	(0.9–1.8)
Group	0.331	16.5	(11.9–22.8)	0.237	8.8	(6.2–12.5)
Age	0.070	3.3	(1.8–6.1)	0.016	1.7	(0.9–3.1)
Long-term NFI at registration	0.333	14.5	(10.6–19.4)	0.206	6.1	(4.4–8.6)

with long-standing NFI present is 41/100 PYAR, reducing by a factor of nearly 3–15/100 PYAR in the last 6 months of follow-up. Amongst patients with no long-standing NFI present at registration, the IR in the first 6 months is 3.7/100 PYAR, reducing by a factor of over 7–0.5/100 PYAR by the end of follow-up. The IR in the first 6 months amongst males is higher (9.5/100 PYAR) than for females (4.4/100 PYAR) but by the end of follow-up there is virtually no difference. Adults had a higher IR than children (8.4 versus 1.8/100 PYAR) in the first 6 months, reducing to 1.8 and 0.5, respectively, by the end of follow-up. However, numbers of children involved were small.

Table 6 shows the results of the Cox proportional hazards regression analysis. The HRs under univariate analysis shows the risk of developing NFI for four variables considered separately. All four variables all have significant prognostic strength with HRs of 1.8 for male sex, 3.3 for adult age, 14 for presence of long-standing NFI at registration and 16 for MB leprosy group. However, when the four variables are entered into a multivariate analysis, the model created does not show quite the same picture. The variables of leprosy group and presence/absence of long-standing NFI at registration still have significant HRs of 8.8 (95% CI 6.2-12) and 6.1 (4.4-8.6) respectively, but the HRs for sex and leprosy group are not significant at the 5% level (limits for the 95% CI fall below 1). This shows that it is the risk factors of leprosy group and presence/absence of long-standing NFI at registration that are the key determinants of future NFI risk.

Discussion

PROPORTIONS OF PATIENTS DEVELOPING EPISODES OF NFI

The published prevalence of reversal reactions and NFI occurring at first examination and during MDT has been comprehensively reviewed.[11,12] Amongst MB patients in field-based studies, they range from 9.6% in Indonesia[13] to 41% in Ethiopia,[14] placing the results of this study, 36% with acute NFI, near the top end of the range. However, there are considerable problems with comparison of results since the definition of 'reversal reaction' varies from one study to another. In addition, definitions of PB and MB classifications are not consistent. Amongst PB patients in this study, the proportion of 4.4% developing NFI either before or after registration compares with the results from other studies, ranging from 3.7 to 14%. Amongst both MB and PB cases, the majority of new NFI occurred *after* registration. Schreuder found that the majority, 82% of PB cases developing reversal reaction, did so before registration.

The majority of patients in the study developing NFI events did so in the first year (75%), and this is a common finding.[11–13,15] Although the proportion of patients experiencing their first NFI event diminishes with time, amongst MB patients there is a moderate number who have their first episode after 18 months of MDT (10.1% of all those who develop NFI, 3.6% of all MB patients). This highlights the importance of *continuing vigilance* after registration for at least 2 years, especially in the case of MB patients, and probably thereafter as well since it is known that NFI and reactions continue after 2 years.[11] These results are important, since treatment regimens are becoming shorter. The WHO is now recommending 12-month treatment for MB cases, and a 6-month course for PB cases with two to five skin patches.[16] Active surveillance may cease after treatment has been completed for both MB and PB cases in many LCPs, making it very important both to educate patients adequately about the symptoms of NFI and reaction, and to make it easy for such patients to refer themselves back to leprosy clinics. Fortunately, there is evidence that such an approach is effective for most patients who develop late reactions.[17]

INCIDENCE RATES OF NFI AND REACTIONS, AND HAZARD RATIOS

A broad pattern emerges, indicating that the IRs of NFI, type 1 skin reaction and silent NFI are considerably higher amongst MB patients compared with PB patients, and amongst patients with long-standing NFI present at registration compared with those without it. In addition, incidences are higher amongst males than females and adults than children, although the differences are much less marked. However, there are problems with nerve function testing in children, so results must be interpreted with caution. Other studies show a similar picture amongst MB and PB patients, although the rates given are lower than those in the present study: 1/100 PYAR amongst PB cases and 12/100 amongst MB cases in Nepal;[12] 1/100 and 6/100 respectively in an earlier, retrospective study at DBLM in Bangladesh;[18] and 1.9/100 PYAR during the first 6 months of PB/MDT, 14/100 PYAR during 24 months of MB/MDT in Thailand.[11] These compare with rates of 1.3 and 24/100 PYAR respectively in the present study. Again, comparisons must be made with caution, since there is a lack of agreement between authors about definitions of reactive events.

In Nepal, van Brakel found that the risk of developing NFI was 5 times greater amongst patients with 'extensive disease' (three or more body areas involved, roughly equivalent to our MB classification) than amongst patients with more limited disease;[19] this is similar to the finding of a significant HR of 8.8 in the multivariate analysis. Van Brakel highlighted the importance of the presence of extensive disease, identified by a body area count, as an indicator of the risk of reversal reaction. The present study strongly supports this evidence. However, Roche and others only found an odds ratio of 1.3 for 'neural type 1 reaction' in a retrospective study, also carried out in Nepal.[20]

In this study, the IR amongst patients with long-term NFI present at registration is even higher than that amongst MB cases (27 versus 24/100 PYAR amongst MB patients), and this has emerged as another strong risk factor for the development of NFI after registration, with a HR of 14 in the univariate and 6.1 in the multivariate analysis. Roche found that a disability index of >0 carried an odds ratio of 2.6 for 'neural type 1 reaction';[20] however, Schreuder found that a WHO disability grade of 1 or 2 was not a significant risk factor for the development of a reversal reaction during treatment, although it was a significant risk-factor for reversal reaction present at the time of registration.[11] In Ethiopia, de Rijk and others found that PB patients with WHO disability grade 1 or 2 had significantly more NFI/reactive events

than those without disability, but that was not true for MB patients.[14] It is true that MB leprosy group and the presence of long-standing NFI at registration overlap to a certain extent, NFI being more common amongst MB patients. However, there are a large number of MB patients who do not have impairment at registration.

Whilst the IR was higher amongst males compared with females, and adults compared with children, this was much less marked than with the other two risk variables. Neither van Brakel nor Roche found that male sex had a statistically significant predictive value for the development of type 1 reaction.[12,20] The multivariate analysis carried out here shows that the apparently significant predictive strength of age and sex are not significant at the 5% level in a multivariate model which includes leprosy group and presence/absence of long-standing NFI at registration as co-variables. This indicates that it is leprosy group and the presence/absence of NFI at registration which are the key risk factors for predicting future NFI amongst leprosy patients and that age and sex can safely be ignored as risk factors.

It is interesting that whilst the IR of NFI amongst patients with long-standing NFI present at registration is 15 times higher than amongst those without, it is only twice as high for type 1 reactions. It appears that the two types of reaction, one with a skin component and the other without, are independent of each other, supporting immunological evidence of antigenic heterogeneity between patients with skin and nerve disease predominating.[21] A study in Hyderabad, India found that a first symptom-to-reaction time amongst patients with neurological symptoms was twice as long as that amongst patients with skin symptoms.[22] Roche found that only 7% of cutaneous type 1 reactions occurred after 6 months of treatment, but 32% of neural type 1 reactions,[23] again supporting the view that skin and nerve reactions are relatively independent of one another.

Most patients (86%) developing an NFI event after registration experienced it 'silently', i.e. without a skin reaction or the development of nerve pain. This concurs with findings from other studies,[12,14] and highlights the need for regular nerve function testing to be available for patients at clinic visits, and for patients to be aware that developing numbness in hands or feet must not be ignored. The IR of silent NFI, 3.2/100 PYAR, is close to that found in Nepal (4.1).[5] It is perhaps more informative to compare the IRs of type 1 reaction with this silent NFI group, since the cases included in these two are mutually exclusive ('All NFI' patients include 24 who were included in the 'type 1 reaction' group). The differences noted in the paragraph above are even more marked when this comparison is made.

The IR for SNFI is over double that for MNFI (2.7 versus 1.3/100 PYAR, respectively). This study used the ballpoint test. Rates for SNFI could be expected to be relatively higher if more sensitive tests were performed using graded monofilaments. Van Brakel found rates considerably higher than ours (SNFI, 13/100 PYAR; MNFI, 7.5/100 PYAR[19]), but his study had a higher proportion of MB patients. In the present study, rates of SNFI and MNFI were much higher amongst the MB group (19 and 9.37/100 PYAR, respectively). It is sensory impairment which is potentially more damaging for patients, since loss of protective sensation can lead to ulceration and loss of digits unless the patient exercises great care.

The graphs showing cumulative incidence are the graphical complements to the IRs and RRs. They show clear differences in incidence between the risk factors in each category, much more marked for leprosy group and presence/absence of long-term NFI than for sex and age, although all of the differences shown are statistically significant ($P < 0.001$). These curves bring into even sharper focus the importance of considering leprosy group and presence/absence of long-term NFI at registration time in predicting the probability of developing NFI after registration.

The IRs presented for successive 6-month periods during follow-up (cf. Table 5) show some interesting trends. These statistics show as rates per 100 PYAR what was expressed as a simple proportion in Figure 1. During the first 6 months the IRs for all risk variables are at their highest, and it is during this period that patients and leprosy control staff need to be at their most vigilant, especially for MB patients and patients with a history of NFI present at registration.

It should be borne in mind that these findings are being presented at a relatively early stage and that there is one more year of follow-up for PB patients and three more for MB patients to run in the study. There is an incidence of 'late' reversal reactions or NFI occurring in the third and fourth years after RFT, although amongst PB patients this is almost zero. In Malawi only 2/17 reversal reactions occurred after the first year, since RFT amongst 498 PB patients (0.4%),[24] and there were none in Thailand.[11] At Karigiri, India, only 11 patients (1.1%) of 980 MB leprosy patients developed a reaction during 10 years of post-MDT surveillance, and most of these did so within the first 3 years.[25] In Thailand, 2/218 MB patients (1%) had a reversal reaction, and 1/218 (0.5%) an episode of silent neuropathy in the third year after registration. Given these very low incidences, it is safe to assume that the figures presented in this study for 2 years of follow-up are close to the total number that will occur.

Eight patients developed an ENL reaction during treatment, out of 84 BL and 51 LL patients in the cohort. Only one patient at registration had an ENL reaction present, bringing the total to nine (6.7% of lepromatous patients). This compares with 12% found in Thailand,[11] 17/175 (9.7%) in Nepal,[12] 11% in Zaire[26] and only 2/149 (1.3%) in Ethiopia.[14]

In conclusion, an analysis of NFI events occurring in a large prospective cohort of newly registered leprosy patients has been carried out. Whilst most NFI events occurred either before registration or during the first year after the start of MDT, amongst MB patients almost a third occurred in the second year of MDT. The IRs of NFI amongst MB patients and those with long-standing NFI present at registration are particularly high, and whilst the IR reduced over time, it was maintained at a moderately high level amongst these latter two groups of patients even at the end of follow-up. The presence of long-standing NFI at registration and MB group have emerged as important predictors for the development of NFI after registration in a regression model which included age and sex as co-variables. The subject of predicting NFI and the development of a prediction rule is an important area requiring further investigation, both for understanding the pathogenesis of nerve damage in leprosy and implementing leprosy control programmes.

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References

[1] Croft RP, Nicholls P, Richardus JH, Smith WCS. Nerve function impairment in leprosy: design, methodology and intake status of a prospective cohort study of 2664 new leprosy cases in Bangladesh *Lepr Rev,* 1999; **70**: 140–159.
[2] Job CK. Nerve damage in leprosy. *Int J Lepr,* 1989; **57**: 532–539.

[3] Lienhardt C, Fine PE. Type 1 reaction, neuritis and disability in leprosy. What is the current epidemiological situation? *Lepr Rev,* 1994; **65**: 9–33.
[4] Duncan ME, Pearson JM. Neuritis in pregnancy and lactation. *Int J Lepr,* 1982; **50**: 31–38.
[5] Van Brakel WH, Khawas IB. Silent neuropathy in leprosy: an epidemiological description. *Lepr Rev,* 1994; **65**: 350–360.
[6] Srinivasan H, Rao KS, Shanmugan N. Steroid therapy in recent 'quiet nerve paralysis' in leprosy. Report of a study of 25 patients. *Lepr Ind*, 1982; **54**: 412–419.
[7] Anderson AM, Croft RP. Reliability of Semmes Weinstein monofilament and ballpoint sensory testing and voluntary muscle testing in Bangladesh. *Lepr Rev*, 1999; **70**: 305.
[8] Anonymous. Chemotherapy of leprosy. Report of a WHO study group. *WHO Technical Report Series*, 1994; **847**: 1–24.
[9] Anonymous. *Technical guide and operational manual for leprosy control in Bangladesh. Dhaka.* TB and leprosy control services, Government of Bangladesh, 1995.
[10] Schreuder PA. The occurrence of reactions and impairments in leprosy: experience in the leprosy control programme of three provinces in northeastern Thailand, 1978–1995. II Reactions. *Int J Lepr*, 1998; **66**: 159–169.
[11] Van Brakel WH, Khawas IB, Lucas SB. Reactions in leprosy: an epidemiological study of 386 patients in west Nepal. *Lepr Rev*, 1994; **65**: 190–203.
[12] Bernink EH Voskens JE. Study on the detection of leprosy reactions and the effect of prednisolone on various nerves, Indonesia. *Lepr Rev*, 1997; **68**: 225–232.
[13] De Rijk AJ, Gabre S, Byass P, Berhanu T. Field evaluation of WHO-MDT of fixed duration at ALERT, Ethiopia; the AMFES project – II. Reaction and neuritis during and after MDT in PB and ME leprosy patients. *Lepr Rev*, 1994; **65**: 320–332.
[14] Becx-Bleumink M, Berhe D. Occurrence of reactions, their diagnosis and management in leprosy patients treated with MDT; experience in the leprosy control program on the All Africa leprosy and rehabilitation training centre (ALERT) in Ethiopia. *Int J Lepr*, 1992; **60**: 173–184.
[15] Anonymous. WHO Expert committee on Leprosy Control, 7th report. *WHO Technical Report Series*, 1998; **874**: 1–43.
[16] Croft RP. Active surveillance in leprosy: how useful is it? *Lepr Rev*, 1996; **67**: 135–140.
[17] Richardus JH, Finlay KM, Croft RP, Smith WCS. Nerve function impairment in leprosy at diagnosis and at completion of MDT: a retrospective cohort study of 786 patients in Bangladesh. *Lepr Rev*, 1996; **67**: 297–305.
[18] Van Brakel WH, Khawas IB. Nerve damage in leprosy: an epidemiological and clinical study of 396 patients in west Nepal. Part 1. Definitions, methods and frequencies. *Lepr Rev*, 1994; **65**: 204–221.
[19] Roche PW, Le Master J, Butlin CR. Risk factors for type 1 reactions in leprosy. *Int J Lepr*, 1997; **65**: 450-455.
[20] Barnetson RS, Bjune G, Pearson JM, Kronvall G. Antigenic heterogeneity in patients with reactions in borderline leprosy. *BMJ*, 1975; **4**: 435–437.
[21] Lockwood DN, Vinaykumar S, Stanley JN, McAdam KP, Colston MJ. Clinical features and outcome of reversal (type 1) reactions in Hyderabad, India. *Int J Lepr,* 1993; **61**: 8–15.
[22] Roche PW, Theuvenet WJ, Britton WJ. Risk factors for type 1 reactions in borderline leprosy patients. *Lancet,* 1991; **338**: 654–657.
[23] Boerrigter G, Ponnighaus JM, Fine PE, Wilson RJ. Four-year follow-up results of a WHO-recommended multiple-drug regimen in paucibacillary leprosy patients in Malawi. *Int J Lepr,* 1991; **59**: 255–261.
[24] Vijayakumaran P, Manimozhi N, Jesudasan K. Incidence of late lepra reaction among multibacillary leprosy patients after MDT. *Int J Lepr*, 1995; **63**: 18–22.
[25] Groenen G, Janssens L, Kayembe T, Nollet E, Coussens L, Pattyn SR. Prospective study on the relationship between intensive bactericidal therapy and leprosy reactions. *Int J Lepr,* 1986; **54**: 236–244.

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Which physical signs help most in the diagnosis of leprosy? A proposal based on experience in the AMFES project, ALERT, Ethiopia

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Summary As integration of leprosy control programmes proceeds, general health staff will have responsibility for the diagnosis of most new cases of leprosy. The training required by these workers has not yet been set out in detail. In this paper the criteria for making the diagnosis of leprosy in the AMFES cohort of 594 new cases are examined. Since this study does not include details of suspects in whom leprosy was excluded on clinical grounds, true sensitivity and specificity values cannot be calculated, but the positive predictive value of the diagnostic criteria can be measured. Sensory loss in a typical skin patch is the most important sign of early leprosy, but was not present in 132 (49%) of the 268 cases with a positive skin smear. Thickening of the ulnar nerve is a valuable sign of leprosy in Ethiopia. It can be taught to health workers, who can practise by examining their own ulnar nerves. It is more likely to be present than nerve function impairment and is particularly important when skin smears are difficult to do or are unreliable. We recommend that five basic signs are used, the presence of any two being diagnostic of leprosy:

- Skin lesion(s) consistent with leprosy.
- Loss of sensation in such a lesion.
- Thickening of either ulnar nerve.
- Loss of sensation in the palm of the hand or the sole of the foot.
- The presence of acid-fast bacilli in skin smears.

Exact policies for the diagnosis of leprosy should be worked out and validated for each national programme.

Introduction

Leprosy is becoming less common in most previously endemic areas. Most traditional vertical leprosy control programmes are handing over their work to integrated or combined programmes, in which routine patient management is carried out by general health staff in a peripheral clinic.[1,2] There are many potential advantages of this change, not least of which is increased cost-effectiveness.

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The major disadvantage anticipated, however, is the lack of specialized skills in these general health workers, who have to manage a variety of conditions and for whom leprosy will usually be a rare problem. Those involved in the training of health staff have expressed concern about defining a basic curriculum related to leprosy, which would not overload the trainee, but which at the same time would provide a sound basis for the management of the cases being seen.[3–5]

This paper looks at one aspect of a basic curriculum, namely the diagnosis of leprosy and what would be the simplest message to teach general health workers. The objective of such training would be to enable them to suspect leprosy and either make the diagnosis themselves in a reliable manner, or refer the case to someone with more experience.

Traditionally, three cardinal signs have been used to diagnose leprosy,[6] namely:

1. Definite loss of light touch sensation in a skin lesion consistent with leprosy.
2. Skin smears positive for acid-fast bacilli.
3. Thickening of one or more peripheral nerves.

These signs have not been extensively tested for sensitivity, specificity and inter-observer agreement, and studies that have been published give equivocal results.[7–9]

Current WHO guidelines, however, advocate the use of only two cardinal signs, numbers 1 and 2 above,[10] either one being sufficient to make the diagnosis of leprosy. These guidelines further state that: 'nerve damage, mainly to peripheral nerve trunks, constitutes another feature of leprosy. There may be loss of sensation in the skin and weakness of muscles supplied by the affected nerve. In the absence of these signs, nerve thickening by itself, without sensory loss and/or muscle weakness is often not a reliable sign of leprosy.'

The role of nerve thickening in the diagnosis of leprosy is made clear in the seventh report of the WHO Expert Committee on Leprosy,[11] which stated that 'the disease should not be diagnosed if only nerve thickening is present, without any other accompanying symptoms or signs.'

We decided to examine the criteria for the diagnosis of leprosy in a large prospective study being carried out in Ethiopia, in order to determine what may be the most appropriate diagnostic criteria for use by peripheral health staff.

Patients and methods

Unselected new cases were enrolled in the AMFES project (ALERT MDT Field Evaluation Study) between March 1988 and March 1993.[12] For a variety of reasons related to deeply held cultural beliefs and practices, patients with leprosy in central Ethiopia have generally presented very late for diagnosis; signs of nerve involvement are therefore rather common in this group.[13] Detailed records of the clinical signs at diagnosis were available for analysis.

The following details for each case were analysed:

- Skin smear result.
- The number of skin lesions.
- The presence of loss of sensation in a skin lesion, tested with a wisp of cotton wool.
- The presence of nerve function impairment, based on the testing of four muscles for power,

using a three-point scale of strong/weak/paralysed (eye closure, fifth finger abduction, thumb abduction and dorsiflexion of the foot) and 10 points on each palm and sole for loss of touch sensibility, using a 10 g nylon monofilament. Details of any loss of muscle power and any loss of touch sensibility were recorded.

- The presence of visible damage to hands or feet (who impairment grade 2).[14]
- The presence of thickening in any of six nerves examined (greater auricular, ulnar, median, radial cutaneous, peroneal and posterior tibial).
- Skin biopsy results for certain patients.

Results

In all, 603 new cases were enrolled in AMFES. Nine patients were excluded on the grounds of incorrect diagnosis (three cases) and incorrect enrolment procedures (6 cases), leaving 594 cases for the current analysis.

Biopsies were performed for 10 cases in whom the diagnosis on clinical grounds (usually typical skin lesions without sensory loss) was suggestive but not certain. Leprosy was confirmed in nine cases (90%). Biopsies were also done on a random sample of 102 patients whose diagnosis was not considered doubtful by experienced field staff. Leprosy was confirmed in 100 of these cases (98%).

Figure 1 shows how the traditional cardinal signs of leprosy contributed to the diagnosis in 594 AMFES patients. In this analysis, thickening in any of six nerves was taken into

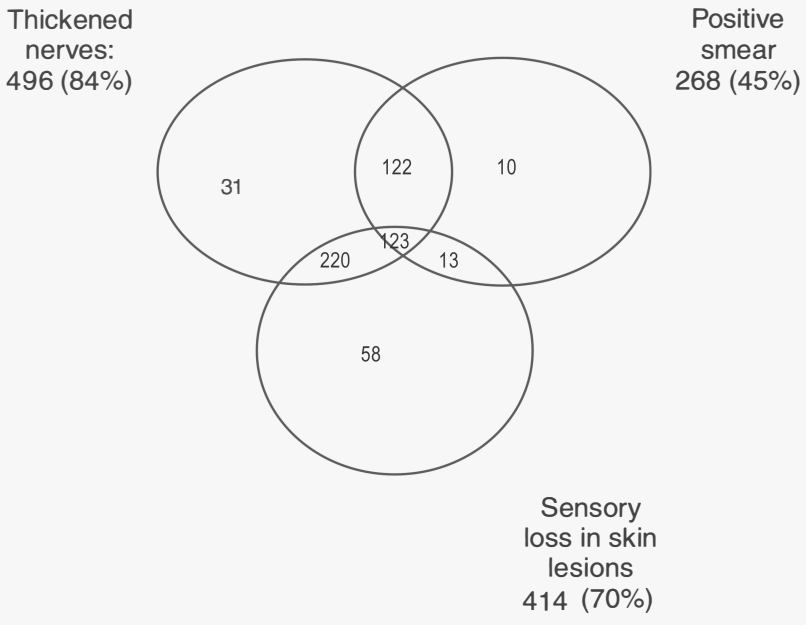

Figure 1. Traditional criteria for the diagnosis of leprosy (AMFES). $n = 594$; 17 cases are undiagnosed using these criteria.

Table 1. The contribution of different nerves to the diagnosis of leprosy

Cases with any nerve thickening	Cases with ulnar nerve thickening	Cases with radial cutaneous nerve thickening	Cases with either ulnar or radial cutaneous thickening
496 cases in total	403 (81%)	283 (57%)	443 (89%)
31 cases without other diagnostic signs	25 (81%)	19 (61%)	30 (97%)

account, all positive smears and any sensory loss in skin lesions. Seventeen cases did not show any of the three cardinal signs: they were diagnosed as follows:

Clinical suspicion confirmed by biopsy	9 cases
Strong clinical suspicion alone (including one child) when a biopsy could not be done for logistic reasons	6 cases
Nerve function impairment, without a cardinal sign	2 cases

The ulnar and radial cutaneous nerves were the most commonly involved, as shown in Table 1. The one case diagnosed by the finding of a thickened nerve, but without thickening of either the ulnar or radial cutaneous nerves, had a grossly thickened median nerve and some loss of function of the ulnar nerve.

Because of the very frequent involvement of the ulnar nerve and the relative ease with which it can be examined, Figure 2 looks at the effect of using only that nerve for diagnostic purposes.

Figure 3 shows how the new WHO guidelines would work in practice in this cohort of patients in Ethiopia, using positive smears, sensory loss in the lesions and nerve function impairment as the three cardinal signs. Of the 310 patients with impairment, 277 (89%)

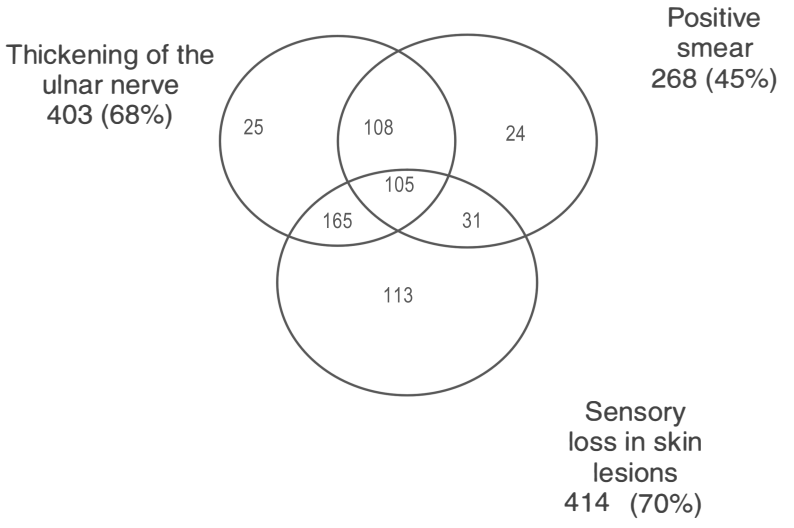

Figure 2. Using the traditional cardinal signs, but restricting the examination of nerves to the ulnar alone (AMFES). $n = 594$; 23 cases are undiagnosed using these criteria.

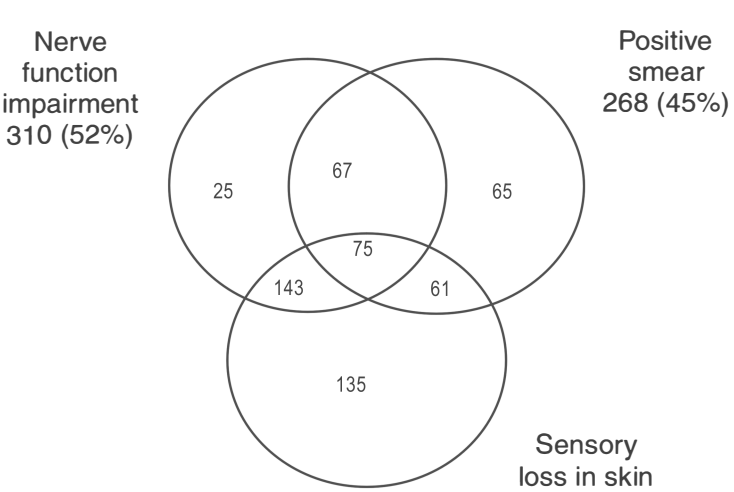

Figure 3. WHO criteria for the diagnosis of leprosy (AMFES). $n = 594$; 23 cases are undiagnosed using these criteria.

had sensory loss, while only 160 (52%) had loss of muscle strength. By examining sensory loss and loss of muscle strength as two different criteria, it is found that sensory loss is a much more sensitive diagnostic tool; if both tests are used, loss of muscle strength contributes very little, with only one additional case being diagnosed.

The simplest group of signs with the maximum yield in this patient population consists of four criteria, as shown in Figure 4, with any one sign being strongly suggestive of leprosy:

- A skin smear positive for acid-fast bacilli.
- Sensory loss in a typical skin lesion.
- Loss of sensation anywhere in the palms of the hands or soles of the feet.
- Thickening of one or both ulnar nerves.

The most worthwhile addition to this battery of tests would be to add thickening of the radial cutaneous nerve: three additional cases would be diagnosed, bringing down the number of undiagnosed cases to 14. Voluntary muscle testing and an assessment of damage to the hands and feet (WHO impairment grade 2) would add very little to the diagnostic process, even in this cohort with relatively high rates of impairment at diagnosis.

Discussion

When proposing diagnostic criteria for any medical condition, the sensitivity, specificity and predictive values of the criteria are important considerations. Table 2 shows how these terms are defined and calculated. In leprosy, a test with low sensitivity will mean that new cases are missed, with the possible outcome of permanent nerve damage, disability and deformity. Low specificity, on the other hand, will lead to overdiagnosis and the unnecessary labelling

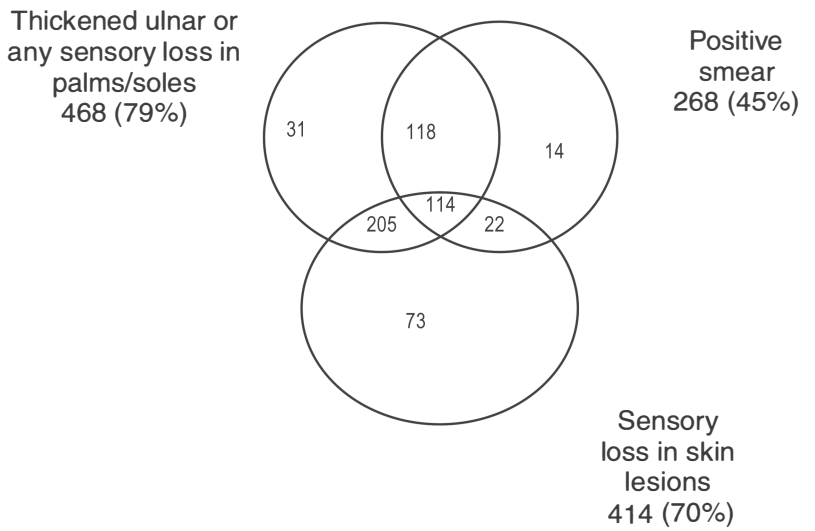

Figure 4. The use of four basic signs for the diagnosis of leprosy (AMFES). $n = 594$; 17 cases are undiagnosed using these criteria.

of some people as leprosy patients, still associated with varying degrees of stigma in many cultures.

For a rare condition, such as leprosy now is in most countries, the specificity of a diagnostic test must be very close to 100%. If the specificity is much less than this, there will be many false positives and a large proportion of the patients diagnosed would not actually have the disease: in other words the positive predictive value of the test would be very low. In practice, the positive predictive value of diagnostic tests in this situation is improved by pre-selection of cases:[15] for leprosy, clinic attenders with suggestive skin lesions are

Table 2. The definition and calculation of terms relating to diagnostic tests

	True disease status		
Test result	Present	Absent	Total
Positive	A	B	A + b
Negative	C	D	C + d
Total	a + c	b + d	a + b + c + d

Definitions: a = true positives; b = false positives; c = false negative; d = true negatives.

Sensitivity = a/(a + c) or the proportion of all those who really have the disease who come out positive in the test.

Specificity = d/(b + d) or the proportion of all those who do not have the disease who come out negative in the test.

Positive predictive value = a/(a + b) or the proportion of those with a positive test who really have the disease.

pre-selected to undergo the more formal diagnostic tests and the prevalence of leprosy will be much higher in this group than in the general population.

The specificity of a diagnostic test can only be measured when a large number of suspects are examined and the proportion of false positives is calculated. The gold standard for determining the actual status of each subject (leprosy: yes or no) is difficult to define, but is likely to include a combination of expert clinical opinion and histopathological examination.[7] As the present study neither took biopsies nor recorded details of suspects who were examined and thought not to have leprosy, it is impossible to calculate the specificity of this battery of diagnostic tests from this dataset. However, in those cases biopsied as a random check of the accuracy of the clinical diagnosis, only 2% were found to be falsely positive, indicating a positive predictive value of 98% in this setting.

In this cohort, cases missed by the various diagnostic regimens described, range from 14 to 23 out of a total of 594 new cases. This difference may well be smaller than the errors to be expected in any routine programme. The field staff in the AMFES project were very experienced and worked in a vertical programme, so that their performance may not be reproducible in a general clinic. On these grounds, therefore, any of the methodologies described would be acceptable in terms of sensitivity.

The skin smear is the only part of the diagnostic process which is outside the direct control of the primary healthcare worker. Given appropriate training and motivation, (s)he can carry out all the other diagnostic steps. In many programmes, therefore, it is not surprising that the skin smear is the weak link and many leprosy suspects may wait a long time for a smear result, or never have the possibility of a skin smear at all.

Using the traditional diagnostic criteria (Figure 1), there are only 10 patients diagnosed solely by a positive smear, while 478 (80%) of patients are diagnosed by at least two criteria. If the number of nerves examined is reduced to one (Table 1, Figure 2), the figures are not greatly changed. Using the new WHO guidelines (Figure 3), 65 patients are diagnosed by smear alone, while only 346 (58%) are diagnosed by at least two criteria. The addition of ulnar nerve thickening as a diagnostic sign (Figure 4) greatly improves the possibility that two signs are available to suggest the diagnosis of leprosy. This could be an important consideration in areas where smears are not available.

Similar data have been published from Bangladesh in a study which examined the classification of new cases.[16,17] A total of 244 consecutive new cases were diagnosed clinically, with skin smears and biopsy. It was found that 32% had positive skin smears, 77% had loss of sensation in a skin lesion, 90% had enlarged nerves and 54% had nerve function impairment; of the 32 cases not confirmed by biopsy or skin smears, 24 had loss of sensation in a skin lesion, seven had enlarged nerves and one had nerve function impairment. No combined figures are available, since data were collected for classification purposes, not diagnosis, but the similarity with the AMFES data as illustrated in Figures 1 and 3, is striking.

The reliability of thickened nerves as a sign of leprosy was first questioned in Nepali army recruits, 63% of whom had thickened greater auricular nerves.[18] It was suggested that well-developed musculature could lead to enlargement of the related nerve, an effect noted in the ulnar nerves of another group of manual workers.[19] However, in a detailed clinical and histological study, Srinivas *et al.* found that in a carefully selected group of suspects with nerve enlargement but no other clinical sign of leprosy, five of 16 (31%) had leprosy, two had diabetic neuropathy and nine were labelled as idiopathic neuropathy.[20]

In a large population survey in Malawi, the sensitivity and specificity of the cardinal signs of leprosy were examined: 95% of the cases diagnosed were early paucibacillary cases.[7] It was noted that amongst self-reporting new cases in Malawi, 49·5% had definite nerve enlargement, while the figure was only 19·2% for actively detected cases. Definite nerve enlargement was said to make the diagnosis of leprosy 'extremely likely', although it contributed to the diagnosis in only a minority of cases of paucibacillary disease. It is interesting that in the same survey, sensory loss in skin lesions was found unsatisfactory as a diagnostic test with a sensitivity of 48·5% and a specificity of 72%. The conclusion of the Malawi study was that the diagnosis of very early leprosy is so uncertain by clinical methods alone that such a total population survey should not be undertaken without the help of histopathology.

In the cohort presented here, nerve enlargement is shown to be a valuable sign in skin-smear positive cases. These patients may have poorly defined skin lesions, which often do not show sensory loss. All four figures show that 132 (49%) of skin-smear positive cases do not display the cardinal sign 'definite loss of light touch sensation in a skin lesion consistent with leprosy'. If skin smears are not easily available, Figures 3 and 4 indicate that ulnar nerve palpation could greatly increase the sensitivity of the diagnostic procedure for this very important group of patients.

The most recent report of the WHO Expert Committee on Leprosy defines a case of leprosy as a person having one or more of the following features:[11]

1. Hypopigmented or reddish skin lesion(s) with definite loss of sensation.
2. Involvement of the peripheral nerves, as demonstrated by definite thickening with loss of sensation.
3. Skin smears positive for acid-fast bacilli.

The first two features are, in fact, double signs. We propose splitting them into their component parts, making five signs of leprosy, any two of which would be grounds to diagnose the disease. This means that a typical case with early lepromatous leprosy, who has skin lesions without definite sensory loss and thickened nerves without impairment, could be diagnosed even if a skin smear result is not available. While a positive skin smear on its own should be enough to diagnose leprosy, it is unlikely to be found without any of the other four signs.

We therefore recommend that those general health staff who are to be responsible for the diagnosis of leprosy should be taught to look for five signs:

1. Skin lesion(s) consistent with leprosy.
2. Loss of sensation in such a lesion.
3. Thickening of either ulnar nerve.
4. Loss of sensation in the palm of the hand or the sole of the foot.
5. The presence of acid-fast bacilli in skin smears.

Finding any two of these signs would be diagnostic of leprosy.

The exact policy for diagnosis must be determined by each national programme; it may be necessary to recommend that certain suspects are referred to a specialist for confirmation of the diagnosis. Further research into the sensitivity and specificity of these diagnostic criteria in different endemic countries is needed and the best methods for teaching general health staff remain to be elucidated.

Acknowledgements

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References

[1] Feenstra P. Leprosy control through general health services and/or combined programmes. *Lepr Rev*, 1993; **64:** 89–96.
[2] Saunderson PR. Joint Tuberculosis/Leprosy Programmes. *Lepr Rev*, 1997; **68**: 2–9.
[3] McDougall AC. Training in leprosy: does the current strategy need revision? *Lepr Rev*, 1995; **66:** 89–95.
[4] Groenen G, Alldred N, Nash J. Comment: training in leprosy: the training needs for Africa, and the role of large training institutions. *Lepr Rev*, 1996; **67:** 148–150.
[5] Saunderson PR. Future role of leprosy training and/or research institutions. *Lepr Rev*, 1998; **69:** 160–163.
[6] Hastings RC. *Leprosy*, 1st edn. Churchill Livingstone, New York, 1985.
[7] Ponnighaus JM, Fine PEM. Leprosy in Malawi: 1. Sensitivity and specificity of the diagnosis and the search for risk factors for leprosy. *Trans R Soc Trop Med Hyg*, 1988; **82**: 803–809.
[8] Sirumban P, Kumar A, Durai V, Neelan PN. Diagnostic value of cardinal signs/symptoms in paucibacillary leprosy. *Ind J Lepr*, 1988; **60:** 207–214.
[9] Gupte MD, Vallishayee RS, Nagaraju B, Ramalingam A, Lourdusamy G, Kannan S. Inter-observer agreement and clinical diagnosis of leprosy for prophylaxis studies. *Indian J Lepr*, 1990; **62:** 281–295.
[10] WHO. A Guide to Eliminating Leprosy as a Public Health Problem. WHO, Geneva, 1995.
[11] WHO Expert Committee on Leprosy. Seventh Report. *Technical Report Series* 874; 1998.
[12] de Rijk AJ, Gebre S, Byass P, Berhanu T. Field evaluation of WHO-MDT of fixed duration at ALERT, Ethiopia: the AMFES project—I. MDT course completion, case-holding and another score for disability grading. *Lepr Rev*, 1994; **65:** 305–319.
[13] Bekri W, Gebre S, Mengiste A, Saunderson PR, Zewge S. Delay in presentation and start of treatment in leprosy patients: a case-control study of disabled and non-disabled patients in three different settings in Ethiopia. *Int J Lepr*, 1998; **66**: 1–9.
[14] WHO Expert Committee on Leprosy. Sixth Report. *Technical Report Series* 768; 1988.
[15] Toman K. Sensitivity, specificity and predictive value of diagnostic tests. *Bull Int Union Tuberc*, 1981; **56**: 18–27.
[16] Groenen G, Saha NG, Rashid MA, Hamid MA, Pattyn SR. Classification of leprosy cases under field conditions in Bangladesh. I. Usefulness of skin-smear examinations. *Lepr Rev*, 1995; **66:** 126–133.
[17] Groenen G, Saha NG, Rashid MA, Hamid MA, Pattyn SR. Classification of leprosy cases under field conditions in Bangladesh. II. Reliability of clinical criteria. *Lepr Rev*, 1995; **66:** 134–143.
[18] Lynch P. Greater auricular nerve in the diagnosis of leprosy. *BMJ*, 1978; 1340.
[19] Dharmendra. Thickened nerves in diagnosis of leprosy. *Lepr Ind*, 1980; **52:** 1–2.
[20] Srinivas HV, Lakhani R, Mehta LN, Antia NH. Study of thickened nerves in a leprosy endemic region. *Lepr Ind*, 1980; **52:** 53–64.

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A 6 week quadruple drug regimen for the treatment of multibacillary leprosy

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Introduction

Although the WHO recommended multidrug therapy regimen for multibacillary (MB) leprosy is highly effective, there is a need from the operational point of view[1] to develop regimens of shorter duration.

We present here the results of a regimen of 6 weeks duration involving the supervised administration of four drugs, introduced in November 1989. Follow-up from 7 years on has become increasingly difficult as a result of political turmoil in the country. We therefore present the results as available.

Patients and methods

As in our previous studies,[2–4] all patients were examined clinically, neurologically and bacteriologically; a copy of the clinical file was sent to Antwerp together with a skin biopsy fixed in 10% formalin. MB leprosy was defined as disease with a bacterial index (BI) of 2 or more at any of three sites from which slit-skin smears were prepared (one earlobe and two skin sites) and confirmed by histopathology.

Yearly follow-up examination identical to those at intake are performed. Patients received daily, 6 days a week, under supervision, rifampicin 600 mg, ofloxacin 400 mg, clofazimin 100 mg and once a week minocycline 100 mg.

For follow-up, patients were invited to present to the National Leprosy Centre in the capital or to the regional Health Centres, where they were examined by the mobile teams and actively searched for as far as possible. This became more and more difficult from year 7 on.

Relapses were suspected clinically when new active looking lesions appeared. These were

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confirmed by bacterial and histopathological examinations. All relapses had a BI of 4 or 5 with a proportion of solid staining bacilli after several negative BIs during the previous years.

The study was approved by the Ethical Committee of the Institute of Tropical Medicine, Antwerpen and the Ministry of Health of the Republic of the Comores.

Results

Between November 1989 and December 1993, a total of 136 patients giving their consent were taken into the study. At intake there were 18 (13.2%) patients with a BI = 2, 21 (15.4%) with a BI = 3, 73 (53.6%) with a BI = 4 and 24 (17.6%) with a BI = 5. All patients showed a rapid favourable clinical evolution. No major complications such as hepatitis or severe ENL requiring specific treatment were observed. No complaints of photophobia or skin discoloration were noted. As shown in Table 1, follow-up later than 6 years concerned considerably less than 50% of patients. The mean follow-up at year 6 was 4.7 years. During the first 6 years of follow-up, two relapses were diagnosed, at 56 and 60 months, respectively, after the start of treatment, giving rise to a cumulative relapse rate of 2%. Six more relapses were diagnosed at 72, 96, 96, 103, 106 and 111 months, respectively, after the start of therapy. Due to the small number of patients seen at 7–10 years of follow-up, calculations of cumulative relapse rates would be much misleading. At the start of therapy, the two patients relapsing at year 5 had a BI of 5. Among the six patients relapsing later, two had a BI of 4, the other had a BI of 5.

Table 1. Number of patients taken in the study, their follow-up and appearance of relapses

Years of follow-up	Number of patients	Cumulative number of patient years	Relapses		
			Number	Cumulative number	%
1	136	136	–		
2	124	260	–		
3	121	381	–		
4	106	487	–		
5	88	575	2	2	2
6	66	641	–	2	2
7	52	693	1	3	*
8	27	720	2	5	*
9	14	734	2	7	*
10	3	737	1	8	*
Mean (up to year 6)		4.7			

*Not calculated because low number of patients seen at the 7th year of follow-up.

Discussion

The antileprosy drugs of the 1980s, ofloxacin and minocycline,[5–8] created new hopes for shorter treatment regimens in multibacillary leprosy. However, a treatment regimen consisting of the two drugs rifampicin and ofloxacin given daily for 4 weeks gave rise to an unacceptable high relapse rate of 2.9% or 11.5 per 100 patient years.[9,10] In the present study, the quadruple regimen of daily rifampicin, ofloxacin, clofazimine and once weekly minocycline administered during 6 weeks, gave rise to a cumulative relapse rate of 2 per 100 patient years at year 6. Calculation of the relapse rate at years 7–10 when a continuously decreasing number of patients were seen would produce an unrealistic figure. In the absence of sufficient information concerning years 7–10 of follow-up, we cannot present a definitive result on the value of this regimen, only that it is superior to the 4 weeks daily rifampicin–ofloxacin evaluated at *5* years. It is noteworthy that in the present study, all relapsing patients had a BI of 4 or 5 at the start of treatment, as was the case in the study by Jamet *et al.*[11] Minocycline being a bactericidal[8,12] and long acting drug against *Mycobacterium leprae*[12,13] and in order to avoid possible unexpected side effects of the drug combination, it was decided in 1989 to administer minocycline only once a week. It is possible that daily administration of minocycline would enhance the bactericidal action of this regimen. No skin or oral pigmentation was observed. Indeed, these complications appear only after years of minocycline intake.[14,15]

The strategy of multibacillary leprosy treatment has evolved along two main axes: either once monthly supervised treatment, completed by unsupervised drug intake, but for long duration, originally 24 months, now reduced to 12 months[1] or daily drug intake of shorter duration. The Antwerp laboratory[16] has been involved in studies of treatment regimens lasting 52, 34, 13 and 4 weeks duration, all involving only the drugs of the 1970s: rifampicin, ethionamide, dapsone or clofazimine. These studies showed that some regimens may be very promising during the first 5 years of follow-up but may give rise to cumulative relapse rates of 4 per 100 patient years at 8–9 years of follow-up.[16] The interpretation could be that 'early' relapses appearing during the first 5 years of follow-up are due to insufficient killing of originally actively multiplying organisms, while late relapses could be due to revival of dormant bacilli that resist all chemotherapeutic agents currently in use. Wayne[17] and Wayne *et al.*[18,19] showed that slow depletion of oxygen permits tubercle bacilli to adapt to a non-replicating state under microaerophilic conditions and enhance their ability to survive anaerobic conditions. This could account for long term latency of tuberculosis in the human host. Efforts to eradicate these bacteria should include agents killing these in both microaerophilic and anaerobic non-replicating stages. If this hypothesis of Wayne, sustained by experimental evidence, concerning *M. tuberculosis* is correct, and holds also for *M. leprae*, other fluoroquinolones active against anaerobes, such as clinafloxacin or trovafloxacin, should be studied in the treatment of leprosy in mice and in humans.

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References

[1] Ji B. Why multidrug therapy for multibacillary leprosy can be shortened to 12 months. *Lepr. Rev.*, 1998; **69**: 106–109.

[2] Pattyn SR, Groenen G, Janssens L, Deverchin J, Ghys P. Combined regimens of one year duration in the treatment of multibacillary leprosy. I Combined regimens with rifampicin administered during one year. *Lepr. Rev.*, 1989; **60**: 109–117.

Pattyn SR, Bourland J, Kazeze. Ambulatory treatment of multibacillary leprosy with a regimen of 8 months duration. *Lepr. Rev.*, 1992; **63**: 36–40.

[4] Pattyn SR, Groenen G, Janssens L, Kuykens L, Mputu MB. Treatment of multibacillary leprosy with a regimen of 13 weeks duration. *Lepr. Rev.*, 1992; **63**: 41–46.

[5] Pattyn SR. Activity of ofloxacin and pefloxacin against *Mycobacterium leprae* in mice. *Antimicrob. Agents Chemother.*, 1987; **31**: 671–672.

[6] Pattyn SR. Antimycobacterium leprae activity of several quinolones studied in the mouse. *Int. J. Lepr.*, 1991; **59**: 613–617.

[7] Gelber RH. Activity of minocycline in *Mycobacterium* leprae-infected mice. *J. Infect. Dis.*, 1987; **156**: 236–239.

[8] Xiong J, Ji B, Perani EG, Petinon C, Grosset JH. Further study of the infectiveness of single doses of clarithromycin and minocycline against *Mycobacterium leprae* in mice. *Int. J. Lepr.*, 1994; **62**: 37–42.

[9] Ji B, Jamet P, Sow S, Perani EG, Traore I, Grosset JH. High relapse rate among lepromatous leprosy patients treated with rifampin plus ofloxacin daily for 4 weeks. *Antimicrob. Agents Chemother.*, 1999; **41**: 1953–1956.

[10] Ganapati R, Pai VV, Revankar CR, Kingsley S, Buichand HO. Relapse of multibacillary leprosy after rifampin and ofloxacin treatment for 28 days; a case report. *Int. J. Lepr.*, 1998; **66**: 56–57.

[11] Jamet P, Ji B and the Marchoux Chemotherapy Study Group. Relapse after long-term follow-up of multibacillary patients treated by WHO multidrug regimen. *Int. J. Lepr.*, 1994; **63**: 195–201.

[12] Ji B, Jamet P, Perani EG, Bobin P, Grosset JH. Powerful bactericidal activities of clarithromycin and minocycline against *Mycobacterium leprae* in lepromatous leprosy. *J. Infect. Dis.*, 1993; **169**: 188–190.

[13] Gelber RH, Siu P, Tsang M, Alley P, Murray LP. Effect of low level and intermittent minocycline therapy on the growth of *Mycobacterium leprae* in mice. *Antimicrob. Agents Chemother.*, 1991; **35**: 992–994.

[14] Eisen D, Hakim MD. Minocycline-induced pigmentation. Incidence, prevention and management. *Drug Saf.*, 1998; **18**: 431–440.

[15] Morrow GL, Abbott RL. Minocycline-induced scleral, dental, and dermal pigmentation. *Am. J. Ophthalmol.*, 1998; **125**: 396–397.

[16] Pattyn SR. Search for effective short course regimens for the treatment of leprosy with a regimen of 8 months duration. *Int. J. Lepr.*, 1992; **60**: 234–243.

[17] Wayne LG, Sramek HA. Metronidazole is bactericidal to dormant cells of *Mycobacterium tuberculosis*. *Antimicrob. Agents Chemother.*, 1994; **38**: 2054–2058.

[18] Wayne LG. Dormancy of *Mycobacterium tuberculosis* and latency of disease. *Eur. J. Clin. Microbiol. Infect. Dis.*, 1994; **13**: 908–914.

[19] Wayne LG, Hayes LG. An in vitro model for sequential study of shiftdown of *Mycobacterium tuberculosis* through two stages of non-replicating persistence. *Infect. Immun.*, 1996; **64**: 2062–2069.

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Computerization of leprosy records: national leprosy recording and reporting system in China

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Summary This paper describes the national system of leprosy recording and reporting in China and the computerization of records. The system was designed for data collection at local level and data entry by optically scanned or manual mode as well as for sophisticated data analysis. The major functions include data entry, data check, sum-up, maintenance, communication, inquiry, statistics, graph and print. A total of 17 options for epidemiological and clinical data analysis are available. Through the implementation for about 10 years, the system has gained widespread acceptance. This acceptance would facilitate introduction of computer analysis to other leprosy projects and other disease control programs in China. Up to 1998, a database of more than 740,000 records covering all the leprosy patients detected since 1949 had been established by this system.

Introduction

One of the major roles of leprosy surveillance is the collection, analysis and dissemination of information relating to demographic, epidemiological and clinical aspects of the disease. To fulfil this role, a national leprosy recording and reporting system is needed to provide for efficient recording of a database, rapid retrieval of information about epidemiological status and rapid, economical analysis of collected information. The computerization of medical records with or without the automated data entry system has been pursued for various diseases.[1–4] Along with the wider availability of micro-computers, computerized options for

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data management should be applied in leprosy. This paper describes the computerization of records in the national system of leprosy recording and reporting in China.

The system

The national leprosy recording and reporting system in China was initiated by the Ministry of Public Health in 1990 and is managed and implemented by the National Centre for STD and Leprosy Control, which is located in Nanjing. The demographic and clinical data on all patients detected from 1949 through 1996 were collected each with the individual forms (four types of one-sided forms, Figure 1a–d). The different forms are distinguished by colours. Patients are tracked between the different forms through their area code and registry number.

The forms were completed manually by leprosy workers or clerical staff at county level according to the guideline and instructions for the system (5–10 min being needed for one patient). All items had to be completed by filling numbers in blank boxes and marking (shading) the printing digit that corresponded to the number.

Data on the forms were entered automatically into an IBM computer by the Optical Mark Reader A30 (OMR) with the computer program designed for the system. Two digits (computer generated) were added to each two-digit number of calendar year to differ the year 1999 from the unknown year coded ''99'', and to solve the problem of year 2000. During data entry, the computer could automatically check logical mistakes in the relationship between the items. If the computer found any mistake, it stopped to wait for a correction; alternatively, corrections could be ignored if the operator did not wish to correct it at once or if the apparent error was intentional. Data entry was readily performed by staff without previous keyboard skills or experience with computers, so that manual dexterity did not significantly influence the entry speed achievable; however, operators had to be familiar with the relationship between the items.

A total of more than 740,000 forms have been entered into the computer in this way to establish databases according to different forms, provinces and calendar years. Copies of the databases will be sent back to the original institutions. In order to undertake the management and analysis of the database, software for the system was developed through the cooperation of leprosy experts and computer programmers using C language. The system (Figure 2) is simple to use and has a series of multi-level menus for data entry, data check, sum-up, maintenance, communication, inquiry, statistics, graph and print. The data entry menu allows for addition, modification, or deletion of data. The data check menu can check for logical mistakes or duplications of registry numbers in the same area. The sum-up menu is used to collect data for the national level. The maintenance menu allows for duplication, deletion or restoration of databases, and for transformation of file formats. The statistics menu gives the descriptive epidemiological results at provincial, prefecture, or county levels. The graph menu produces the common graphs based upon epidemiological results.

Quality control is facilitated by the institutions at different levels and quality evaluation is undertaken by the National Centre for STD and Leprosy Control in Nanjing. Following implementation for almost 10 years, it has been found that data entry errors or logical mistakes are rare, occurring on less than 1% of forms, but coding or numbering errors occasionally occur in the follow-up patients, which leads to mis-connection of forms ($< 5\%$) if the errors cannot be found and corrected.

Outputs

The outputs of the system include selective inquiry, statistics, graph and data print (Figure 2). The selective inquiry can search original forms, or it provides a tabulation of areas and item, according to the calendar year and item selected. The statistics provide the calculation of numbers of patients and rates if the relevant population data have been entered, which includes incidence, detection, prevalence and periodic numbers and rates with or without stratification by sex and age group. In addition, the system can calculate the statistics for demographic, epidemiological and clinical characteristics of newly detected and active cases, MDT regularity and coverage, disability rates and so on using 17 options for statistical analysis. The graph menu produces a series of statistical graphs such as bar, line or distribution map with an assistance of other software, for example, Epi-Map. The print menu prints a series of results generated by the system as well as the original data of individual forms.

Application and dissemination

Data in the system can be used at national, sub-national or even county levels to describe the epidemiological and clinical profiles of leprosy. The annual national and provincial reports and statistics of leprosy can be automatically produced through the system. The national data can be used by the MOH or National Centre for STD and Leprosy Control, and the provincial and county data can be used by relevant leprosy institutions. Some scientific papers based upon data from the system have been or will be published in domestic or international journals.[5–8] In addition, the annual data summarized from the system not only provide feedback to sub-national or county levels, but provide useful information for policymakers, programme managers, leaders of the Leprosy Expert Committee and mass media. This is helpful in requesting expanded action or increased resources, to help increase the impact of control measures, to assist in designing effective control programmes and to influence beliefs about and attitudes to leprosy.

Discussion

The target of basic eradication of leprosy, defined as a reduction of the prevalence rate to less than 0·1 per 10,000 and an average detection rate for the past 5 years of less than 0·5 per 100,000 by the end of this century, was set up in 1981. At that time, the Ministry of Health (MOH) and its Expert Committee decided that when China came to declare its achievement of that target, it would not be enough simply to present the two indicators, but there should be a national system for collecting the data necessary to calculate them. National leprosy control in China was initiated in the mid-1950s and is well organized. All the leprosy institutions,

Figure 1. Registration forms for computerized system of leprosy reporting and recording in China. (a) Form 1. (b) Form 2. (c) Form 3. (d) Form 4. PDDS = previous DDS monotherapy; PB/MB = PB-MDT/MB-MDT; CC = clinical cure, **SI = significant improvement; ***FUC = follow-up complete; FAC = follow-up after cure; ACT = active disease; LBC = lost before cure; DBC = died before cure; MBC = move out before cure; LAC = lost after cure; DAC = died after cure; MAC = move out after cure.

FORM 1. REGISTRATION FORM OF NEWLY DETECTED PATIENT

PATIENT'S NAME: REF. NO: FILLED BY: CHECKED BY: DATA: Y M D

A SEX	B BIRTH Y.	M.	C NATION	D JOB	E INFECT SOURCE	F ONSET YR.	MONTH	G DETECT Y.	M.	H MOVE-IN Y.	M.	I AREA CODE	II REG. NO.
□	□□□□	□□	□□	□□	□	□□	□□	□□	□□	□□	□□	□□□□	□□□□
	⓪⓪⓪	⓪⓪	⓪⓪	⓪⓪		⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪⓪⓪	⓪⓪⓪⓪
① M	①①①①	①①	①①	①①	① With family	①①	①①	①①	①①	①①	①①	①①①①	①①①①
② F	②②②②	②	②②	②	② Out of family	②②	②	②②	②	②②	②	②②②②	②②②②
	③③③	③	③③	③		③③	③	③③	③	③③	③	③③③③	③③③③
	④④④	④	④④	④		④④	④	④④	④	④④	④	④④④④	④④④④
	⑤⑤⑤	⑤	⑤⑤	⑤		⑤⑤	⑤	⑤⑤	⑤	⑤⑤	⑤	⑤⑤⑤⑤	⑤⑤⑤⑤
	⑥⑥⑥	⑥	⑥⑥	⑥		⑥⑥	⑥	⑥⑥	⑥	⑥⑥	⑥	⑥⑥⑥⑥	⑥⑥⑥⑥
	⑦⑦⑦	⑦	⑦	⑦		⑦⑦	⑦	⑦⑦	⑦	⑦⑦	⑦	⑦⑦⑦⑦	⑦⑦⑦⑦
	⑧⑧⑧	⑧	⑧	⑧		⑧⑧	⑧	⑧⑧	⑧	⑧⑧	⑧	⑧⑧⑧⑧	⑧⑧⑧⑧
⑨ Unk	⑨⑨⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨ Unk	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨⑨⑨	⑨⑨⑨⑨

I DETECT MODE	J CONFIRM UNIT	K NO. LESION	L NO. N DAMAGE	M REACTION	N DISABILITY	O BI	P TYPE	III CATEGORY	IV FORM
□	□	□	□	□	□	□□	□	□	
⓪ Voluntary	⓪ Leprosy Unit	⓪ None	⓪ None	⓪ None	⓪ None	⓪⓪	⓪ I		
① Skin Clinic	① PHC unit	① Single	① 1-2	① Type I	① Grade I	①①	① TT	① Original	■ Form 1
② Notification	② Dept Dermatol	② 2-4	② ≥ 3	② Type II	② Grade II	②②	② BT	② Correct	
③ Contact exam	③ Other Dept.	③ ≥ 5	③ Countless	③ Mixture	③ Grade III	③③	③ BB	③ Suppl.	
④ Spot survey	④ Other	④ Countless		④ Type-less	④ Grade-less	④④	④ BL	④ Deletion	
⑤ Group survey					⑤ Other	⑤⑤	⑤ LL	⑤ Code change	
⑥ Clue survey						⑥⑥	⑥ T	Original	
⑦ Mass survey						⑦⑦	⑦ B	Area Code	Reg. No.
⑧ Other						⑧⑧	⑧ L	□□□□	□□□□
⑨ Unk	⑨ Unk	⑨ Unk	⑨ Unk	⑨ Unk	⑨ Unk	⑨⑨	⑨ Unk		

Figure 1.

FORM 2. ANNUAL FOLLOW-UP FORM OF ACTIVE PATIENT

PATIENT'S NAME: REF. NO: FILLED BY: CHECKED BY: DATA: Y M D

A FOL-UP Y. M.		B RELAPSE	C REGIMEN*	D DDS START Y. M.		E MDT	F MDT START Y. M.		G TR. PLACE	H REGULAR	I AREA CODE	II REG. NO.
□□	□□	□	□	□□	□□	□	□□	□□	□	□	□□□□	□□□□
⓪⓪	⓪⓪	⓪ No	⓪ Un-treatment	⓪⓪	⓪⓪	⓪ None	⓪⓪	⓪⓪		⓪ Untreat	⓪⓪⓪⓪	⓪⓪⓪⓪
①①	①①	① 1st	① Mono-DDS	①①	①①	① 1st	①①	①①	① Hospital	① Yes	①①①①	①①①①
②②	②	② 2nd	② PDDS+1/2 yr. PB	②②	②	② 2nd	②②	②	② Home	② No	②②②②	②②②②
③③	③	③ 3rd	③ PDDS+2 yr. MB	③③	③	③ 3rd	③③	③			③③③③	③③③③
④④	④	④ 4th	④ PDDS+ MB→CC	④④	④	④ 4th	④④	④			④④④④	④④④④
⑤⑤	⑤		⑤ 1/2 yr. PB	⑤⑤	⑤		⑤⑤	⑤			⑤⑤⑤⑤	⑤⑤⑤⑤
⑥⑥	⑥		⑥ 2 yr. MB	⑥⑥	⑥		⑥⑥	⑥			⑥⑥⑥⑥	⑥⑥⑥⑥
⑦⑦	⑦		⑦ MB→CC	⑦⑦	⑦		⑦⑦	⑦			⑦⑦⑦⑦	⑦⑦⑦⑦
⑧⑧	⑧		⑧ Other MDT	⑧⑧	⑧		⑧⑧	⑧			⑧⑧⑧⑧	⑧⑧⑧⑧
⑨⑨	⑨⑨	⑨ Unk	⑨ Others	⑨⑨	⑨⑨		⑨⑨	⑨⑨	⑨ Unk	⑨ Unk	⑨⑨⑨⑨	⑨⑨⑨⑨

I MDT COMPLETE		J REACTION	K DISABILITY	L BI	M TYPE	N EFFECT**	O STATUS***	P CURE Y. M.		Q FOL-UP COMPLETE		III CATEGORY	IV FORM
□□	□□	□	□	□□	□	□	□	□□	□□	□□	□□	□	
⓪⓪	⓪⓪	⓪ None	⓪ None	⓪⓪	⓪ I	⓪ Cure	⓪ FUC	⓪⓪	⓪⓪	⓪⓪	⓪⓪		
①①	①①	① Type I	① Grade I	①①	① TT	① SI	① FAC	①①	①①	①①	①①	① Original	
②②	②	② Type II	② Grade II	②②	② BT	② Improve	② ACT	②②	②	②②	②	② Correct	■ Form 2
③③	③	③ Mixture	③ Grade III	③③	③ BB	③ No change	③ LBC	③③	③	③③	③	③ Suppl.	
④④	④	④ Type-less	④ G-less	④④	④ BL	④ Worsen	④ DBC	④④	④	④④	④	④ Deletion	
⑤⑤	⑤		⑤ Other	⑤⑤	⑤ LL	⑤ Self-cure	⑤ MBC	⑤⑤	⑤	⑤⑤	⑤	⑤ Code change	
⑥⑥	⑥			⑥⑥	⑥ T		⑥ LAC	⑥⑥	⑥	⑥⑥	⑥	Original	
⑦⑦	⑦			⑦⑦	⑦ B		⑦ DAC	⑦⑦	⑦	⑦⑦	⑦	Area Code	Reg. No.
⑧⑧	⑧			⑧⑧	⑧ L		⑧ MAC	⑧⑧	⑧	⑧⑧	⑧	□□□□	□□□□
⑨⑨	⑨⑨	⑨ Unk	⑨ Unk	⑨⑨	⑨ Unk	⑨ Unk	⑨ Unk	⑨⑨	⑨⑨	⑨⑨	⑨⑨		

Figure 1. (b) continued.

FORM 3. REGISTRATION FORM OF RELAPSED PATIENT

PATIENT'S NAME: REF. NO: FILLED BY: CHECKED BY: DATA: Y M D

A RELAPSE	B ORIGINAL REGIMEN*	C ORIGINAL CURE		D RELAPSE Y. M.		E DETECT Y. M.		F MOVE-IN Y. M.		G DETECT MODE	I AREA CODE	II REG. NO.
□	□	□□	□□	□□	□□	□□	□□	□□	□□	□	□□□□	□□□□
⓪ No	⓪ Un-treatment	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪ Voluntary	⓪⓪⓪⓪	⓪⓪⓪⓪
① 1st	① Mono-DDS	①①	①①	①①	①①	①①	①①	①①	①①	① Skin Clinic	①①①①	①①①①
② 2nd	② PDDS+1/2 yr. PB	②②	②	②②	②	②②	②	②②	②	② Notification	②②②②	②②②②
③ 3rd	③ PDDS+2 yr. MB	③③	③	③③	③	③③	③	③③	③	③ Regular exam	③③③③	③③③③
④ 4th	④ PDDS+ MB→CC	④④	④	④④	④	④④	④	④④	④	④ Follow-up	④④④④	④④④④
	⑤ 1/2 yr. PB	⑤⑤	⑤	⑤⑤	⑤	⑤⑤	⑤	⑤⑤	⑤	⑤ Mass survey	⑤⑤⑤⑤	⑤⑤⑤⑤
	⑥ 2 yr. MB	⑥⑥	⑥	⑥⑥	⑥	⑥⑥	⑥	⑥⑥	⑥	⑥ Others	⑥⑥⑥⑥	⑥⑥⑥⑥
	⑦ MB→CC	⑦⑦	⑦	⑦⑦	⑦	⑦⑦	⑦	⑦⑦	⑦		⑦⑦⑦⑦	⑦⑦⑦⑦
	⑧ Other MDT	⑧⑧	⑧	⑧⑧	⑧	⑧⑧	⑧	⑧⑧	⑧		⑧⑧⑧⑧	⑧⑧⑧⑧
⑨ Unk	⑨ Others	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨ Unk	⑨⑨⑨⑨	⑨⑨⑨⑨

H REACTION	I DISABILITY	J BI	K TYPE	L REGIMEN*	M STATUS**	N RELAPSE CURE		O STATUS Y. M.		III CATEGORY	IV FORM
□	□	□□	□	□	□	□□	□□	□□	□□	□	
⓪ None	⓪ None	⓪⓪	⓪ I	⓪ Un-treatment	⓪ FUC	⓪⓪	⓪⓪	⓪⓪	⓪⓪		
① Type I	① Grade I	①①	① TT	① Mono-DDS	① FAC	①①	①①	①①	①①	① Original	
② Type II	② Grade II	②②	② BT	② PDDS+1/2 yr. PB	② ACT	②②	②	②②	②	② Correct	
③ Mixture	③ Grade III	③③	③ BB	③ PDDS+2 yr. MB	③ LBC	③③	③	③③	③	③ Suppl.	■ Form 3
④ Type-less	④ Grade-less	④④	④ BL	④ PDDS+ MB→CC	④ DBC	④④	④	④④	④	④ Deletion	
	⑤ Other	⑤⑤	⑤ LL	⑤ 1/2 yr. PB	⑤ MBC	⑤⑤	⑤	⑤⑤	⑤	⑤ Code change	
		⑥⑥	⑥ T	⑥ 2 yr. MB	⑥ LAC	⑥⑥	⑥	⑥⑥	⑥	Original	
		⑦⑦	⑦ B	⑦ MB→CC	⑦ DAC	⑦⑦	⑦	⑦⑦	⑦	Area Code	Reg. No.
		⑧⑧	⑧ L	⑧ Other MDT	⑧ MAC	⑧⑧	⑧	⑧⑧	⑧	□□□□	□□□□
⑨ Unk	⑨ Unk	⑨⑨	⑨ Unk	⑨ Others	⑨ Unk	⑨⑨	⑨⑨	⑨⑨	⑨⑨		

Figure 1. (c) continued.

FORM 4. REGISTRATION FORM OF PATIENT CURED, DIED OR MOVED OUT BEFORE 1990

PATIENT'S NAME: REF. NO: FILLED BY: CHECKED BY: DATA: Y M D

A SEX	B BIRTH Y. M.		C INFECTION	D ONSET Y. M.		E DETECT Y. M.		F MOVE-IN Y. M.		G DETECT MODE	H REGIMEN*	I AREA CODE	II REG. NO.
□	□□□□	□□	□	□□	□□	□	□□	□□	□□	□	□	□□□□	□□□□
	⓪⓪⓪	⓪⓪		⓪⓪	⓪⓪		⓪⓪	⓪⓪	⓪⓪	⓪Voluntary	⓪ Un-treatment	⓪⓪⓪⓪	⓪⓪⓪⓪
① M	①①①①	①①	① In family	①①	①①	①①	①①	①①	①①	① Skin Clinic	① Mono-DDS	①①①①	①①①①
② F	②②②②	②	② Out fam.	②②	②	②②	②	②②	②	② Notification	② PDDS+1/2 yr. PB	②②②②	②②②②
	③③③	③		③③	③	③③	③	③③	③	③ Contact exam	③ PDDS+2 yr. MB	③③③③	③③③③
	④④④	④		④④	④	④④	④	④④	④	④ Spot survey	④ PDDS+ MB→CC	④④④④	④④④④
	⑤⑤⑤	⑤		⑤⑤	⑤	⑤⑤	⑤	⑤⑤	⑤	⑤ Group survey	⑤ 1/2 yr. PB	⑤⑤⑤⑤	⑤⑤⑤⑤
	⑥⑥⑥	⑥		⑥⑥	⑥	⑥⑥	⑥	⑥⑥	⑥	⑥ Clue survey	⑥ 2 yr. MB	⑥⑥⑥⑥	⑥⑥⑥⑥
	⑦⑦⑦	⑦		⑦⑦	⑦	⑦⑦	⑦	⑦⑦	⑦	⑦ Mass survey	⑦ MB→CC	⑦⑦⑦⑦	⑦⑦⑦⑦
	⑧⑧⑧	⑧		⑧⑧	⑧	⑧⑧	⑧	⑧⑧	⑧	⑧ Other	⑧ Other MDT	⑧⑧⑧⑧	⑧⑧⑧⑧
⑨Unk	⑨⑨⑨⑨	⑨⑨	⑨ Unk	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨ Unk	⑨ Others	⑨⑨⑨⑨	⑨⑨⑨⑨

I DDS START Y. M.		J MDT START Y. M.		K BI	L BI NEGATIVE Y. M.		M DISABILITY	N TYPE	O RESULT**	P RESULT Y. M.		Q STATUS**	III CATEGORY	IV FORM
□□	□□	□□	□□	□□	□□	□□		□	□	□□	□□	□	□	
⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪ None	⓪ I	⓪ Self	⓪⓪	⓪⓪	⓪ FUC		
①①	①①	①①	①①	①①	①①	①①	① Grade I	① TT	① Clinic	①①	①①	① FAC	① Original	
②②	②	②②	②	②②	②②	②	② Grade II	② BT	② LBC	②②	②	② ACT	② Correct	
③③	③	③③	③	③③	③③	③	③ Grade III	③ BB	③ DBC	③③	③	③ LBC	③ Suppl.	
④④	④	④④	④	④④	④④	④	④ Grade-less	④ BL	④ MBC	④④	④	④ DBC	④ Deletion	■ Form 4
⑤⑤	⑤	⑤⑤	⑤	⑤⑤	⑤⑤	⑤	⑤ Other	⑤ LL		⑤⑤	⑤	⑤ MBC	⑤ Code change	
⑥⑥	⑥	⑥⑥	⑥	⑥⑥	⑥⑥	⑥		⑥ T		⑥⑥	⑥	⑥ LAC	Original	
⑦⑦	⑦	⑦⑦	⑦	⑦⑦	⑦⑦	⑦		⑦ B		⑦⑦	⑦	⑦ DAC	Area Code	Reg. No.
⑧⑧	⑧	⑧⑧	⑧	⑧⑧	⑧⑧	⑧		⑧ L		⑧⑧	⑧	⑧ MAC	□□□□	□□□□
⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨ Unk	⑨ Unk	⑨ Unk	⑨⑨	⑨⑨	⑨ Unk		

Figure 1. (d) continued.

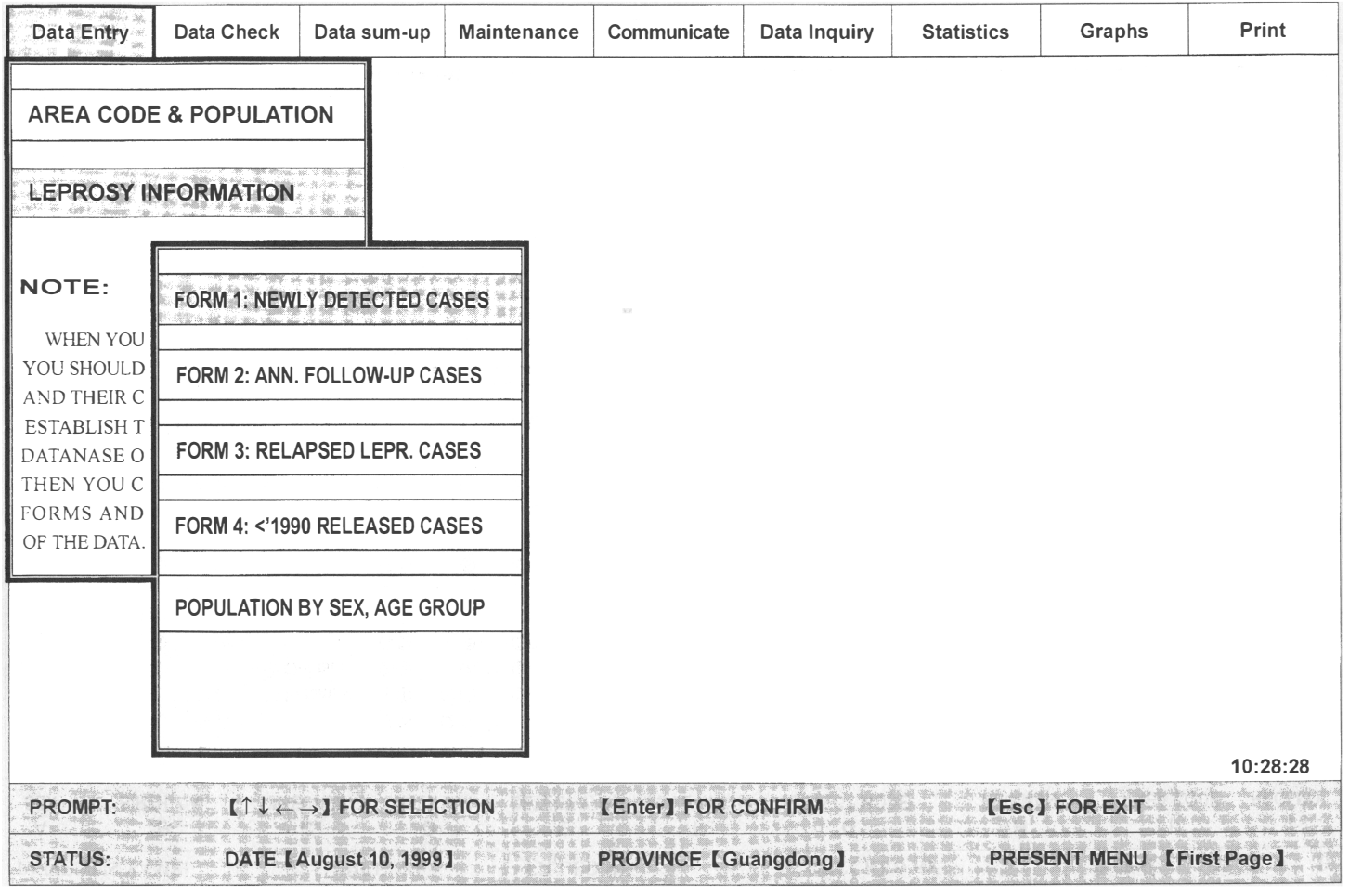

Figure 2. Screen display of computerized system of leprosy reporting and recording in China.

usually called institutes of skin disease control at provincial level or leprosy hospital or village at county level, have good storage of medical records for all leprosy patients. In order to tap this source of useful information further, it is important and necessary to establish a national system to collect these data using the structured forms. This will allow the data from different regions not only to be used to express the epidemiological trend and its relation to leprosy control strategies, but also to be compared with each other, thereby increasing their epidemiological value. It is obvious that the establishment of this system is a massive project covering the whole country. Financial support is vital to initiate the system. However, leprosy control in China is vertically implemented by a well organized programme, and therefore extra money for the system is only provided to cover the training courses at different levels, printing of recording forms and establishment of computer at national level and annual working meeting/training course as well as logistic expenses.

The OMSLEP system in the recording and reporting of leprosy patients was developed in cooperation between the Unit of Epidemiology, University of Louvain, Belgium, and WHO, and introduced into leprosy programmes in 1980.[9] On the basis of technical developments as well as the feedback received from the field, a newer edition of OMSLEP was developed in 1987.[10] With reference to the OMSLEP system and in the light of the leprosy programme in China, the individual patient forms for our system were designed and tested in the pilot areas. From the start, the system was also designed to facilitate the entry of data onto computers through an automated, optionally scanned machine. After some modifications, the system was approved by the Ministry of Public Health to be introduced nationwide in 1989. The system has been implemented in leprosy programs in China for 10 years, and the results have generally been very gratifying.

The uniform system for data recording and reporting offers considerable benefits for a leprosy programme. It facilitates standardization of data collection, whereas computerization of the data can motivate the full utilization of data that were previously stored or locked in wooden or metal drawers. The sophistication or subtleties of data analysis required can only be achieved by computerization. The present system can provide 17 analysis options on epidemiological and clinical aspects, covering most indicators used in a leprosy programme. More complex or detailed analysis of the data can be achieved by using a pre-programmed statistical package, such as SPSS 8.0. Although the system has worked well for years in China, some obstacles or problems have been encountered during its implementation. Firstly, the items in recording forms may be complex for leprosy workers at local levels, particularly in remote areas. Secondly, mis-recording of the area codes or registry numbers in some patients caused a mis-connection between different forms. Thirdly, incompleteness of or delay in reporting may influence the annual statistical report. Fourthly, a few logical mistakes in records or incomplete records have occurred in some patients; these can be found by OMR and immediately sent back to the original institutions for correction.

The automated, optionally scanned data entry mode is not only more efficient, rapid, accurate and cost-effective than the manual mode, but also able immediately to find logical mistakes in the records. This entry mode has played an important role in facilitating the transfer of data onto computers, particularly at the initiation of the system, because there were a huge number of backlog records (more than 500,000 forms) to be entered, which is time-consuming work by manual entry. However, in recent years there are fewer than 20,000 individual forms annually, half of which are entered by manual entry at provincial level using the program of the system in some areas (Figure 2). The database under the standardized structure is sent to the National Centre for STD and Leprosy Control by mail in form of 3·5-in

floppy disks or by e-mail in the form of attachments. In these areas, medical staff prefer to enter the data by themselves because: (1) manual entry avoids blurring of digits in data collection, which is a major task for local leprosy workers and one of the reasons causing optical entry errors; (2) logical mistakes in the forms can be found and corrected at once by themselves, so as not to waste time in mailing the wrong forms between local institutions and the Centre. Therefore, for data entry the system can be implemented flexibly.

The system has been widely accepted throughout China, mainly due to its feasibility and ease of operation, and the rapidly rising popularity of computers at local level as well as extensive training on the system. This acceptance would facilitate introduction of computer analysis to other leprosy projects and other disease control programmes, such as STD, for which a national computerization of STD epidemiological and clinical records has been established in our centre in recent years.

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References

[1] Hart G. Computerization of clinic records: the resource utilization system for a sexually transmitted diseases clinic. *Sex Transm Dis*, 1989; **16:** 1–6.
[2] Margolis S, Baker TG, Alterescu S. OpScan-MIMS. A data network system. *J Med Syst*, 1983; **7:** 363–377.
[3] Gouveia Oliveira A, Raposo VD, Salgado NC *et al*. Longitudinal comparative study on the influence of computers on reporting of clinical data. *Endoscopy*, 1991; **23:** 334–337.
[4] LaMorte WW. A simple, inexpensive technique for recording and reporting the operative experience of residents in a surgical training program. *Surgery*, 1990; **107:** 584–589.
[5] Chen X-S *et al*. Prediction of elimination of leprosy in leprosy endemic areas of China. *Ind J Lepr*, 1999, **71:** 189–201.
[6] Chen X-S *et al*. Leprosy in children: a retrospective study in China, 1986–1997. *J Trop Pediatr*, 2000, **46:** 1–5.
[7] Chen X-S *et al*. A study on delay in detection of leprosy patients in China. *Ann Trop Med Parasitol*, 2000 (in press).
[8] An analysis of leprosy trends during the years 1949–1997 in China (in Chinese). *Dis Surveil*, 1999, **14:** 285–288.
[9] Lechat MF, Mission CB, Walter J, Seal KS, Sansarricq H. An information system for leprosy control (OMSLEP Recording and Reporting System). *Int J Lepr*, 1980; **48:** 51–61.
[10] Lechat MF, Misson CB, Sansarricq H, Declercq E, Vanderveken M. *OMSLEP, recording and reporting system for leprosy patients*, edition 3. Published with the sponsorship of WHO, Geneva 1987.

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A survey on knowledge and skills in the early diagnosis of leprosy in general health services at different levels in Shandong province, The People's Republic of China

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Summary In the late phase of a leprosy control programme, problems arise with regard to the early detection and treatment of a small number of new incident cases. We describe a study in the province of Shandong, People's Republic of China, on the knowledge and skills regarding leprosy of general health service staff, including rural doctors, paramedical doctors at township level, doctors from county general and provincial hospitals and dermatologists. The results showed that there is a continuing need for suitable training programmes for medical staff in the general health services. Most dermatologists had good levels of knowledge and skills and more than 80% of new cases have been diagnosed in skin clinics in this province since 1990. Their participation in early diagnosis and training of staff should be strengthened.

Introduction

Leprosy control is a long-term project. Even in the late phase in which the goal of elimination of leprosy has been achieved, there is often still a need for some form of leprosy control programme. In this phase, programme managers and planners still face two major problems, i.e. early detection and treatment with multiple drug therapy (MDT) for the small number of incident new cases and rehabilitation for those who are disabled.[1] From an epidemiological point of view, leprosy is under control and is no longer a public health problem in Shandong province,[2] which is located in the eastern part of China, with a population of 87 million. In the past 10 years, 50–70 new cases have been detected each year, of whom 20% have WHO grade 2 disability at diagnosis.[2] This indicates that there is room for improvement in case finding, to detect all cases at an early stage. Since the prevalence of leprosy in Shandong is very low, with only a few new cases widely scattered in the population, it is not cost-effective to conduct population or rapid surveys to find these few new cases. Even contact survey loses its value because the percentage of new cases detected in this way may accounts only for

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1.5% of the total new cases detected in the past 10 years. Utilization of the general health services at all levels in case-finding may help in solving this problem. The objective of this pilot study is to assess the knowledge and skills of general health service staff at different levels in the early diagnosis of leprosy and to use the results for the design of appropriate training programmes.

Materials and methods

- At provincial level, two general hospitals were visited. All doctors on duty in the internal medicine and surgical departments and the dermatological clinics were interviewed.
- At county level, one general hospital in each of the three counties in Jining prefecture was selected. All doctors on duty in internal medicine and surgical departments were interviewed.
- At township level, all doctors on duty were asked to fill in a questionnaire.
- For rural doctors, we checked the leprosy register book to select the last 50 patients affected by leprosy (cured cases), and then visited the rural doctors based on the patients' villages.

When we arrived at the study areas (hospitals or village health station), the chief of the department or clinic was introduced to us by the local health officer and we then briefly explained our purpose and asked him or her to distribute the structured self-administered questionnaires to the interviewees. The investigators watched the doctors filling in the questionnaires and explained any question that was not understood.

Results

On the day of the visit, some rural doctors were not on duty. In all, 33 rural doctors from 33 villages, 34 doctors from 13 township hospitals, 27 doctors from county hospitals. 35 doctors from two provincial hospitals and 13 dermatologists from two skin clinics answered the

Table 1. Sex, age, education background and professional experience of medical staff in general health services

	Rural doctor	Township doctor	County doctor	Province doctor	Dermatologist
Sex					
M	31 (94)	32 (94)	22 (81)	18 (22)	6 (46)
F	2 (6)	2 (6)	5 (19)	4 (18)	7 (5.4)
Age (range)	54 (23–68)	46 (28–59)	38 (23–55)	42 (27–58)	4 (25–59)
Education level					
University	0 (0)	24 (71)	13 (48)	21 (95)	10 (77)
Paramedical school	11 (33)	10 (29)	14 (52)	1 (5)	3 (23)
Other*	22 (67)	0 (0)	0 (0)	0 (0)	0 (0)
Professional experience (years) (range)	28 (2–43)	21 (5–38)	18 (1–29)	19 (3–32)	14 (2–33)

Other: trained locally for less than 1 year.

Table 2. Origin of knowledge on leprosy and knowledge and skills in early diagnosis of leprosy among staff in general health services at different levels

	Staff in general health services	Dermatologists
	$n = 116$(%)	$n = 13$(%)
Origin of knowledge on leprosy		
University/medical school	85 (73.28)	13 (100)
Lecture	62 (53.45)	10 (77)
Reading materials	57 (49.14)	13 (100)
Basic knowledge on leprosy		
Pathogen of leprosy	70 (60.34)	13 (100)
Life-long medication	90 (77.59)	11 (85)
Multidrug therapy	15 (12.93)	8 (62)
Recognition of early symptoms and signs of leprosy		
Early symptoms*	37 (31.90)	10 (76.92)
Early signs of leprosy**	11 (9.48)	13 (100)

* Defined as numbness or tingling of extremities; ** defined as anaesthetic, pale or erythematous patches with or without peripheral nerve enlargement.

questionnaire. Their sex, age, education background and professional experience are presented in Table 1.

A comparison of the origin of leprosy knowledge, basic leprosy knowledge, and knowledge and skills in early diagnosis of leprosy between dermatologists and the staff in general health services is shown in Table 2. Since the staff at different levels play different roles in a leprosy control programme, further details will be given as below. Regarding the pathogen of leprosy, 18% of village doctors, 6% of township hospital doctors, 19% of doctors in county hospitals and 14% of doctors from internal medicine and surgical departments in provincial general hospitals did not know about *Mycobacterium leprae*. Information regarding the duration of treatment and MDT showed that 9% of rural doctors, 12% of township doctors, 11% of county doctors, 73% of provincial doctors and 15% of dermatologists erroneously believed that a leprosy patient should take anti-leprosy drug(s) for life, once a diagnosis was made. None of the rural, township and provincial doctors, 44% of county doctors and 38% of dermatologists in this investigation knew about MDT. The majority of doctors investigated, except for dermatologists, could not recognize the early sign of leprosy. This may simply reflect their lack of experience in the early diagnosis of leprosy in their medical practice, as shown in Table 3, although some had experience in diagnosing leprosy cases at the late stages

Table 3. Experience with leprosy cases among medical staff at different level

		Seeing leprosy cases		Consulted by leprosy cases	
	n	Yes (%)	No (%)	Yes (%)	No (%)
Rural doctor	33	33 (100)	0 (0)	20 (61)	13 (39)
Township doctor	34	18 (53)	16 (47)	5 (15)	29 (85)
County doctor	27	15 (56)	12 (44)	3 (11)	24 (89)
Province doctor	22	9 (41)	13 (59)	2 (9)	20 (91)
Dermatologist	13	4 (31	9 (69)	10 (77)	3 (23)
Total	129	79 (61)	50 (39)	40 (31)	89 (69)

of illness or with deformity. In terms of skills in the examination of peripheral nerves, the correct answers, except for dermatologists, were given by 36% of rural doctors, 6% of doctors from township hospitals, 18% of doctors from county general hospitals and 0% of doctors from provincial general hospitals. Seventy percent of rural doctors, 71% of township doctors, 59% of county doctors and 77% of provincial doctors did not know that a skin smear or biopsy may be indicated for the confirmation of diagnosis in a suspected leprosy case.

Discussion

The deformity rate among newly diagnosed leprosy cases is an important indicator in the assessment of case-finding activity.[3] Disability rates as high as 30% (WHO grade 1–2) among newly detected cases have been reported in some countries.[4,5] Recently, a report from the International Federation of Anti-Leprosy Association (ILEP) and WHO showed disability rates (WHO grade 2–3) in different leprosy control programmes ranging from 0 to 79%.[6] In China, disability rates have been variously reported as 19.4–36%.[7–11] The disability rate among newly detected leprosy cases in Shandong province has been about 20% on average in the last 10 years. This indicates that there is room for improvement in case-finding, even in a low endemic situation. In some leprosy control programmes such as that in Malaysia, in which the goal of elimination of leprosy has been achieved, the disability rate among newly detected cases can be as low as 5% (personal communication). The detection method and case-finding activity,[12] as well as the epidemiological situation, can influence the disability rate among newly detected leprosy cases. Theoretically, however, the lower the disability rate the better, because early diagnosis and treatment with MDI are very important in reducing the risk of disability, although the disability cannot be avoided completely.[4]

Many approaches to case finding have been used in different leprosy control programmes according to the local situation. In Shandong province, case detection methods such as population survey and rapid survey are no longer cost-effective, since the prevalence is too low (0.037/10,000 population in 1994) and the distribution of leprosy cases is too scattered in the population. Contact examination is an important method of case-finding, which is still used in many leprosy control programmes. In the late phase of a leprosy control programme with the very low prevalence in Shandong province, however, fewer and fewer new leprosy cases are detected in this way. A recent analysis showed that 97 (12.4%) out of 773 newly detected cases between 1987 and 1996 had a family history of leprosy (unpublished data).

New cases detected through contact examination account for only 1.5% of new cases detected in the past 10 years. Usually, there is a time gap between the identification of an index case and the onset of disease among family numbers. Furthermore, the fact that the examination of household contacts is done only once, when diagnosis of the index case is made, is seldom useful for the finding of a secondary case in a low endemic situation. The time between an index case and a secondary case in Shandong is, on average, 10 years (unpublished data). Obviously, it is impossible to carry out contact examinations year by year for many years, if only because they may create social stigma. Utilization of general services in case-finding would therefore be one of the options in solving this problem in the long run.

In most medical and paramedical schools in Shandong province, a short course (usually 2–3 h) on leprosy is available (Table 2). However, knowledge and skills related to the early diagnosis of leprosy among the doctors in this investigation were low. This is partly related to the lack of experience in practice. In a group of 335 new cases reported in China, 150 cases

(44.38%) consulted general health services at different levels for 326 person times for their disease before the diagnosis of leprosy was made. Two hundred and twenty-eight (70%) of the patients in this group were misdiagnosed on their first visits.[11] In another analysis of 50 new leprosy cases misdiagnosed for a long time, the main reason for the misdiagnosis was that the staff in general health services at different levels lacked of basic knowledge and expenence.[13] Many doctors in this study had some experience in contacting cured or deformed leprosy cases, but not new cases. A study conducted in India also showed that the field investigators could initially miss about 35% of cases of leprosy, mostly with early manifestations. After training and experience, the proportion of missed cases decreased to about 20%.[14]

In the past, training programmes for rural doctors and doctors at township level involved in the leprosy control programme, did not include task assignment and orientation on the early diagnosis of leprosy. The main role they played in a vertical leprosy control programme was very limited, such as guiding the way to the patient's home or delivering medication to patients. Even in rapid surveys, they were asked to report suspects with late signs of leprosy such as lagophthalmos, claw hand or painless foot wound. Our findings show that in order to detect all new cases as early as possible, the participation of dermatologists in early diagnosis and training of staff should be strengthened. Incorporation of leprosy in the curricula of medical faculties and paramedical schools should continue with an opportunity to see and examine patients whenever possible.

Dermatologists, in general, have good knowledge and skill in early diagnosis of leprosy. An important incidental finding of this study was that more than 80% of new cases have been diagnosed in skin clinics at different levels in Shandong since 1990. The relationship between dermatologist and leprosy control programme manager should be strengthened. Skin clinics at different levels should be part of the whole programme. Dermatologists should also be involved in the training programme. They can form a bridge between the leprosy control programme manager and the staff working in general health services, to ensure the early diagnosis of leprosy.

References

[1] Feenstra P. Sustainability of leprosy control services in low endemic situations. *Trop Geograph Med*, 1994; **46**: 65–71.
[2] Chen S. *Options for leprosy control programme in Shandong Province, China.* Thesis, 31st International Course in Health Development, 1995, Amsterdam, The Netherlands.
[3] WHO. *Epidemiology of leprosy in relation to control.* Report of a WHO Study Group. Technical Report Series 716, WHO, Geneva, 1985.
[4] Watson JM. Disability control in a leprosy control programme. *Lepr Rev*, 1989; **60**: 169–177.
[5] Wittenhorst B, Vree ML, Ten Ham PBG *et al.* The national leprosy control programme of Zimbabwe: a data analysis. *Lepr Rev*, 1998; **69**: 46–56.
[6] Smith WCS. Prevention of disability in leprosy – ILEP Medical Bulletin. *Lepr Rev*, 1996; **67**: 68–72.
[7] Wu GC *et al.* Analysis on 329 leprosy new cases detected in recent 10 years in Qian Xinan prefecture, Gui Zhou province. *Chinese J Lepr*, 1991; **7**: 90–91.
[8] He R *et al.* Analysis on 407 newly detected leprosy cases in Hubei. *Chinese J Lepr*, 1994; **10**: 99–100.
[9] Lai ZJ *et al.* Analysis on 1493 newly detected leprosy cases. *Chinese J Lepr*, 1994; **10**: 160–162.
[10] Liau DZ *et al.* A report of 177 new leprosy cases detected in recent 10 years in Xu Zhou. *Chinese J Lepr*, 1995; **11**: 199–200.
[11] Sun HT *et al.* Analysis on 335 new leprosy cases diagnosed in skin clinic. *Chinese J Lepr*, 1991; **7**: 79–80.
[12] Ishida Y, Biswas AK, Guglielmell E. Detection mode of leprosy and its disability grading in Khulna City, Bangladesh. *Nihon Hansenbyo Gakkai Zasshi*, 1998; **67**: 391–400 (abstract).
[13] Ma DJ. Analysis on 50 misdiagnosed leprosy cases. *Chinese J Lepr*, 1990; **6**: 231–232.
[14] Gupte NB. Diagnostic problems of early leprosy in field studies. *Ind J Lepr*, 1994; **66**: 463–472.

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A new face for an old disease: some reflections on the role of the media in Nepal's first National Leprosy Elimination Campaign

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'This campaign has achieved more in four months than I have achieved in 45 years working in leprosy'

Eileen Lodge

Introduction

This article reports briefly on the Media Campaign run in conjunction with Nepal's first National Leprosy Elimination Campaign. The article is not intended to be a scientific evaluation of the Campaign's effectiveness but rather information about the Campaign itself and personal reflections from some of those involved and who were both impressed and challenged by its impact.

Background

In 1997 the World Health Organisation decided on a number of initiatives to accelerate the elimination of leprosy in endemic countries. One of these was to engage the BBC–MPM (Marshall Plan of the Mind) Trust (a Charitable Trust set up by the BBC) to investigate the possibility of organizing a large media-based leprosy awareness campaign in five endemic countries (Nepal, India, Brazil, Ethiopia and Indonesia). With financial support from the Novartis Foundation for Sustainable Development, BBC–MPM undertook a 5-month feasibility study. At the end of this time it was agreed that a major Media Campaign in leprosy was both feasible and desirable. Following the study, a proposal was prepared and work began on planning individual country campaigns to (in the words of BBC–MPM's Editor Mr Roy Head), give a 'new face to an old disease'.

Nepal was the first of the five countries to undertake the Campaign, as His Majesty's Government had already decided to undertake a National Leprosy Elimination Campaign (NLEC) in the autumn of 1998 (later re-scheduled to January 1999). The Media Campaign was enthusiastically embraced as a core component of the NLEC.

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Campaign aims

As soon as the project was approved, the Leprosy Control Division Director, Dr J. P. Baral, met with various partners and agreed the threefold aims of the Media Campaign to be:

1. To raise public awareness about the symptoms of leprosy.
2. To inform the community that leprosy is curable and that medicine is available free of charge.
3. To reduce the stigma and fear associated with leprosy.

Campaign strategy

While the aims of the Campaign were quite typical, the strategy adopted to communicate them was not, BBC–MPM developed a multi-faceted approach with many innovative components to ensure the effective communication of the three core messages. These key components included:

- Skilled co-ordination

BBC–MPM who had undertaken the original feasibility study were given the contract by WHO to co-ordinate the electronic media Campaign. In October 1998, BBC–MPM appointed as Co-ordinator to the project one of its experienced producers, Ms Susan Mackay who had just finished another media project in Mongolia. Her energy and enthusiasm were infectious and largely fuelled the momentum, excitement, and vision generated in the Campaign.

- In-country media

Early meetings were held with Nepal State television and radio, both of whom showed a high level of interest in and commitment to the Campaign. This meant that important airtime deals could be agreed fairly early in the planning process.

In fulfillment of one of the aims of BBC–MPM to build up local broadcasting capacity, and therefore the sustainability of the project, Ms Mackay set about searching for and recruiting some of the best local producers and media professionals. Following discussions with a number of government and NGO officials, it became evident that the Academy of Audio Visual Arts and Sciences (AA–VAS), based in Kathmandu, was the foremost local organization in creative media. AA–VAS is a non-profit centre dedicated to developing skills in the communication arts and sciences. This partnership led to one of the most important outcomes of the Campaign. The AA–VAS team led by Deependra Gauchan quickly became convinced by the Campaign's message and goals. Within a short time, AA–VAS agreed to undertake the whole Campaign and became one of its most committed proponents. AA–VAS invested large amounts of time and creative energy into getting 'inside' leprosy so that they could find effective ways of communicating this to others. Frequent late night editing sessions were evidence of the commitment of the team to their work. Extensive field tours were also undertaken, with much time spent meeting people affected by leprosy. The team wanted to 'touch' leprosy—and they did. As a result of this approach, people affected by leprosy were to become the real stars of the Media Campaign.

INVOLVEMENT OF PEOPLE AFFECTED BY LEPROSY

One of the most impressive aspects of the Campaign was the involvement of people affected by leprosy. Throughout the planning process the AA–VAS team kept in touch with the heart of the Campaign through ongoing meetings and discussions with people affected by leprosy. Through this interaction, the idea was born to feature the experiences of some of these people as core components of the Campaign. Six people were invited to participate. All were charismatic personalities, who had had different experiences of the disease. They ranged from those who had no impairments to those who had been completely rejected by their families and communities. Some were senior professionals (bank manager, teacher, nurse) and others were semi-skilled workers. The one thing they all had in common was that they had overcome leprosy, not only physically but also socially, emotionally and psychologically. Short TV/radio spots that interviewed these people at home and at work were produced. These features did not seek to hide leprosy but rather were a powerful tool to demonstrate that the disease could truly be overcome and was therefore not to be feared.

A most effective poster collage of nine people some of whom had been featured in the TV/radio spots was produced, headed by the question, 'Which of these people has leprosy'? Below, the simple answer was given 'None, they have all been cured'. The poster which was colourful, attractive and showed nine happy and obviously fulfilled people, was in stark contrast to many of the images more usually used to educate about leprosy.

Two celebrities involved in the Campaign were also photographed interacting with people affected by leprosy. These images were used in another series of posters. The impact was very striking, particularly in a society where public figures would not normally be identified with a disease such as leprosy.

BASELINE SURVEY AND FOCUS GROUPS

Another important activity undertaken at the beginning of the Campaign planning phase was the commissioning of a baseline survey. One of the top market research companies in Nepal, New Era, was recruited and a questionnaire developed for use in carefully selected sample areas throughout the country. The baseline survey had three purposes:

- To provide the baseline position against which to compare any changes in knowledge and attitude resulting from the Campaign.
- That information on the current knowledge about and attitudes to leprosy would guide how the Campaign messages should be presented.
- To describe the availability of various forms of media in Nepal, to ensure appropriate use of different materials.

There were no particular surprises in the survey. When the baseline results were published, poor knowledge and attitude to leprosy were confirmed and the need for a Campaign of this sort was reinforced.

Furthermore, the survey also highlighted that approximately 51% of Nepali homes have access to radio and only 20% to TV. This pointed to the need for other methods of communicating the Campaign messages at the local level.

New Era also conducted a series of independent focus group discussions in three districts to assess the suitability of IEC materials as they were produced.

WIDE RANGE OF MEDIA MATERIALS

Following the publishing of the baseline survey, the project was ready to forge ahead with preparing a broad range of media materials. The government immediately set to work to produce its own package of posters and leaflets that would be used extensively throughout the country to promote the forthcoming NLEC. BBC–MPM and AA–VAS started on the production of its range of complementary media materials. These included:

- TV adverts—short adverts counting down to the campaign were broadcast twice nightly for the 10 days before the Campaign.
- A tele-film—a half-hour comedy written and produced by Nepal's two top film/TV personalities.
- TV spots—three spots featuring two well known celebrities and based on famous scenes from the Nepali films were produced with leprosy as the core message.
- Radio spots—there was a five-part discussion programme involving the Director of the Leprosy Control Division and also featuring people affected by leprosy who had all successfully overcome the disease. A number of short radio dramas about leprosy were also produced.
- TV/chat programmes—a number of general interest/current affairs programmes focussing on leprosy.
- Posters—three posters were produced portraying positive images of people affected by leprosy. Three further posters were produced by the government, giving information about the disease and the NLEC Campaign.
- School materials—an attractive colouring book telling the story of a boy affected by leprosy was produced for schools.
- POP/folk songs—four songs/jingles were written by well-known song-writers. A CD was produced and the songs were broadcast regularly on state radio and private FM stations. A theme song was also written for the Campaign.
- Commissioned written articles—the British Embassy supported an initiative through the Nepal Press Institute for five press fellowships, for journalists to write considered articles on the experiences of people affected by leprosy.

INVOLVEMENT OF CELEBRITIES

One of the principal tasks in the early planning of the electronic Media Campaign was to find key celebrities who would not only endorse the Campaign but would also play a leading role in the Campaign itself. Madan Krishna Shrestha and Hari Bamsha Acharya ('MaHa'), Nepal's top film and TV personalities and the two most widely known personalities in the country, agreed to do the advertisements (for free) and TV drama (at a much reduced cost). In a novel approach to the advertisements 'MaHa' took some of the most famous scenes from their highly popular films and re-enacted them with leprosy as the key message. Both the advertisements and the tele-film were hilariously funny, but effectively and eloquently conveyed the message that leprosy was curable and not to be feared. (A new 'MaHa' movie is greeted with the same sort of enthusiasm and excitement as a new Mr Bean movies would be in the UK!) 'MaHa' had some prior interest in leprosy and had been in discussions with a local NGO to develop a film that would raise awareness about leprosy. One of the ongoing benefits of the Campaign is the continued interest and commitment of people like 'MaHa' to the work of eliminating leprosy and its stigma.

CREATIVITY

The Media Campaign was driven by people expert in creative media. Some of us 'leprosy experts' were a little nervous at first about taking our hands off what we considered to be our field and leaving it to people who knew little about leprosy. The result, however, was startling. The whole subject was seen with new eyes. Humour, colour and pop music were used to great effect alongside common symbols and themes. All of these features gave a new dynamic appearance to a subject that at best has been the object of fear.

MOBILIZATION OF OTHER RESOURCES

One of the other interesting outcomes of the Campaign was the amount of excitement and goodwill generated amongst a whole range of organizations (some not related to leprosy). International bodies, Embassies and NGOs were all willing to add funds, ideas and resources to the overall project. One initiative worth mentioning was a project to take the Campaign messages into areas with limited media access. One NGO recruited well-known Nepali actors and actresses to train 75 community group members from five endemic districts in Street Drama. These community groups using a communication form still very important in Nepal, conducted intensive, targeted campaigns in their own districts. The Street Drama programme proved to be a popular and effective means of communicating the message. A follow-up programme has already started with the support of the Sasakawa Memorial Health Foundation. Other health related programmes are now considering Street Drama initiatives as a means of health promotion.

Campaign reflections

The Campaign created tangible optimism amongst those associated with it. It was exciting, colourful and succeeded in touching the human side of leprosy. It certainly convinced many that the media was a resource grossly undervalued in the fight against leprosy.

The use of humour mentioned already was an interesting and successful medium in the Campaign. Comedy is an important form of communication in Nepal and the leprosy Campaign used it to great effect both in the electronic media component and in activities like the Street Drama Programme. While not reducing the seriousness of leprosy it gave light and humanity to a subject that for too long had been shrouded in fear and darkness.

The many positive images of people affected by leprosy but who had overcome the disease were also very refreshing.

The culmination of the whole Media Campaign was of course the NLEC Search Week. This was itself a success. Thousands of government health workers in 27 districts were mobilised and in the 6-day search period almost 12,000 new cases were identified. The message about NLEC seemed to have reached almost everywhere (there were phone calls to district health offices requesting a visit when teams did not reach them at the right time). The comment made again and again by government officials, NGO staff and others, was how easily people reported for treatment. It appeared that the usual fear of stigma, expected to hinder people from coming forward was generally not in evidence during the Search Week. This was surprising as changing of attitudes at this level is usually a much longer term affair.

Where to now?

The Media Campaign in Nepal left many of us working in the field of leprosy feeling very encouraged. We were particularly delighted at how much had been achieved in such a short time when people with expertise, energy and creativity were given the opportunity to cross the boundaries of 'Our World'. Already in Nepal we are looking for ways to follow-up on this first programme, to ensure the momentum gained is not lost. We have had a glimpse of a powerful resource, not so far fully utilized. How can we make full use of it?

In the midst of this excitement we should offer one small word of caution. Media Campaigns can do a lot for leprosy. They can help effectively get the message across, can change attitudes and much, much more. We as leprosy agencies must ensure that the service we are asking media experts to 'advertise' is as good as the 'advertisement' promise. If not we run the risk of losing much public trust and goodwill, which once lost will be difficult to regain. The NLEC Media Campaign in Nepal cannot have been finally called a success until every person identified during the Campaign has been cured.

With the caution, perhaps I should add a challenge. Media campaigns are by nature expensive and tangible results are not always immediately obvious. With more and more funding organizations seeking short-term easily measurable results from their investments, there may be a danger that the benefits to be gained from a resource like the media will not be pursued. Are donor agencies ready to invest more resources in the process of education and changing attitudes?

The Nepal experience so far, however, is a very positive one and gives us confidence for the future. For many of us involved in leprosy work in Nepal, we are convinced it is an investment worth making. In the words of Ram Nandan Mahara, a person affected by leprosy who featured in the Campaign: 'The villagers had several meetings and they tried to kick me out of the village. At that time I felt like committing suicide . . . now all the villagers call me 'Hakim' (leader). A leader! 'Oh, Ram Nandan is an important man—a leader.' If resources like the media can help us to turn lives around, then let us work with them as partners, to ensure we do it.

Theme song for the campaign

The theme song was designed to comfort the issue of social stigma. The lyrics of the ballad do not mention leprosy directly, rather imply that the singer was made a social outcast for a problem brought on him by his fate. The singer confronts the audience with his feelings, challenging them to identify with him, and to see him as a person just like them. The song builds to a climax where he has the courage to take charge of his own destiny. The song concludes with a voice-over carrying the campaign messages.

KUN JUNIKA PAAP HO

Some say it's the result of sins in a former life
Some say it's a curse from a former life
But more than my wounds it hurts me more
When some say my life is over

Friends turned away, friends left my side
I don't mind the attitude of others
But even my very own cut off ties from me
I became a speck of dust in the eye
I became a thorn in the flesh
I'm a person too
Although I'm human I became distanced from humanity

What's the difference between you and me?
I'm just like you too
I, too have feelings
I'm a person just like you
I too have desires, let me weave my own sweet dreams
I'm a person, let me live like one

Sins, curses don't mean a thing
I'll write my own destiny
I'm a person, I'll put together my world

VOICE OVER
It's not a sin, it's not a curse
Leprosy is just a simple disease
If you recognize the signs and get treatment on time, you can be cured
Let's get treatment on time
Let's chase the disease, not the people out of our community
Let's make a leprosy free society
Let's increase mutual understanding

Examples of stories used for the radio dramas

MAN KO BAGH (THE DEMON WITHIN)

The drama has a rural setting and deals with the relationship between husband and wife when he discovers that she is taking medicine secretly. He fears that she is taking contraceptives without his consent and rather than confronting her he visits the health post to seek the doctor's advice. He learns that she has leprosy and as she is on treatment he and his daughter are not at risk.

However, he still has many doubts and finds the courage to share the secret with a friend. He is shocked to find that his friend already knew. Additionally, he discovers that this friend also had leprosy but is now cured. As the friend and his wife have just given birth to a child this helps to convince him that it is safe to be close to his wife.

THE WEDDING

The problem of arranging marriages in a family affected by leprosy is one of the most challenging social issues of leprosy. This drama tells the story of a professor, a former leprosy sufferer, trying to arrange the match of his daughter. Two previous matches have failed once the families learnt of his disease.

A prospective groom is found for the girl and negotiations take place. The family is a little surprised to see that the father of the groom is not present at the negotiations and although they like the boy, and he and his aunt seem keen, they are not sure that it can go ahead. Despite the protestations of the matchmaker, they are determined to be very open with their prospective in-laws and the professor tells them about his disease and that he has been cured.

The girl's family are not the slightest bit discouraged. The matchmaker is keen to know what they think of the boy. Once he is reassured that they like him he reveals himself as the boy's father. He explains that he entered the subterfuge because he wanted to be sure that they liked the boy for his own merits. He makes it clear that he is not worried at all by the fact that the professor had leprosy. He was more worried that their family would not want her to marry the son of a matchmaker.

Quotations from people involved in the campaign

> This, (the campaign) in my opinion, marks a chapter in Nepal's history of changing people's attitudes towards not just leprosy but towards every other disease or social problem where the affected persons feel stigmatized. The brave people who spoke out when given the opportunity will work as pathbreakers for other persons afflicted by other taboo diseases or difference of opinion. The key elements that came through were HOPE, DETERMINATION AND COURAGE.
>
> *Deependra Gauchan (AA–VAS)*

Yashodha Jiriel cried when she heard the NLEC theme song because she felt it expressed to all how a person affected by leprosy feels deep within. Being able to break through and share this pain with everyone gave her a sense of liberation she had never felt before. It lifted a huge burden. She said, 'Leprosy used to be a disease I hated. But today, I feel I'm lucky to have had the disease. It guided me on the path I was meant to take, helping people in pain'.

Yashoda Jiriel (Nurse)

'My daughter is studying in school. I work hard to educate her so that she will grow up and become a nurse or a teacher and she will teach people not to shun people affected by leprosy. She will teach people that we are all the same—leprosy affected or not'

Lal Bahadur Limbu (Craft Worker)

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Recent trends in leprosy in a large district of West Bengal, India, revealed by a modified leprosy elimination campaign (MLEC), 1998

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Summary A Modified Leprosy Elimination Campaign (MLEC) in September 1998 in the District of Midnapore, West Bengal, covered a population of 8·1 million people and detected 8181 new cases. Available data from 7328 cases were studied to observe the trend for leprosy in this area. Data are presented on sex and age distribution, classification and the proportions of multibacillary (MB), paucibacillary (PB) and single skin lesion (SSL) cases discovered in a period of only 8 days. The large numbers of people examined in this district and the high total of new cases revealed are in keeping with experience in other parts of the State and in other parts of India. However, many cases were found in endemic areas and these will receive special attention in a second MLEC, planned for January 2000.

Introduction

Midnapore in West Bengal is the largest populated district of India (about 10 million) situated near The Bay of Bengal at the southern most part of the State. Topographically, it is divided into two halves – an eastern half of fertile alluvial soil and a western half of infertile laterite soil with forest areas. More than 1·5 million tribal people inhabit the western half, along with 0·2 million poor slum dwellers in its urban part, rendering it backward both economically and in literacy levels in comparison to the eastern part (Figure 1).

MDT was started in this district in March 1991 with a caseload of 31,847. On 31 March 1992, the caseload was 32,159. Every year thereafter caseloads showed a substantial decreasing trend (Figure 2) with a caseload of 4663 on 31 March 1998 due to the routine activities of the State members of the National Leprosy Eradication Programme.

It was, however, presumed by sample survey, performed by the Zonal Leprosy Officer,

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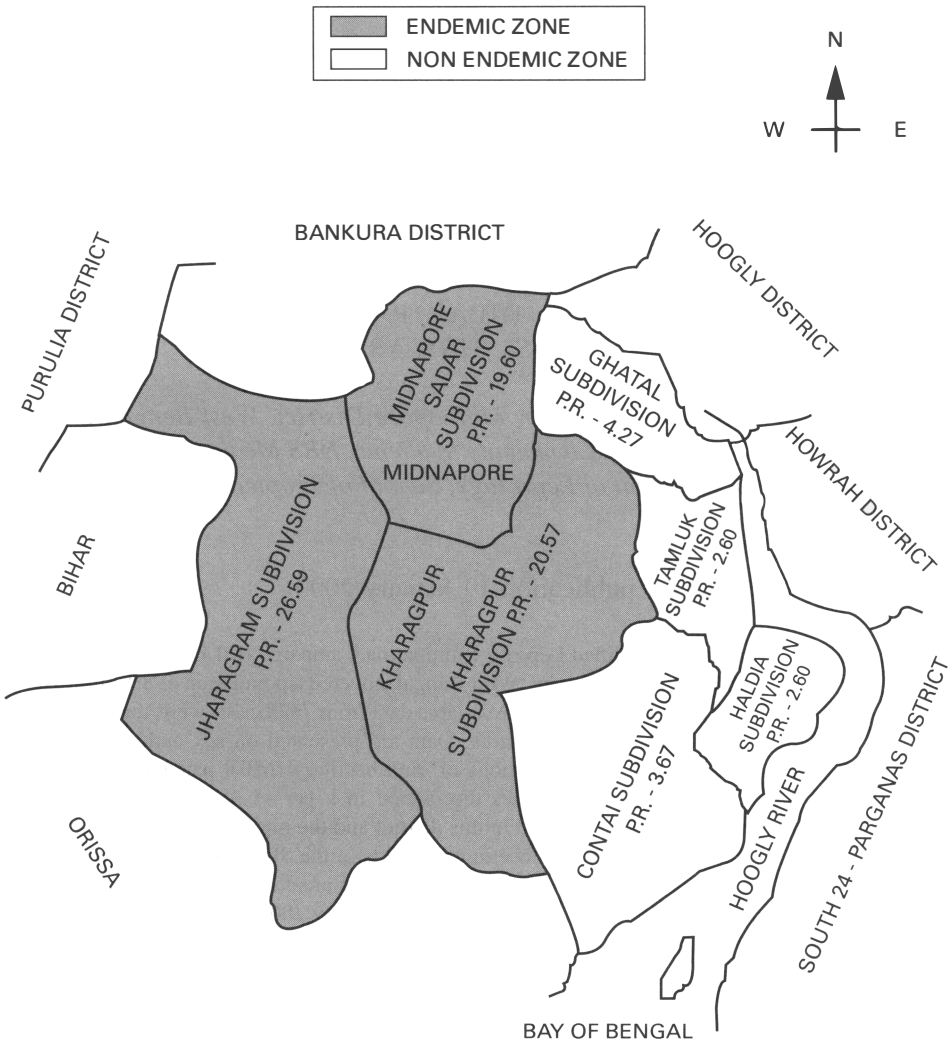

Figure 1. District of Midnapore (population approximately 10 million). Case load in September 1998 (after MLEC) was 12,326.

Midnapore, that the existing case load of 4663 cases represented only the tip of an iceberg of a huge number of hidden cases due to ignorance, illiteracy, social taboos and stigmas. To combat this situation a Modified Leprosy Elimination Campaign (MLEC) was started in this district (and elsewhere in this State) in September 1998.

Materials and methods

This MLEC included preparatory and active phases. In the initial part of the preparatory phase mass awareness was created by continuous health education, involving all categories of

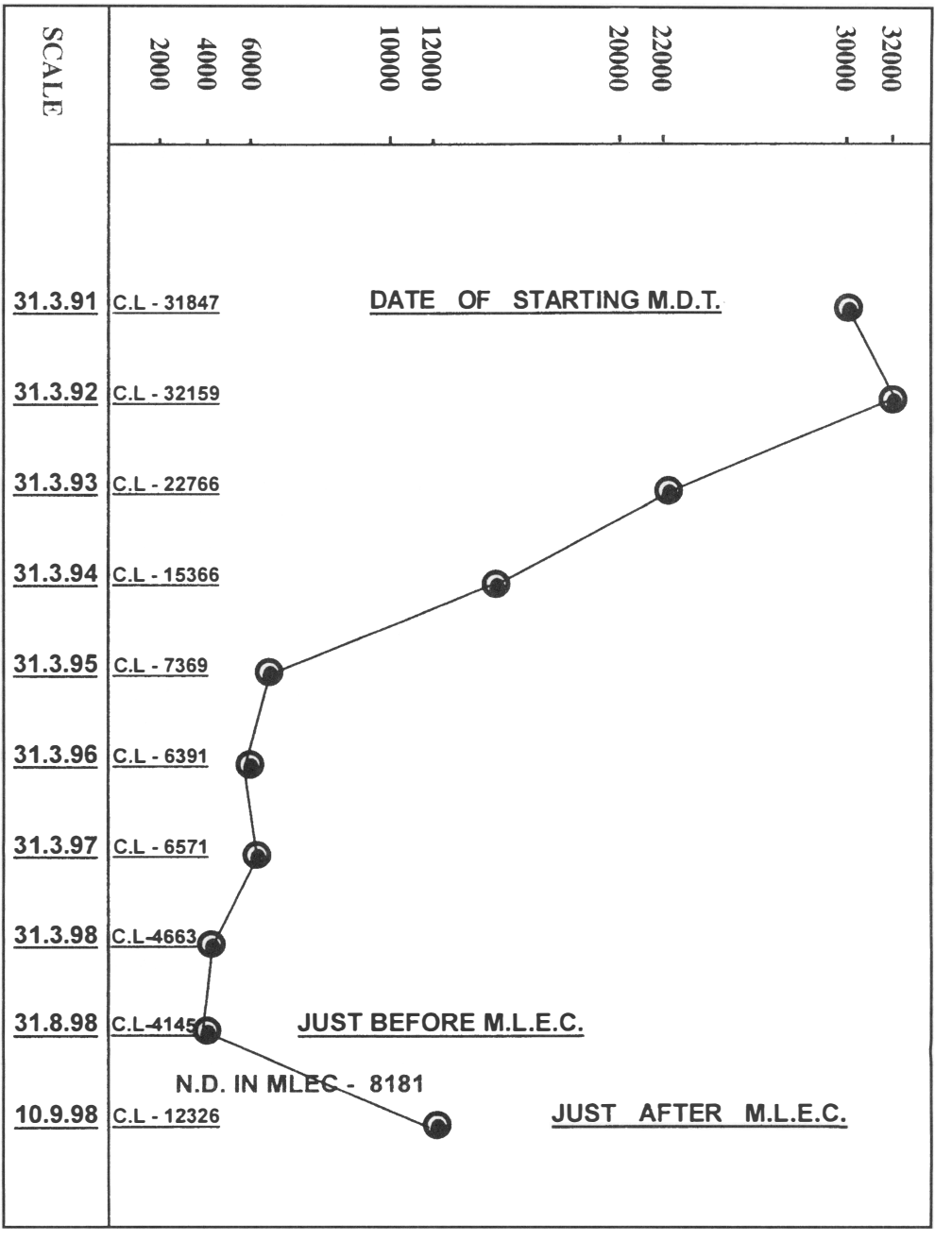

Figure 2. Leprosy picture in Midnapore District from 31 March 1991 to 10 September 1998 (MLEC). C.L. = case load, N.D. = newly detected cases.

Table 1. Sex distribution of cases

Male (%)	Female (%)	Total
4290 (58·5)	3038 (41·5)	7328

health staff. The general population was covered by door-to-door hand-bill distribution, wide audio and audiovisual publicity including TV and radio programmes and publicity in local newspapers. At a later stage, 9500 workers selected for MLEC were trained at 61 blocks and municipalities.

The active phase involved about 3000 teams of survey workers (each consisted of three people) for the enumerated 9·2 million population. The survey examined about 8·1 million people over a period of 8 days (1–8 September 1998).

Results

In all, 47,854 suspected persons were detected by the survey workers, out of which 8181 cases were confirmed by experienced observers and treated by special teams. Detailed data of 7328 cases were available and analysed for the present study. After MLEC the caseload in this district rose to 12,326 and the prevalence of cases per 10,000 became much higher in the western compared with the eastern part. In the western region, the prevalence rates per 10,000 of the population were 26·59, 20·57 and 19·60 in the three subdivisions, but in the eastern region they were 4·26, 3·67, 2·60 and 2·60 in its four subdivisions (Figure 1). On the basis of this finding, the western and eastern region could be designated as 'endemic' and 'non-endemic' areas, respectively. Tables 1–6 show sex and age distribution, classification and the proportions of multibacillary (MB), paucibacillary (PB) and single skin lesion (SSL) cases discovered in the MLEC in this district.

Table 2. Age and sex distribution of cases

0–5 years (%) 94 (1)		6–14 years (%) 1158 (16)		>14 years (%) 6076 (83)	
Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
54 (57·4)	40 (42·6)	618 (53·4)	540 (46·6)	3618 (59·5)	2458 (40·5)

Table 3. Classification of cases

SSL (%)	PB (%)	MB (%)	Total
193 (2·67)	4833 (65·95)	2302 (31·45)	7328

Table 4. Age and sex distribution of different case types. *n* = number of cases

Age group (years)	Male			Female		
	SSL	PB	MB	SSL	PB	MB
0–5 (*n* = 94)	*n* = 54 (57·4%)			*n* = 40 (42·6%)		
	8	38	8	2	28	10
6–14 (*n* = 1158)	*n* = 618 (53·4%)			*n* = 540 (46·6%)		
	25	467	126	30	417	93
>14 (*n* = 6076)	*n* = 3618 (59·5%)			*n* = 2458 (40·5%)		
	73	2207	1338	55	1676	727

Table 5. Age and sex distribution of different case types in endemic (Midnapore Sadar + Kharagpur + Jhargram subdivisions) and non-endemic (Ghatal + Tamluk + Haldia + Contai subdivisions). *n* = number of cases

Age group (years)	Area	Male			Female		
		SSL	PB	MB	SSL	PB	MB
0–5	Endemic (*n* = 74)	*n* = 44 (59%)			*n* = 30 (41%)		
		5	34	5	2	20	8
	Non-endemic (*n* = 20)	*n* = 10 (50%)			*n* = 10 (50%)		
		3	4	3	0	8	2
6–14	Endemic (*n* = 990)	*n* = 531 (54%)			*n* = 459 (46%)		
		23	399	109	27	356	76
	Non-endemic (*n* = 168)	*n* = 87 (52%)			*n* = 81 (48%)		
		2	68	17	3	61	17
>14	Endemic (*n* = 5115)	*n* = 3002 (59%)			*n* = 2113 (41%)		
		63	1862	1077	45	1469	599
	Non-endemic (*n* = 961)	*n* = 616 (64%)			*n* = 345 (36%)		
		10	345	261	10	207	128

Discussion

The higher incidence of cases in males corresponds to the general trends in leprosy elsewhere, but the relatively larger number of cases among the female population (41·5%) probably

Table 6. Proportion of multibacillary (MB) and non-MB (SSL + PB) cases in non-endemic and endemic areas. *n* = number of cases

	Area	
Type of case	Non-endemic (n = 1149)	Endemic (n = 6179)
MB	428 (37·25%)	1874 (30·33%)
Non-MB	721 (62·75%)	4305 (69·67%)

$Z = 4.5$, $P < 0{\cdot}01$

reflects successful case-detection and better mass awareness generated in this campaign. The higher incidence of cases among adults (83%) also corresponds to general trends of leprosy and the higher percentage of PB cases (65·95%) is consistent with the findings elsewhere in this geographical area. However, in contrast to the findings of the South Indian studies, the percentage of SSL cases was remarkably low – only 2·6% of all detected. In females, a higher percentage of cases was found in the 6–14 years age group (46·6%), compared to that in adult females (40·5%) and this may be due to the higher chances of exposure during free mixing in school, greater social freedom and immunological changes associated with puberty. By contrast the percentage of cases in males was higher in adults (59·5%) than the 6–14 years age group (53·4%), possibly attributable to occupational reasons and greater mobility in this group.

The higher endemicity in the Western region could probably be attributable to economic handicap and illiteracy prevailing in this region. The percentage of adult female leprosy cases was slightly higher in endemic areas (41%) than in non-endemic areas (36%). The finding of more male cases in non-endemic areas (64%) compared to the endemic areas (59%) corresponds to the general trend in population. The occurrence of a higher proportion of MB cases in non-endemic areas (37·25%) compared to that in endemic areas (30·33%) and the reverse situation in SSL and PB groups (62·75% versus 69·67%) calls for explanation, possibly being due to environmental or racial factors so far not identified in this area.

The large numbers of people examined in this district and high total of new cases revealed are in keeping with experience in other parts of the State of West Bengal and in other parts of India. However, the occurrence of 84% of cases in the endemic areas of the district, despite a great deal of work by the specialized 'vertical' teams of the NLEP in previous years clearly calls for attention. Special emphasis to these areas will be given during a planned second MLEC to be started in January 2000.

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Leprosy elimination campaign, Amazonas–Brazil 1997

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Summary A leprosy elimination campaign (LEC) was carried out in 15 endemic areas of Amazonas State, Brazil, in 1997. The LEC concentrated effort to detect leprosy cases during a multi-vaccination national campaign for serious public health problems other than leprosy, such as polio, diphtheria, hepatitis, measles, etc. The national campaign involved intensive population mobilization, giving a valuable opportunity to examine people for leprosy. The LEC personnel included 2964 individuals (municipal and state health workers and community volunteers), distributed in 688 health units and 53 reference health centres. As a result of the LEC, 74,814 person-to-person communications in the community were given; 10,297 clinical skin examinations were conducted, and 40 new leprosy cases were detected on the day of the campaign in urban areas of the municipalities. This total was low, compared to results in other states of Brazil, possibly due to the development of health education activities and regular community services in the state of Amazonas since 1987 and to the early implementation of WHO multiple drug therapy (MDT) from 1982 onwards. Despite the fact that the LEC was carried out only in the urban areas of the municipalities, the finding of no cases of leprosy in 7 out of 15 of them was surprising and may indicate that the prevalence of hidden cases of leprosy is not all that high, at least in these areas of the Amazonas State.

Introduction

Leprosy is still endemic in the Amazonas State of Brazil, with a prevalence rate of 12.9 per 10,000 inhabitants, in 1998.[1] The Fundaçã Alfredo da Matta (FUAM) is responsible for leprosy control in the State and a reference centre for skin diseases. According to the World

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Health Organization, about a quarter of leprosy cases in endemic regions do not have access to diagnosis and treatment.[3] The lack of awareness about the first signs and symptoms of leprosy by the community and health workers greatly hampers the early diagnosis and therefore delays its control process.[2] Finding untreated cases in the community and curing the detected cases are the two key activities for the global strategy for eliminating leprosy as a public health problem.[3] A major component of the WHO strategy to detect and treat hidden cases is a campaign approach referred to as the leprosy elimination campaign (LEC). In 1997, the FUAM developed a multi-media campaign to increase population awareness of the first signs of leprosy and enable locally available health services to increase detection and treatment of self-reporting leprosy cases, to inform the general public of modern concepts related to the cure of leprosy and to implement leprosy control measures in local health units where they had not been previously available.

Materials and methods

CAMPAIGN STRATEGIES

All health and community facilities in the urban areas of the 15 municipalities of the Amazonas State including the capital city, Manaus, were involved.

SPECIFIC STRATEGIES

Two months of mass communication via TV, radio, newspapers and other forms of community media were used to inform the population about leprosy symptoms and local health services. FUAM sponsored seminars were held to increase awareness of leprosy among community leaders and health workers. In addition, indirect active case finding through person-to-person communication was carried out in the community.

The LEC concentrated efforts to locate leprosy cases in endemic areas during a national multi-vaccination campaign. This campaign involved intensive population mobilization to eliminate serious public health problems other than leprosy, such as polio, diphtheria, hepatitis, measles etc. The leprosy campaign made use of this large population mobilization to reach a significant part. They came to the local health units during the national campaign. The campaign personnel included 2964 individuals (FUAM, municipalities and state health workers and community volunteers) distributed in 688 health units and 53 reference health centres.

Results and discussion

As a result of LEC, 74,814 person-to-person communications in the community were given; 10,297 clinical skin examinations conducted; and 40 new leprosy cases detected. As shown in Table 1, the total number of single lesion leprosy cases was 15 (37.5%) and three (7.5%) cases were under 15 years old. Regarding disability grade, four (10%) patients were detected with visible deformity or damage. Single lesion PB cases living in Manaus (66.7%) were treated with a single dose of ROM (rifampicin, ofloxacin and minocycline). The remaining patients were treated with standard WHO multiple drug therapy (MDT).

Table 1. Leprosy elimination campaign, Amazon, Brazil, October 25, 1997. New cases detected

		New cases			Number of lesions				Disability grade			Age	
Municipality	Population	PB	MB	Total	1	2–5	+5	Not informed	0	1	2	<15	>15
Manaus	1,193,727	17	04	21	10	04	01	02	17	02	02	01	20
Manacapuru	67,598	02		02		01		01	02				02
Nova O. do Norte	19,375		02	02					02				02
Itacoatiara	66,939	01	01	02					01		01		02
Humaitá	24,418	03		03		03			01	01	01		03
Manicoré*	36,110												
Borba	25550	07		07	04	03			07			02	05
Tefé*	64,546												
Coari*	57,232												
Jutai*	20,414												
Lábrea	26,354		01	01					01				01
Boca do Acre*	23,426												
Eirunepé*	26,943												
Carauri	21,335	01	01	02	01				02				02
Parintins*	74,814												
Total	1,748781	31	09	40	15	11	01	03	33	03	03	03	37

*No cases were detected during LEC

Conclusion

Awareness was increased about leprosy symptoms in the community and knowledge about local health facilities and services available for leprosy treatment was greatly improved. Hidden cases were detected in target areas. The LEC benefited greatly from coupling with the larger national multi-vaccination campaign. The total of cases detected was low, possibly due to the development of health education and community surveys in this state since 1987 and our early implementation of MDT from 1982 onwards. Nevertheless, the complete absence of any cases of leprosy in seven out of 15 of the municipalities was surprising, and may indicate that the prevalence of hidden cases is not all that high, at least in these areas of the Amazonas State.

Acknowledgements

The authors are grateful to all who were involved in the campaign, especially to Henrique dos S. Pereira, Megumi Sadahiro, Valderiza L. Pedrosa, Éneas A. Neto, Marcos B. de Freitas and Richard Padraig Byrne for their assistance in this paper. We are also grateful to the German Leprosy Relief Association for their financial support.

References

[1] Instituto de Dermatologia Tropical e Venereologia Alfredo da Matta. Instrumento de Avaliação das Acões de Controle da Hanseniase, Amazonas, 1998.
[2] WHO Leprosy Elimination Campaign (LEC) and Special Action Projects for the Elimination of Leprosy (SAPEL). *Questions and answers.* World Health Organisation, Geneva, 1997.
[3] WHO. *Weekly Epidemiological Record.* World Health Organisation, Geneva, V.73, n.24, 1998, 177–184.

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CASE REPORT

Genital nodules and testicular hydrocele in a case of relapsed lepromatous leprosy

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Accepted for publication 25 November 1999

Summary A borderline-lepromatous leprosy patient treated initially with dapsone monotherapy for 10 years followed by a combination of dapsone and clofazimine for 6 months stopped anti-leprosy treatment in 1991. He presented 6 years later due to new, widespread nodules, and recurrent testicular hydrocele. He responded to WHO-MB-MDT and steroid therapy. His hydrocele was treated surgically. The co-existence of recurrent testicular hydrocele with genital nodules in relapsed LL led to this report

Introduction

The male external genitalia were considered to be immune to the occurrence of leprosy lesions,[1] in spite of the lower temperature of the scrotum and testicles, which favour the growth of *M. leprae*.[2] However, reports from India[3–5] suggest the occurrence of skin lesions on the penis and scrotum of TT, BT, BL and LL patients. This paper describes a case involving genital lesions in a Nigerian patient.

Case report

In 1968, a 26-year-old man with generalized ill-defined macules and thickened ear lobes was diagnosed as having BL leprosy. DDS monotherapy 100 mg/day was commenced, but unfortunately he refused to attend clinics in his community because of the high level of social stigma against leprosy. He therefore received DDS irregularly from the Leprosy Hospital Etinan, South-East Nigeria, approximately 500 km from his home. After 10 years of taking irregular doses of DDS, skin smears showed BI = 3 + and MI 10%. VMI.ST revealed full power in all muscle groups tested, sensory loss in the medial three fingers of the left hand and sensory loss on the sole of the left foot. Following the BI of 3+, a 6-month course of DDS and CLO was prescribed. Skin smears carried out approximately 1 year after completing the 6-month course of DDS+ CLO showed a BI of 1+. CLO was discontinued while he continued to receive DDS.

Nineteen years after diagnosis (1987), he was admitted due to swelling and ulceration of the right ankle of 3 months duration. BI was 0 and VMT.ST revealed deterioration in function

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with left ulnar paralysis, right foot drop and sensory loss in soles of both feet. A diagnosis of reversal reaction was made and a 12-week course of prednisolone starting at a dose of 40 mg/day was prescribed. The patient continued to receive DDS while on steroids. Between 1987 and 1990, he was admitted with several episodes of plantar ulcers and neuritis. In May 1991, DDS was discontinued following resolution of the macules. Steroid therapy was also discontinued due to the return of full dorsiflexion of the right foot. Skin smears were not carried out on this occasion.

Six years after discontinuing DDS (August 1997), he was re-admitted with a severe ENL reaction involving the eyes and extremities, intermittent nasal congestion and bleeding of 2 years duration, the appearance of new lepromatous nodules on the face, ears, prepuce and scrotum, and a tender left testicular hydrocele measuring approximately 6 cm by 4 cm in size. Questioning revealed that the hydrocele coincided with past episodes of ENL reaction and subsided with ENL regression. Examination showed fixed clawing of all fingers of the left hand and recurrence of right foot drop. The BI was 6+ in scrotal nodules and 5+ in ear nodules.

A WHO.MB.MDT drug regimen comprising rifampicm, CLO + DDS for leprosy, and a 12-week course of prednisolone starting at a dose of 60 mg/day for ENL reaction was prescribed. One week after admission, a left hydrocelectomy was performed following severe left testicular pain. At surgery, the left testis was normal, as was hydrocele fluid analysis. The patient made a good postoperative recovery and was subsequently released from treatment (RFT) for leprosy in August 1998 after successful completion of 12 monthly doses of MB.MDT.[6]

Discussion

The occurrence of a combination of new lepromatous nodules and intermittent nasal bleeding in 1995 and increase in BI from 0 to 6+ suggests relapsed LL. This BL patient relapsed perhaps because he was poorly compliant with anti-leprosy treatment for 10 years, even though he later responded to a 6-month regimen of CLO + DDS in 1978 and to DDS monotherapy from 1978 to 1991, which he took regularly.

Although orchitis and testicular damage are common features of lepromatous infections[7] and chronic ENL reactions, the author is unaware of reports of recurrent unilateral testicular hydrocele in leprosy. The author agrees with Mittal, *et al.*[8] that under-reporting of genital lesions may be due to the reluctance of patients to expose, or the health workers to examine, the genitalia.

References

[1] Fox H, Knott J. Leprous nodules of male genitalia. *Int J Lepr,* 1934; **2**: 445–446.
[2] Hastings RC. *Leprosy*, 1st edition. Churchill Livingstone, Edinburgh, 1985: p. 125.
[3] Parikh DA, Parikh AC, Ganapati R. Penile and scrotal lesions in leprosy: case report. *Lepr Rev,* 1989; **60**: 303–305.
[4] Dixit VB, Choudhaiy SD, Jain VK, Rajeev S. Primary involvement of scrotum in tuberculoid leprosy. *Ind J Lepr,* 1990; **62**: 120–121.
[5] Arora SK, Mukhija RD, Mohan L, Girdhar M. A study of cutaneous lesions on male genitalia. *Ind J Lepr,* 1989; **61**: 222–224.
[6] WHO. *A guide to the elimination of leprosy as a public health problem*, 2nd edition. WHO/LEP/97.7 1997: pp. 52–53.
[7] Ridley DS. *Pathogenesis of leprosy and related diseases*, 1st edition. Butterworth, London, 1988: p. 89.
[8] Maru S, Mittal A, Gupta L, Sharma M, Bansai N. Penile lesions in Hansen's disease. *Int J Lepr,* 1996; **64**: 324–325.

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Letters to the Editor

RADIO AS A MEANS TO ENHANCE EARLY CASE FINDING IN LEPROSY

Editor,

Improving community awareness about leprosy in largely rural, poor communities in order to improve early case finding is a major challenge. Use of the mass media is limited by access but does not require literacy and possibly increases authenticity of the message received. In 1998, the Health Education Committee of the Danish Bangladesh Leprosy Mission developed and recorded a series of six distinct radio jingles and short radio plays using the local dialect with the aim of increasing community awareness of the early signs of leprosy. In the first 2 weeks of May 1998, all six were played extensively over a local radio network, each at least once a day. Our clinic assistants and supervisors were asked to record the cause of presentation prospectively in all newly registered cases presenting voluntarily to our clinics, usually around 40% of all of our new cases. This began in the month before and continued until 3 months after the radio campaign. A small database was created to store this data. Since virtually all new cases of leprosy within the broadcasting area of the radio programme (potential population coverage around 4 million) are identified by our control program, we were able to identify the number and percentage of new cases presenting due to radio.

In April 1998, before the campaign, out of a total of 49 cases presenting voluntarily, none identified radio as a factor in their presenting to the leprosy facility. In May, out of a total of 82 cases, five (6·1%) mentioned radio as the cause of their presentation. In June and July of 1998, none of a total of 117 cases identified radio as a cause of their presentation. In summary, in the 3 months following a radio campaign, five out of 199 (2·5%) new voluntary cases presented as a result of radio information, presumably via this campaign, since no other broadcasts on leprosy were in operation at the time in our area. All five cases presented within the first month and showed no disability and no evidence of reaction at diagnosis. One was MB, and four PB, including one single lesion. All cases were male.

The fact that no cases had any evidence of disability, in a project where cases presenting voluntarily generally have a grade I or II disability rate of more than 20% at diagnosis is interesting, but not statistically significant. The small number of cases, all men, underlines the problem of access to this medium of health education. In 1999 also, despite extensive radio broadcasting as part of the national leprosy elimination campaign, we have not recorded any cases presenting to our clinics as a result of radio messages among over 850 new voluntary cases, though the television campaign was clearly more effective in this regard. The more general potential effects of mass communication in raising community awareness and helping to destigmatize the disease have not been examined in this study, but are very important. The total cost of development and broadcasting in this case was Bangladesh Taka 26,000 (approximately US$500), a considerable sum given the meagre recorded response, but which could be reduced considerably by willingness of radio stations to air such messages without charge. We are also continuing to use these messages as part of our village information programme.

In summary, we were not able to demonstrate a significant response to a 2-week radio campaign about early signs of leprosy in our project area. The search for ways to increase the effectiveness of such

programmes is becoming more important with the approach of the elimination deadline for leprosy, and the increasing importance of the mass media.

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SENSORY TESTING USING NEUROTHESIOMETRY

Editor,

As colleagues at the West Midlands School of Podiatry, we are curious about the use of vibration perception measurements as a clinical tool for the determination of neurological dysfunction in conditions such as diabetic neuropathy and leprosy. Our curiosity is *not* with the use of vibration perception thresholds (VPT) *per se*, since this technique is well documented, *but* the site at which testing is performed.

It is our understanding that in a neurological setting, vibration perception is assessed by holding a vibrating device (tuning fork or neurothesiometer etc.) firmly against the malleollus or some other bony prominence.[1] However, it is known that whilst skin has a variety of somatic sensory receptors, bone has none.

Therefore, the action of placing a vibrating device against a bony prominence has a number of pitfalls. Firstly, the skin is likely to be 'thinner' at this site, with little underlying subcutaneous tissue. This suggests that the number of sensory units per unit area is lower than at other sites where there is a greater 'body' of tissue present. Secondly and more importantly is the role that the underlying bone will play in the vibration transmission. It has been pointed out that a bony site will act as a sounding board[2] and hence it would be difficult to know which receptors were being activated. In fact, it was reported as a common experience that vibration in the fingers was felt when a tuning fork was held against a 'bone protuberance at the elbow'.

The variation in the 'damping and spread' of the vibration is determined by the 'stiffness' of the tissue.[3] These workers reported in their study that 'care was taken to apply the stimulator where the subcutaneous tissue was so thin that the stimulus would be transferred maximally to the underlying bone'. These two comments from the same report appear at odds with each other. Surely if it is known that vibration is damped by a 'stiffer' tissue (such as bone), it would more prudent *not* to apply it to a 'stiffer' tissue such as a bony prominence. Goldberg and Lindblom[3] have reported a series of vibration amplitudes, where it can be seen that the malleolus and tibia all damp the vibration significantly; the finger pad damps the signal to a much lesser degree.

In the well-known report by Bloom *et al.*,[4] the centile charts for vibration thresholds for the thumbs and medial malleoli may possibly be explained by this damping effect. The vibration threshold is lower in the thumb, which unlike the medial malleolus, has no bony prominence.

The ramifications of this damping effect are obvious. Firstly, it will be impossible to get a true determination of VPT when using a bony prominence. Secondly, a situation might arise in a neuropathic patient where the stimulus is felt as a *consequence* of transmission of the vibration along the bone in the lower limb away from a neuropathic area, to an area where the vibration is perceived not as a consequence of the initial cutaneous stimulus, but as a secondary effect of transmission to the sensory receptors 'outwards' from the bone; from 'underneath' as it were.

We would welcome discussion on this topic, since the technique is widely used in podiatry clinics and is one of the major pieces of armament in the battle against neuropathy and its consequences.[5,6]

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References

[1] Dyck JP. Quantitation of cutaneous sensation in man. *Peripheral Neuropathy*, 1975; **22**: 465–479.
[2] Geldard FA. The perception of mechanical vibration. I. History of a controversy. II. The response of pressure receptors. III. The frequency of function. IV. Is there a separate 'vibratory sense'? *J Gen Psychol*, 1940; **22**: 243, 271, 281, 291.
[3] Goldberg I, Goldberg M, Lindholm U. Standardised method of determining vibratory peception thresholds for diagnosis and screening in neurological investigation. *J Neurol Neurosurg Psychiatry*, 1979; **42**: 793–803.
[4] Bloom S, Till S, Sonsken P, Smith S. Use of a biothesiometer to measure individual vibration thresholds and their variation in 519 non-diabetic subjects. *Br Med J*, 1984; **288**: 1973–1975.
[5] Kahn R. Quantitative sensory testing. *Diabetes Care*, 1992; **15**: 1092–1094.
[6] Franklin GM, Kahn LB, Baxter J, Marshall JA, Hamman R. Sensory neuropathy in non-insulin-dependent diabetes mellitus. The San Louis Valley Diabetes study. *Am J Epidemiol*, 1990; **131**: 633–643.

GRADING IMPAIRMENT IN LEPROSY

Editor,

With interest we read the article 'Grading impairment in leprosy' by Van Brakel *et al.* in *Leprosy Review* **70**, no. 2. It would be an advantage for the management of leprosy control programmes if there was a simple accurate indicator to measure changes in impairment. This indicator could help to monitor how well a programme is able to prevent impairments. Reporting on Prevention-Of-Impairment-and-Disability (POID) activities would encourage the health workers to take this part of the work seriously.

In leprosy, the major impairments are caused by nerve damage: loss of sensation, loss of muscle power in hands, feet and eyes. Secondary impairments (e.g. wounds) can develop in addition to these primary impairments. These impairments can be measured and scored. The presently used WHO impairment grading system has the advantage that it is relatively simple. Eyes, hands and feet are examined for impairment caused by nerve damage. Disability grade 0 means no anaesthesia and no visible impairments or damage, disability grade 1 means that there is anaesthesia but no visible deformities or damage and grade 2 means that visible deformities or damage is present. The WHO impairment score is the maximum score found in any eye, hand or foot (range 0–2).

This WHO impairment grading system has serious limitations. The basic problem is that this grading system combines in one figure three basically different impairments. This does no justice to the three different components.

1. The impairment grade is not a good measurement for the severity of the impairment. Visible deformities are graded to be more severe than invisible ones. However, a person with loss of sensation in both hands and feet (grade 1) is more at risk of becoming severely disabled than a person with only paralysis of one small finger (grade 2). Grade 2 shows a different impairment than grade 1 (or a combination of impairments).
2. There is a wide range of severity of impairment in each category, e.g. disability grade 2 can mean paralysis of a little finger or loss of all fingers.
3. Voluntary muscle testing and sensation testing used for impairment grading are not always easy to score. In many patients, nerve damage causing the impairments is not complete. These slight changes in sensation and muscle power are often difficult to interpret, especially for general health workers with limited experience. The impairment may change over time with increasing and decreasing immune response.
4. The impairment grade can alter by small changes in impairment. On the other hand, large changes in impairment do not always alter the impairment grade. Improvement from grade 2 to 1 and *vice versa* may only be a wound appearing or healing. On the other hand, the disability in a hand may have improved very much without this showing in the disability grade (e.g. due to permanent loss of a finger).
5. The grading system depends on the accuracy of the sensation testing and the voluntary muscle

Table 1. Changes in impairments in 40 patients who started leprosy treatment at Abu Rof in 1997

Impairment	Improved	Same	Worse
Sensation	5	31	4
Muscle power	4	33	3
Secondary impairments	–	39	1

testing of the health workers. In addition, other factors may influence the accuracy of a test, e.g. noise in a clinic may distract the patient during the test. Changes in disability grade may reflect changes in accuracy more than changes in actual impairment.

6. Not all programmes use the same grading system. Weak muscles are graded in some programmes as grade 0, whereas this constitutes an impairment. Other programmes consider weak muscles to be grade 1. The WHO grading system used to consider lagophthalmos as grade 1 but changed this to grade 2. Some programmes may still use the old system.

The 'WHO sum impairment score' is used in some programmes. In this grading system, the disability grades of hands, feet and eyes are added up together. Thus the impairment sum score of a patient ranges between 0 and 12. The advantage of this grading system is that it gives a better idea of the extent of the impairment. The disadvantage is that it is slightly more complicated than the WHO grading system. It still has all the problems of combining different impairments in one figure. As it has a larger range, the idea is that this grading system could monitor the changes in impairments better.

Van Brakel *et al.* demonstrate that impairment sum score (adding up the Eyes, Hands and Feet disability scores) changes more in patients than the maximum impairment score, which is used at the moment. The question is whether these changes measure a real change in impairment.

At the Abu Rof leprosy clinic in Omdurman Province, Khartoum State, Sudan, we looked at the changes in impairment of the patients who started treatment in 1997. We scored sensation, muscle power and secondary impairments separately and calculated the WHO impairment score and the WHO impairment sum score. Out of 68 patients who started treatment, 40 patients completed the treatment, from whom we could get all the necessary data. Like Van Brakel *et al.*, we noticed that the changes in disability grade were larger when the WHO impairment sum score was used, compared to the WHO maximum impairment score (changes in four patients instead of two). The total score did not detect the changes in impairment in five patients, whereas it gave an improvement in impairment score for one

Table 2. Changes in impairment in 40 patients who started leprosy treatment at Abu Rof in 1997 compared to changes in the WHO (maximum) impairment score

	WHO impairment maximum score			
Impairment	Improved	Same	Worse	Total
Improved	1	3		4
Changed (+ and –)		2		2
Same		30		30
Worse		3	1	4
Total	1	38	1	40

*Improved is improvement in one of the three impairment scores without deterioration in another

Table 3. Changes in impairment in 40 patients who started leprosy treatment at Abu Rof in 1997 compared to changes in the WHO impairment sum score

	WHO impairment sum score			
Impairment	Improved	Same	Worse	Total
Improved	2	2		4
Changed (+ and –)	1	1		2
Same		30		30
Worse		3	1	4
Total	3	36	1	40

patient who had worsening of sensation and improvement of muscle power (Tables 1–3). These results show the complications of adding up three different types of impairment into one score.

We doubt whether WHO impairment score is a good instrument to measure Prevention of Impairment and Disability because:

- the impairment score does not reflect the severity of the impairment.
- it does not detect changes in impairment well.
- changes in the score may not reflect changes in actual impairment.

The WHO impairment sum score has no real advantages here. It does give a better idea of the severity of the impairments of the patient than the WHO maximum score and it is more sensitive to changes in impairment, but still has all the limitations attached to the WHO impairment score. In the sum score, it is even more unclear what a certain score actually means in terms of impairment. Instead of being more accurate, this score may multiply the confusion by six, while giving a false sense of accuracy.

It is important to include indicators for Prevention of Impairment and Disabilities in the reporting of leprosy control programmes. Specialized programmes may continue to measure the change in the different impairments separately to evaluate the quality of POID activities. This will not be possible for integrated programmes. Here instead of an outcome indicator, output indicators could be used (e.g. what percentage of patients have wounds at the beginning of the treatment and what percentage at the end, what percentage of patients was diagnosed to have a severe reaction and what percentage of these completed the reaction treatment).

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HENK BUDDINGH
GWEN IDLE

Reference

[1] Van Brakel WH, Reed NK, Reed DS. Grading impairment in leprosy. *Lepr Rev*, **70**, 180–188.Table 1. Changes in impairments in 40 patients who started leprosy treatment at Abu Rof in 1997.

REPLY

Editor,

Thank you for giving me the opportunity to respond to the letter submitted by Buddingh and Idle. I would like to make the following comments.

I would like to thank Buddingh and Idle for their comments on our paper titled 'Grading impairment in leprosy'. In general, I agree with what they are saying, but it gives me the opportunity to emphasize a few of the points, some of which were already made in the paper.

1. The WHO impairment grading system has several serious shortcomings. The units of measurements are crude and, even when summed as the EHF score, the scale is not very responsive to change. Large changes in impairment may not be reflected in the score. The latter may happen when limbs have already reached their maximum score (2), or when some limbs improve while others deteriorate.
2. Severity of impairment as measured with the WHO grading does not necessarily correlate well with the limitation in activities of daily living experienced by the person. However, this is likely to be more of a problem when the maximum score is used as an indicator of severity than when the EHF score is used.
3. The strength of the WHO grading system is its widespread use. Buddingh and Idle state that it is unlikely to be possible for integrated programmes to monitor POID activities using systems that record impairments in more detail. The 'output' or process indicators they suggest may be very relevant, but their widespread introduction would take quite a few years to accomplish. Meanwhile, we should try to make the best use of what is already being recorded. In our opinion, as an indicator, the EHF score makes better use of the WHO grading data than does the maximum score. Its main advantage, as confirmed by Buddingh and Idle, is a greater responsiveness to change.
4. Point 5 in Buddingh and Idle's letter is in itself true. However, it is not a shortcoming of the WHO grading system, but of the tests underlying the system. It will be difficult, if not impossible, to find tests of better accuracy and reliability than those commonly used in sensory testing and voluntary muscle testing, if they are still to be suitable for field use. Imperfect accuracy of screening and diagnostic tests is a reality that one needs to accept in public health.
5. I disagree with the statement 'the impairment score does not reflect the severity of the impairment'. The EHF score does reflect extent of impairment, which is usually correlated with severity. Note that this does not mean severity in this sense of what is perceived by the person affected as severe. Perceived severity is more likely to be correlated with activity limitations and restriction in social participation. However, when one is monitoring prevention of impairment activities or a prevention of impairment programme, it is appropriate to use an indicator that reflects simply severity of impairment.
6. Buddingh and Idle state that 'changes in the score may not reflect changes in actual impairment'. While there may be instances when this is true, for example due to spurious test results, this is not normally the case. The opposite is more likely to be a problem as argued in comment one above.
7. In my opinion, the meaning of a particular score is no more or less clear in the EHF score than in the maximum score. At least, when using the EHF score, one knows that all four limbs and both eyes have been taken into account in the score.

Use of the EHF score must never lead to a false sense of accuracy and keep us from trying to improve on what we have got. Let us join hands in searching for better and more meaningful measures and indicators to monitor and evaluate POID activities and programmes, while making the best use of available data in the meantime.

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Lepr Rev (2000) **71,** 89

OBITUARY

Gjalt Boerrigter

Gjalt Boerrigter was born on 11th September 1931 and died on 24th August 1999. To those who knew him his death did not come as a surprise; although we had hoped he would live for another couple of months, for another year.

Gjalt grew up in Bergen near the sea in Holland. He studied medicine in Amsterdam, from where he would go home ice skating across frozen canals on cold winter weekends. While doing military service he was posted to Indonesia, which was still a Dutch colony at that time. From Indonesia, Gjalt went to Ghana and from Ghana to Malawi, where he joined the British Leprosy Relief Association in the late 1960s.

I shall miss Gjalt greatly. Much of my clinical skills with regard to leprosy I learnt from him and I owe him many stimulating discussions. We did several studies together, mostly related to the evaluation of reaction and relapse rates during and after MDT. And it was fun to do them together with Gjalt, which is why we did them.

However, more than anything else I shall miss Gjalt as a friend. Gjalt was one of the most honest and reliable men I ever met; he always said exactly what he meant. He had his convictions but he would not fight for them. He would say: 'I have heard your opinion and you know mine. Let's leave it at that'.

Gjalt spent nearly half his life building up a splendid leprosy control service in Malawi for which he was awarded 'Officer in the Order of Oranje Nassau'. Nevertheless, he was always very modest and quiet about his achievements. He simply loved his work. He hoped that he had never done any harm to anyone and was pleased about every leprosy patient whom he had saved from developing disabilities.

Gjalt only left Malawi and returned to his native Bergen in Holland in 1998 when he knew he was approaching the curtain that separates the living from the dead.

Gjalt was very much loved and appreciated by his brother and his sister and their families, who spent many holidays with him in Malawi. Family and friends alike, we will always remember him and I think Gjalt would agree that your soul will exist as long as someone puts flowers on your grave. This, I am sure, will happen for many years to come.

J. M. Pönnighause

0305-7518/00/071089+01 $1.00

Lepr Rev (2000) **71,** 90–97

Teaching Materials and Services

Training courses in leprosy and tuberculosis, ALERT Ethiopia, 2000

January 10–February 11
Prevention and management of disabilities

Target group: physiotherapists, occupational therapists, podiatrists as well as experienced Hansen's disease workers involved in POD. Emphasis on both patient care (early detection of nerve deterioration, health promotion, problem solving) and program management (POD management, home based care and rehabilitation).

March 6–March 17
Introduction to Hansen's disease for physicians

Highly recommended for the participants in the following 'Management of Combined Programs' course who need to refresh their knowledge of clinical Hansen's disease. The course can also be taken on its own by physicians responsible for diagnosis, treatment and care of patients with Hansen's disease in either a hospital or a control programme setting.

March 20–April 14
Management of combined Hansen's disease and tuberculosis control programmes for physicians

Target group: experienced physicians responsible for managing a Hansen's disease and TB control programme at the regional level or above. Emphasis on program management: needs analysis, action plan, implementation of activities, supervision, evaluation, management of POD. A brief review of the essentials of TB is included, but Hansen's disease expertise is a prerequisite. Participants lacking the latter should also take the preceding 'Introduction to Hansen's disease' course.

May 29–June 16
Essentials of Hansen's disease and tuberculosis for administrative and programme support staff

Target group: administrative and managerial staff without a medical background, working in Hansen's disease and TB programmes and donor agencies. Objectives: to gain a better understanding of the two diseases, to communicate more effectively with the medical staff, and contribute more efficiently in decision making and priority setting.

September 4–October 13
Essentials of Hansen's disease and tuberculosis for physicians

Target group: physicians with limited experience in either Hansen's disease or TB. Emphasis on clinical aspects of Hansen's disease and TB, individual patient care and its application in the context of a combined programme, with an introduction to health promotion and managerial issues, paying special attention to POD and supervision.

November 6–November 17
Introduction to Hansen's disease for senior field staff

Highly recommended for the participants in the following 'Management of Combined Programmes' course who need to refresh their knowledge of clinical Hansen's disease. The course can also be taken on its own.

November 20–December 15
Management of combined Hansen's disease and tuberculosis control programmes for senior field staff

Target group: experienced nurses, paramedical workers or supervisors responsible for Hansen's disease and TB control at the district (or equivalent) level. Emphasis on planning, implementation, supervision and evaluation of control activities, with special attention for POD, health promotion and support functions. A brief review of the essentials of TB included, but Hansen's disease expertise is a prerequisite. Participants lacking the latter should also take the preceding 'Introduction to Hansen's disease' course.

In-Service training

In-service training, tailor made to the individual trainee's needs and interest, can be arranged in surgery, physiotherapy, dermatology opthalmology, laboratory etc.
For further information, please contact:

ALERT Training Division	Tel.:	+251-1-711524 or +251-1-712792
PO Box 165	Fax:	+251-1-711199 or +251-1-711390
Addis Ababa, Ethiopia	Email:	ahri@telecom.net.et

Continuing medical education: the approach in Uganda

The following article by Dr David A. Tibbut was published in the *INASP Newsletter*, No. 13, November 1999:

Medical education has traditionally been teacher-based with formal instruction. Often this instruction was centred on the diagnosis (e.g. pneumonia, malaria) rather than on the problem with which a patient presents (e.g. fever and rigors). The problem is the real situation and the diagnosis the possible one. It is clear that problem-solving is essential for near-patient learning. Time spent on such study is immediately applicable to health workers' practices and encourages team learning.

The design of a continuing medical education (CME) programme must include *all* health professionals with the opportunity for joint activities. A system that covers CME for each profession in isolation is likely to fail. The reasons include: insufficient organizing manpower; duplication of

activities leading to wastage of resources and time; and undermining of the team ethic. There is also poor co-ordination and lack of a unified approach to the Ministry of Health's *Minimum Health Care Package*—essential knowledge that healthcare professionals should have to cope with common diseases such as malaria and tuberculosis.

The CME programme in Uganda has developed over a number of years. The concept and value of CME in Uganda, as in all parts of the world, has taken time to be accepted. The climate for progress was created by the Ministry's recognition of the need for CME, and the partnership work by the Ministry and the Tropical Health and Education Trust (UK). The management structure is now almost complete with a National CME Steering Committee made up of representatives from the Ministry, medical school, professional councils and associations. Each Region now has a CME Co-ordinator, who is a senior clinician. Many of the Districts within each Region now have CME Co-ordinators (mainly nurses) in post, and each of these are members of their respective Regional CME Committee.

The philosophy of CME in Uganda is modern. We are attempting to create environments for continuing learning rather than providing just formal instruction, to encourage collective activities within hospitals and health units, and to survey the learning needs of professional groups (bearing in mind the *Minimum Health Care Package*). Throughout we emphasize the importance of the individual through personal assessment of strengths, interests, weaknesses and ambitions of individual medical and clinical officers, leading to personal CME plans. There is evidence, at this early stage, that the approach is working but we need to be patient and prepared to modify methods depending on outcomes.

An increasingly important part of CME is the *Uganda CME Newsletter*. This is produced monthly by the National Advisor/Co-ordinator (the author) and distributed to all (about 100) hospitals and many other health units and individuals. The *Newsletter* has 15–20 pages and includes general articles, case reports and 'Letters to the editor'. In addition there are sections such as 'Questions from Up-country', which provides the opportunity to answer queries directly from rural doctors, and 'Multiple Choice Questions' with a prize offered. A popular section includes abstracts that are adapted into an easily readable format that highlights the essential points and excludes confusing statistics and ambiguities.

The contents of the *Newsletter* are increasingly written by rural medical officers themselves. With editing (and joint learning!) most case reports and articles submitted by medical officers are published in the *Newsletter* under the name of the originating professional. We all like to see our name in print and Ugandan professionals are no different. This approach has already led to the publication of two articles from rural doctors in an international journal. The effect on morale is clear to see.

Production and distribution of the *Newsletter* is not expensive—the total cost is well under £200 (approximately US$300) each month. A number of organizations assist with distribution, including the MoH, Mission Aviation Fellowship, the Protestant and Catholic Medical Bureaux and Médecins sans Frontières.

Many hospitals do not have reliable telephone communications or electricity; even if they had a computer (and most do not), access to the Internet is impractical. Nevertheless some hospitals are acquiring these facilities and such hospitals could act as 'staging posts' for receiving literature for distribution within their regions. At the moment the *Uganda CME Newsletter* system is effectively a 'staging post', and this we would like to strengthen.

Nurses are increasingly becoming involved in CME activities. At the end of March 1999, 20 hospitals included nurses in their regular CME joint activities and by the end of June 1999 this figure had risen to 35. A newsletter is now being developed for the nursing profession. This is proving rather more difficult, there being a great need for appropriate health learning materials for nurses.

The medical officers of rural hospitals are often isolated geographically, socially, professionally and educationally. This, with other factors (e.g. workload and low salaries), leads to a feeling of being forgotten, poor morale and 'what's the point of CME?'. This can be reversed. Visits to hospitals are always welcomed. The author has, during the last year, visited about half of the hospitals in Uganda—a few on several occasions. This enables personal contacts when individual CME plans are made as well as attendance on routine ward rounds. The daily work within the hospital is not significantly interrupted and CME continues 'on the job'. Within a week or so of a visit each medical or clinical officer is sent a letter

confirming their personal plans or just offering encouragement. Clearly it is not possible to visit all hospitals and for those not visited emphasis is placed on communication by post, which works adequately.

We are still in a steep learning stage of designing CME and identifying means of delivery in the African context, but Uganda has progressed far. The system is in place but it will need to be strengthened, preferably and predominantly with Ugandan input before it can be said to be comprehensive and sustainable. It is crucial that methods used are appropriate to the health needs of the population, the learning needs of the individual professional, and the material circumstances of the health units.

David A. Tibbutt, DM, FRCP is National Advisor/Co-ordinator for Continuing Medical Education in Uganda. E-mail: cme@infocom.co.ug

**The Tropical Health and Education Trust is a UK-based organization involved in assistance to health education and training and the provision of basic resources in support of education.*

Address: Professor Eldryd Parry, Euston House, 24, Eversholt Street, London NW1 1AD, UK. E-mail: vpthet1@aol.com

New slide/text teaching set 'Leprosy and the eye' from International Centre for Eye Health, London UK

This superb set of colour transparencies (slides) with written text is one of the latest in a series produced by the *International Centre for Eye Health* (Department of Preventive Ophthalmology), Institute of Ophthalmology, University College London, 11–43 Bath Street, London EC1V 9EL, United Kingdom. Tel: +44171 608 6910. Fax: +44171 250 3207. The contents list of this set is as follows:

1. **Introduction**: Transmission of leprosy (slide 1)
2. **Leprosy around the world** (slide 2)
3. **Clinical presentations**: (slide 3)
   (1) Paucibacillary leprosy and multibacillary leprosy (slide 4)
4. **Skin smear in diagnosis** (slide 5)
5. **Multidrug therapy** (slide 6)
6. **Leprosy**:
   (1) Reactions (type 1 and type 2) (slide 7)
   (2) Massive infiltration with *M.leprae* and secondary atrophy (slide 7)
7. **Treatment of leprosy**:
   (1) Reactions (slide 8)
   (2) Massive infiltration with *M.leprae* (slide 8)
8. **Eye complications**: (slide 9)
   (1) Lagophthalmos (slide 10)
   (2) Treatment of lagophthalmos (slide 11)
   (3) Lateral tarsorrhaphy for lagophthalmos (slide 12)
   (4) Exposure keratitis (slide 13)
   (5) Corneal hypoaesthesia (slide 14)
   (6) Type 2 reaction: acute iritis (slide 15)
   (7) Type 2 reaction: acute episcleritis and scleritis (slide 16)
   (8) Massive bacillary infiltration: peri-orbital (slide 17)
   (9) Massive bacillary infiltration: ocular infiltration (slide 18)
   (10) Massive bacillary infiltration: ocular atrophic changes (slide 19)
9. **Leprosy and cataract** (slide 20)
10. **Examination of the eyes in leprosy**: (slide 21)
    (1) Visual disability grading (slide 22)
11. **Patients most at risk of severe eye complications & blindness** (slide 23)
12. **Prevention of blindness due to leprosy** (slide 24)

This is number 9 in the series. The other subjects available are Examination of the eyes; the eye in primary health care; Cataract; Prevention of childhood blindness; The glaucomas; Onchocerciasis; Trachoma.

In marked contrast to the experience of some other agencies handling slide/text teaching sets, Sue Stevens, the Ophthalmic Resource Coordinator, has informed us that they continue to receive huge orders for existing subjects, suggesting that the cost and availability of working projectors is not a crucial issue.

Further information on costs, packaging, etc. from Sue Stevens at the above address.

Health Information Forum, UK

The Health Information Forum (HIF) is a cooperative programme for organizations and individuals, North and South, with an interest in improving access to reliable information for healthcare workers in developing and transitional countries.

As a focus for the exchange of ideas, experience, information, and contacts, HIF aims to avoid duplication of effort or 'reinventing the wheel', as well as prevent avoidable mistakes. It generates debate and facilitates partnerships, leading to the development of new approaches, whether printed and/or electronic, to meet the needs of different target audiences.

HIF aims to improve the knowledge and understanding of participants as to the needs of health information users and the most cost-effective ways of meeting those needs.

As a collective body of leading organizations in the field, HIF acts as an advisory body to policy makers, publishers and other interested parties with regard to health information. It also gives a voice to frontline healthcare workers and information workers in developing countries, helping to identify priorities and shape policy.

The Health Information Forum was launched in March 1998 in response to increasing demands for a neutral focal point for sharing of ideas and information among individuals and organizations working to improve access to health information.

HIF is run as part of the INASP-Health programme, which also provides an advisory and referral service for health information workers and publishes the INASP-Health Director—a reference and networking tool for organizations working to increase the availability of appropriate, reliable, low-cost information in developing countries in transition. INASP-Health is a programme within INASP (International Network for the Availability of Scientific Publications), itself a non-governmental organization under the aegis of the International Council for Science (ICSU).

Participation in HIF is free of charge and open to all, North and South, whether through physical attendance at meetings and/or by email exchange. There is no formal membership structure; all those with an interest are welcome to come and go as they please. The Forum is non-duplicatory and non-competitive—it does not seek to act as a 'health information provider' in itself. Rather, as a complement to the INASP-Health programme, it aims to provide a range of services for the 'health information community' at large through promotion of cooperation, analysis, and advocacy.

Further information: Neil Pakenham-Walsh, Programme Manager, INASP-Health, International Network for the Availability of Scientific Publications, 27 Park End Street, Oxford OX1 1HU, UK

Tel: +44 1865 249909; Fax: +44 1865 251060; Email (Programme Manager): 101374.3615@compuserve.com; Email (INASP): inasp@gn.apc.org; Web site: www.oneworld.org/inasp

Schieffelin Leprosy Research and Training Centre: Karigiri Vellore District 632 106, Tamil Nadu, India

Courses: English fluency essential. Recognized by WHO and Indian Government (all paramedical & technical courses are fully recognized by the Indian Government).

Facilities: Hostel: 60 men, 16 women & guest house: single & double room.

Rates: Hostel: Accommodation: Rs. 250/- per month (for more than 3 months) (sharing) Rs. 350/- per month (for less than 3 months) Rs. 20/- per day with other amenities—short stay <1 month.

Hostel food approximately per month = Rs. 1000/-

Guest House:

Single room = Rs. 100/- per day

Double room = Rs. 120/- per day

A/c single room = Rs. 250/- per day

A/c double room = Rs. 300/- per day

Food: Indian: vegetarian = Rs. 55/- per day & non-vegetarian = Rs. 140/- per day. Western = Rs. 220/- or US$5.

How to reach Karigiri: Madras is connected to all the major cities of India by air. From Madras Airport the fare for taxi is approximately Rs. 1000/-. Route = Ranipet–Tiruvalam–Sevoor–Karigiri Hospital. There are also many buses which operate between 05.00 h from Madras to Velore. From Vellore, take any taxi or auto, which costs Rs. 150 and Rs. 100, respectively, or else you can take a prepaid taxi or electric train to the City Railway station (Central Station), about 20 kms away from Airport. From there take any train to Katpadi Railway station (13 km away from Karigiri). From Katpadi

Course schedule for the year 2000

	Course	Qualifications	Duration	Commencing date	Fees India	Fees SAARC	Fees Others
I	*COURSES MORE THAN 1 YEAR DURATION*				*Rs.*	*US$*	*US$*
	General						
1)	Community based rehabilitation managers	Graduates, with experience Preferred	12 months	July 01–June 30	12,000	700	800
2)	Laboratory technicians	+2 passed. Science graduates preferred	12 months	July 01–June 30	10,000	675	750
3)	Diploma in prosthetic & orthotic engineering	+2 passed. Graduates preferred (with science subjects)	30 months	July 01–June 30	15,000	750	1500
4)	Medical records technologist	+2 passed	15 months	July 01–Sep 30	5000	250	600
	Related to leprosy						
1)	Physiotherapy technicians	+2 or PUC, passed (with science subjects)	9 months	July 01–Mar 31	5000	250	700
II	*COURSES LESS THAN 1 YEAR DURATION*						
	General						
1)	Course on medical education	(for 4 modules)	8 weeks	Oct 10 Nov 30	*25,000	1000	1500
		(for 1 module)			*7000	300	400
				(*includes board and lodging)			
2)	Health education		8 weeks	April 01 May 31	5000	200	400
3)	Dermatology for primary health care staff and general practitioners		2 weeks	Jan 24			
	Related to leprosy						
1)	Medical officers	Medical personnel engaged in leprosy work	6 weeks	Jan 24–Mar 04 July 17–Aug 26	2500	170	750
2)	Non-medical supervisors	Qualified paramedical workers with a minimum of 5 years experience in the field	2 months	April 01–May 31	2500	150	300

Course schedule for the year 2000 (continued)

Course	Qualifications	Duration	Commencing date	Fees India	Fees SAARC	Fees Others
3) Smear technicians	+2 passed (with science subjects)	3 months	Feb 01–April 30 Sep 06–Dec 04	1500	100	350
4) Paramedical workers	+2 passed. Graduates preferred	4 months	July 01–Oct 31	2500	150	450
5) Shoe makers	V standard with knowledge of English preferred	6 months	Jan 01–Jun 30 July 01–Dec 31	800	55	200
6) Ophthalmic aspects in leprosy	Medical personnel	1 week	Mar 06–Mar 11 Aug 28–Sep 02	1000	70	200
7) Eye care in leprosy	Non-medical personnel	1 week	Sep 04–Sep 09	1000	70	200
III COURSES AFFILIATED TO OTHER COLLEGES						
1) Basics of physiotherapy in leprosy	Undergraduates in BPT	1 week	By arrangement	1000	35	
2) Basics of occupational therapy in leprosy	Undergraduates in occupational therapy	1 week	By arrangement	1000	35	
3) Nursing				50/day		
4) Internship for physiotherapists and occupational therapists	Undergraduates in PT and OT	–	By arrangement			
IV IN-SERVICE TRAINING						
1) In-service training in medicine, surgery, surgical rehabilitation, pathology, laboratory technology, ophthalmology & epidemiology and leprosy control	For qualified medical personnel/health professionals		By arrangement	250 (per week)	20	40
			1 time payment for other amenities	100	7	70
2) Medical record keepers	+2 passed with proficiency in typing and good English	2 months	By arrangement	2000	100	
3) Refresher course in skin smears	Trained laboratory technicians	2 weeks		1000	70	200

to Karigiri an auto will cost Rs 80/-. If you want to be met at Katpadi or at Madras Airport, please let us know well in advance.

Contact mailing address: The Training Director, Training Department, Schieffelin Leprosy Research & Training Centre, Karigiri 632 106, Vellore District, Tamil Nadu, South India
Tel.: +91/41674227, +91/41674229, +91/41674221 (Director) +91/41674215 (Training Director)
Fax: +91/41632103, +91/41671274
E-mail: slrtckrg@md3.vsnl.net.in

International course on Management of Rehabilitation and Prevention of Impairment and Disability (RPOID) Management module

For 5 years now, a much needed and very successful international course on Rehabilitation and

Prevention of Impairments and Disabilities (RPOID) has been conducted in Pokhara, Nepal. The international faculty are very experienced in clinical leprosy and the rehabilitation of persons affected by leprosy.

RPOID MANAGEMENT COURSE

The next RPOID Management course will aim at teaching concepts in rehabilitation and POID, approaches to rehabilitation, rehabilitation and POID management, including monitoring and evaluation of activities in these areas. The course will be based on the concepts and terminology used in the International Classification of Impairments, Activities and Participation (ICIDH-2) published by the WHO.

For a limited number of participants, an opportunity will be offered for additional in-service training during the week(s) following the management course. The participants will be assigned on a one-to-one basis to a tutor who will guide them through a self-learning programme.

Available topics include institutional rehabilitation, CBR, expanding the services of a leprosy hospital to serve people with other rehabilitation needs, agricultural rehabilitation, statistics and information systems, footwear, prosthesis and orthoses, physiotherapy and occupational therapy. These placements will be available strictly by arrangement prior to the course only.

Dates: January 22 to February 2, 2001 (2 weeks) [+optional week(s) if pre-arranged].

Target group: Managers of rehabilitation and/or POID programmes, senior hospital staff, senior leprosy control staff and doctors and therapists with managerial responsibilities for RPOID activities.

Venue: The Green Pastures Training Centre in Pokhara, Nepal.

Course fees (including board & lodging): $175 per week.

RPOID SKILLS COURSE

The RPOID Skills course aims at RPOID-related assessments, such as nerve function assessment, psychosocial assessment, ADL assessment, impairment assessment and socio-economic assessment, treatment and rehabilitation interventions. This course will therefore concentrate on skills acquisition. Through optional workshops the second course will offer the opportunity to study certain topics in more depth. The course will include a 1-week field trip to practice the learned skills in a real programme setting.

Dates: 1–26 May 2000 (4 weeks).

Target group: Physiotherapists, occupational therapists, social workers and field staff with responsibility for the assessment, treatment and/or rehabilitation of people needing RPOID interventions.

Teaching/learning methods: Lectures, group discussion, group assignments, individual assignments, practical work in small groups, problem-based learning, self study, presentations, and simulation exercises. The teaching medium is English. Because of the complicated nature of the subject, fluency in both spoken and written English is required. Experience in leprosy work will be an advantage, but is not essential.

Venue: The Green Pastures Training Centre in Pokhara, Nepal.

Course fees (including board & lodging): $175 per week.

Detailed information on both courses can be obtained from: The Training Officer, GPTC, PO Box 28, Pokhara 33701 Nepal. Tel: +977 61 24562; Fax: +977 61 20430; e-mail: gptc@inf.org.np.

Lepr Rev (2000) **71,** 98–120

News and Notes

Third International Conference on the Elimination of Leprosy

The 3rd International Conference on Elimination of Leprosy was held in Abidjan, the capital of Cote d'Ivoire between 15th and 17th November 1999. It was co-sponsored by WHO, the Sasakawa Memorial Health Foundation, Novartis and Association Francaise Raoul Follereau (AFRF). It was attended by National Leprosy Programme Managers and high officials from the ministries of health of 30 countries, including the 12 most leprosy endemic ones and representatives of several non-governmental organizations and United Nations agencies.

The conference which was opened by the Honourable Prime Minister of Code d'Ivoire had the following objectives:

1. To strengthen political commitment in the most endemic countries, as well as the commitment of concerned partners and agencies.
2. Analyse the situation and identify the most important problems ignored to find rapid solutions.
3. Promote the integration of leprosy elimination activities into general health services, and in particular, strengthen the capacity of general health workers in order to support this integration.
4. Identify strategies to strengthen and organize social mobilization and community participation in leprosy elimination activities.
5. Develop a plan of action and an appropriate strategy to overcome the remaining problems in reaching leprosy elimination in the most endemic countries.

At the beginning of the conference, WHO (through a message from the Director General) announced the creation of a Global Alliance to eliminate leprosy as a public health problem from every country by the end of 2005.

The alliance, to be chaired by the government of India in its first year (2000, has its core members: WHO, the governments of leprosy endemic countries, the Nippon Foundation, the International Federation of Anti-Leprosy Associations (ILEP) and Novartis. Other organizations and agencies which announced their preparedness to work closely with the Alliance included: Danish International Development Agency (DANIDA), the World Bank, UNHCR, the International Federation of Red Cross and Red Crescent Societies (IFRC), the International Association for Integration, Dignity and Economic Advancement (IDEA), the International Foundation for Dermatology (IFD), the International Leprosy Association (ILA), the International Leprosy Union (ILU) and the World Organization of the Scout Movement (WOSM).

The benefits for leprosy elimination, of working in partnerships was highlighted by all five working groups which discussed:

1. What remains to be done and by whom?
2. Integration.
3. Improving accessibility to MDT services and capacity building.
4. Monitoring and evaluation.
5. Alliances and partnerships.

Other key areas emphasized by the working groups included:

1. Strengthening of political commitment.
2. The importance of re-visiting the epidemiological indicators used for assessing the leprosy situation.
3. The important role played by local communities and their leaders and the persons affected by leprosy.
4. Building the capacity of general health staff to own and provide MDT services.
5. The need to keep a clear vision of the leprosy situation at global, national and sub-national levels after the year 2005; some countries will not have achieved elimination of leprosy by the end of the year 2000.

The new target is to achieve a reduction of registered prevalence rate to less than 1 per 10,000 population for all countries by 2005.

A commitment was made by Novartis (a Pharmaceutical Firm) to provide WHO with the MDT drugs worth approximately 30 million US$ for the treatment of all leprosy patients in the world during the next 6 years. The Nippon Foundation and the Sasakawa Memorial Health Foundation pledged US$ 24 million to assist in the implementation of the Global Alliances's strategy. The ILEP partners will contribute US$ 19.5 million out of their 2000 budget towards the Global Alliance in addition to their other commitments to leprosy control especially in the area of social and economic rehabilitation of persons living with disabilities due to leprosy.

The discussions did underline the fact that the provision of drugs alone would not settle the various important aspects of essential care for leprosy patients and persons living with disabilities due to leprosy.

After the conference, all countries (particularly the 12 countries which have not reached elimination) are expected to carry out a critical re-examination of their leprosy situation in order to identify key areas in which strategies should be focused and to design ways of sustaining the successes so far achieved. The strategies will vary from country to country depending on the magnitude of the leprosy problem and other epidemiological and operational factors.

Dr. H. Joseph Kawung

21st Biennial Conference of Indian Association of Leprologists (IAL) held at Chandigarh, India

The 21st Biennial Conference of the IAL, was held at the Postgraduate Institute of Medical Education and Research during 17–19 September 1999 under the warm hospitality of Professor Bhushan Kumar, Department of Dermatology, STD and Leprology. More than 300 delegates, both from India and abroad, participated in the 3-day scientific conference.

On the morning of 17 September there was a symposium on the Continuing Priorities in Leprosy. The session started with a discussion on neuritis. The aim of taking this subject was to standardize five important aspects of neuritis. As a teamwork exercise, a group of experts under the chairmanship of N. B. B. Reddy framed the definitions related to neuritis; the CLT&RI, under the guidance of P. K. Oommen, identified the minimum information on structure and function of nerve; the Central Jalma Institute for leprosy worked on the examination protocol, with B. K. Girdhar in the chair; Bombay Leprosy Project under the guidance of R. Ganapati prepared the recording and reporting system and R. S. Misra and his team finalized the management strategy. The proposed recommendations were briefly presented in the conference under the chairmanship of G. Ramu and suggestions from the delegates were incorporated. This was followed by a presentation by Diana Lockwood, the lead speaker on the subject. In her presentation she emphasized the need for a robust testing method for detecting nerve involvement early, understand the pathogenesis with reference to molecular/immunological mechanisms, and role of steroids and newer immunomodulating agents in management of neuritis. K. V. Desikan spoke on post-MDT monitoring and evaluation and emphasized the need for an inbuilt system for surveillance to detect relapse. He also briefly dealt with the importance of justifying the utility,

safety, cost-effectiveness and advantages of FDT. Ebenezer Daniel stressed the need for incorporating comprehensive eye care in the programme. Ben Naafs's talk dealt with all components of reaction in breif, with paramount reference to neuritis. Indira Nath's presentation emphasized the strong probability of dysregulation of IL-4 as a major factor in bringing the clinical changes in reactions. A. N. Chakravarti's presentation emphasized the homology of animal, human and soil-derived CAN bacteria, whose genetic heterogeneity may help in evaluating the time and place of origin of the disease.

The post-lunch session had the CME under the banner 'Newer Frontiers' in which N. S. Dharmashanktu highlighted the achievements of NLEP in India and opined that probably the programme is at its peak and ripe for integration. A. M. Dhople spoke on leprosy research beyond the year 2000 AD, while K. Prabhakaran dealt with treatment of patients relapsing after MDT. G. P. Talwar stressed the role of combined chemotherapy and immunotherapy in leprosy elimination. Yasin Quabati from Yemen projected his country's and global achievements through MDT. M. D. Gupte presented data on the comparative vaccine trial and highlighted the role of vaccines in the control of leprosy. S. K. Satpathy and B. L. Sharma presented innovative approaches of involving the community in the leprosy control programme undertaken by the DANLEP.

The conference was inaugurated by Professor N. K. Ganguly, Director-General, Indian Council of Medical Research. In the inaugural session, two small books on leprosy were released and A. R. K. Pillai, Director, Indian Leprosy Foundation was congratulated. After the inauguration, the keynote address 'A World Without Leprosy—what it should mean' was delivered by Yo Yuasa, President ILA, and S. K. Noordeen chaired the session.

The conference received a total of 147 abstracts, of which 59 were selected for free papers and the remaining 88 were posters. The sessions for free papers were on clinical leprosy, therapy of leprosy, immunology, experimental leprosy, microbiology and pathology, and social aspects of epidemiology. These sessions were chaired by V. B. Jadhav, V. K. Sharma, S. G. Dastidar, V. P. Shetty, K. V. Desikan, Mathura Prasad, C. S. Walter, V. V. Dongre and Adarsh Chopra. There were also a couple of awards. The Acworth Research Society Award for the best paper went to Arup De Sarkar of Chandigarh. The award for the best publication went to Gigi Ebenezer, Karigiri. Vishwanath Prasad, Kiran Katoch and P. B. Ranganatha Rao, respectively, received the first, second and third prizes for posters.

The valedictory session was presented by C. S. Walter, Director of the Leprosy Mission, South-East Asia. In this brief parting session, the IAL congratulated the Leprosy Mission on its completion of 125 years of dedicated service. In addition, the chairman thanked the organizing committee on behalf of the delegates and the organizing secretary thanked his team. Judged in terms of scientific content, floor management and the hospitality for the delegates, it was a superbly organized meeting. Professor Bhushan Kumar and the team he led deserve high commendation.

'The Past & Present of Leprosy': International Congresses on the Evolution and Paleoepidemiology of Infectious Diseases, Bradford University UK, July 1999

Following the first and second Congresses on syphilis and tuberculosis, respectively, held in France and Hungary, the third, on the 'Past and Present of Leprosy' was held in the University of Bradford in July 1999. The subjects covered were as follows: Vilhem Møller-Christensen, his work and legacy; microscopic study and X-ray analysis of two fifth-century cases of leprosy: paleoepidemiologic inferences; a possible leprosy hospital in Stubbekobing, Denmark; mycobacterial disease in North America; epidemiological evidence for cross immunity; differential diagnosis at a leprosy referral clinic in Nepal; leprosy in the former Russian Empire: historical evidence of dissemination of the disease; comparative pathology of mycobacterial infections in living lower vertebrates; rhinomaxillary syndrome in the absence of leprosy: an exercise in differential diagnosis; was there mediaeval diagnostic confusion between leprosy and syphilis?—an examination of the skeletal evidence; the stigma of leprosy; the history and paleoepidemiology of leprosy in the territory of the Czech Republic; PCR primers that can detect low levels of *Mycobacterium* DNA; exploitation of cell wall lipids for the

diagnosis of ancient mycobacterial disease; molecular evidence of *Mycobacterium leprae* in skeletal remains from an historic ossuary in South Germany; the immunological basis of bone change in mycobacterial disease: a viewpoint for oseologists; acral bone resorption in multibacillary patients: clinical and retrospective study; persistence of leprosy neuropathy after treatment; acro-osteolysis previous to diagnosis of leprosy; leprosy epidemiology in Vietnam; the last leprosy communities . . . and the people wo call them home; historic patterns in the spread of leprosy; evidence for infant and childhood leprosy: past and present; infective bone changes in leprosy; leprosy worldwide, 1999; sociological reaction in the past and present in leprosy: socio-economic rehabilitation of leprosy cured persons (LCPs); reliable lipid biomarkers for the comparative diagnosis of ancient leprosy and tuberculosis; the myth of the spread of leprosy with the crusaders; a population analysis of mycobacterial diseases in Kellisz, Dakhleh, Egypt; lepromatous leprosy in a Romano–Byzantine sample from the Dakhleh, Egypt; a case of late mediaeval leprosy from Ireland; the past can influence the present in the management of leprosy; observations on the pathogenesis of skeletal disease in leprosy; medical historical and skeletal evidence of leprosy in Hungary and interpretations of paleopathological data; the antiquity of leprosy in Britain: the skeletal evidence; can leprosy produce characteristic changes at the micro-level?—results of light microscopic research on tibiae from Chichester Leprosy Hospital cemetery, UK; evidence for pre-European leprosy among ancient Marquesan islanders, Marquesas Archipelago; the ILA (International Leprosy Association) global project on the history of leprosy; *Mycobacterium leprae* DNA in archaeologicasl specimens; the study of ancient DNA answers a paleopathological question; leprosy: a correctable model of immunological perturbation; hepatitis B and C infection among leprosy patients attending the sanatorium of Fontilles (Spain); the history of leprosy in the Pacific; epidemiology and treatment; Immunological aspects of leprosy; history of Leprosy in Finland; detection of *Mycobacterium leprae* in paraffin sections of a museum-preserved leprosy sample by the polymerase chain reaction; new evidence for the history of leprosy in the ancient Near East: an overview.

Further information: Dr Keith Manchester, The Calvin Wells Laboratory, Department of Archaeological Sciences, University of Bradford, Bradford, BD7 1DP, UK.

New global 'Health for All' targets.

The following is extracted from the *British Medical Journal*, volume 319, 11 September 1999, pages 700–703:

Global health targets

Health outcome

1 *Health equity: childhood stunting*: By 2005, health equity indices will be used within and between countries as a basis for promoting and monitoring equity in health. Initially, equity will be assessed on the basis of a measure of child growth.
2 *Survival: maternal mortality rates, child mortality rates, life expectancy*: By 2020, the targets agreed at world conferences for maternal mortality rates (<100/100,000 live births), under 5 years or child mortality rates (<45/1000 live births), and life expectancy (>70 years) will be met.
3 *Reverse global trends of five major pandemics*: By 2020, the worldwide burden of disease will be reduced substantially. This will be achieved by implementing sound disease control programmes aimed at reversing the current trends of increasing incidence and disability caused by tuberculosis, HIV/AIDS, malaria, diseases related to tobacco, and violence or trauma.
4 *Eradicate and eliminate certain diseases*: Measles will be eradicated by 2020. Lymphatic filariasis will be eliminated by the year 2020. The transmission of Chagas' disease will be interrupted by 2010. Leprosy will be eliminated by 2010, and trachoma will be eliminated by 2020. In addition, vitamin A and iodine deficiencies will be eliminated before 2020.

Determinants of health

5 *Improve access to water, sanitation, food, and shelter*: By 2020, all countries, through intersectoral action, will have made major progress in making available safe drinking water, adequate sanitation, and food and shelter in sufficient quantity and quality, and in managing risks to health from major environmental determinants, including chemical, biological, and physical agents.

6 *Measures to promote help*: By 2020, all countries will have introduced, and be actively managing and monitoring, strategies that strengthen health enhancing lifestyles and weaken health damaging ones through a combination of regulatory, economic, educational, organizational, and community based programmes.

Health policies and sustainable health systems

7 *Develop, implement, and monitor national Health for All policies*: By 2005, all member states will have operational mechanisms for developing, implementing, and monitoring policies that are consistent with this Health for All policy.

8 *Improve access to comprehensive essential health care*: By 2010, all people will have access throughout their lives to comprehensive, essential, quality health care, supported by essential public health functions.

9 *Implement global and national health information and surveillance systems*: By 2010, appropriate global and national health information, surveillance, and alert systems will be established.

10 *Support research for health*: By 2010, research policies and institutional mechanisms will be operational at global, regional, and country levels.

Summary points

- The renewal of the Health for All strategy represents a further call for social justice
- Ten new global health targets reflect most health problems in the world
- Although the four targets for health outcome are the most concrete and measurable ones, they will be hard to achieve
- The remaining six targets, dealing with the determinants of health and health policies, need further elaboration
- Global targets are of questionable use to individual member states

'TB ALERT': a response to the growing TB epidemic

TB ALERT is a UK-based charity, first registered in October 1998, and with the main aim of bringing practical help and cure to the world's TB 'hotspots' and to raise awareness both overseas and in Britain about the growing, and increasingly serious, epidemic. The Honorary President is Sir John Crofton, Emeritus Professor of Respiratory Diseases and Tuberculosis, University of Edinburgh, Scotland and the Trustees include representatives and Advisory Board include professionals from medicine, science, the media, medical schools and the law.

Further information: TB Alert, 22 Tiverton Road, London NW10 3HL, United Kingdom. Tel.: +44 181 969 4830; Fax: +44 181 960 0069; e-mail: tbalert@somhealy.demon.co.uk.

'Cytotoxic T-lymphocytes against malaria and tuberculosis: from natural immunity to vaccine design'

This is the title of a publication in *Clinical Science* (1998), 531–538 by Ajit Lalvani and Adrian V. S. Hill of the Nuffield Department of Clinical Medicine, Institute of Molecular Medicine, University of Oxford, John Radcliffe Hospital OX3 9DU, United Kingdom. The Abstract reads as follows:

1. *Mycobacterium tuberculosis* and the liver stage of *Plasmodium falciparum* are intracellular pathogens which are potentially susceptible to cytotoxic T-lymphocytes, a crucial component of the protective immune response to viral infections. Evidence from animal models points to a protective role for cytotoxic T-lymphocytes against *M. tuberculosis* and *P. falciparum*, but cytotoxic T-lymphocytes specific for these pathogens have been difficult to identify in man.
2. Using a reverse immunogenetic approach, candidate epitopes from selected antigens of *P. falciparum* and *M. tuberculosis* were used to detect peptide-specific cytotoxic T-lymphocyte responses in individuals exposed to these pathogens. Cytotoxic T-lymphocyte activity was detected by the ^{51}Cr release cytotoxicity assay and a sensitive ELISPOT assay for single-cell interferon-γ release.
3. In naturally exposed, partially immune Africans in The Gambia, eight largely conserved cytotoxic T-lymphocyte epitopes in *P. falciparum*, restricted by several different HLA class I alleles, were identified. Several epitopes were also recognized in Tanzanians and cytotoxic T-lymphocytes recognised endogenously processed antigen.
4. In tuberculosis patients with HLA-B52, a CD8+ cytotoxic T-lymphocyte epitope was identified in ESAT-6, a secreted antigen specific for *M. tuberculosis* complex but absent in BCG. Cytotoxic T-lymphocytes exhibited HLA-B52-restricted peptide-specific interferon-γ release and lytic activity and recognized endogenously processed antigen.
5. These studies demonstrate that CD8+ cytotoxic T-lymphocytes specific for mycobacterial and protozoal antigens are induced during natural infections in humans. The identification of these T-cells endorses current strategies to develop cytotoxic T-lymphocyte-inducing vaccines against *P. falciparum* and *M. tuberculosis* and highlights candidate antigens for inclusion in subunit vaccines.

Tuberculosis. An interdisciplinary perspective

(edited by John D. H. Porter (London School of Hygiene & Tropical Medicine) and John M. Grange (Imperial College)

The fact that the World Health Organization has declared tuberculosis a 'global emergency' indicates the serious inadequacy of the ways in which the control methods at our disposal are used. Several books on tuberculosis have been published in recent years, but none have taken a deep and detailed look at the 'holistic' aspects of global tuberculosis control, even though international agencies are increasingly aware of the importance of the numerous factors other than the design and efficacy of therapeutic drug regimens. This unique book fills that gap. Although it deals specifically with tuberculosis, the principles outlined and discussed are relevant to many other areas of global medicine, including the ever-growing problem of HIV/AIDS.

The book is aimed principally at those involved in the design, establishment and management of disease control programmes at international, national and local levels, and also at a more general readership of epidemiologists, public health officers, community psychologists, and others interested in understanding the human dimension of disease control.

Contents include: the global burden of tuberculosis; the politics of tuberculosis; public health and human rights; current control strategies; the economics of diagnosis and management; sociocultural dimensions; the impact of HIV; tuberculosis in ethnic minorities; gender issues; health sector reform; educational approaches to tuberculosis control.

Published by Imperial College Press and distributed by World Scientific Publishing Co.

Does tuberculosis accelerate the progression of HIV disease? Evidence from basic science and epidemiology

The following is extracted from an Editorial Review in *AIDS*, 1999, **13**: 1151–1158 by Julia Del Amo *et al.*

From the *Introduction*.

The association between HIV infection and tuberculosis is complex and bi-directional. The epidemiological effects of HIV infection on primary infection, re-infection, and reactivation disease with *Mycobacterium tuberculosis* have been well documented. However, the evidence concerning the effect of tuberculosis on the progression of HIV-associated immune deficiency and disease is less clear. Although there seems to be a consensus among basic scientists that tuberculosis enhances HIV replication, the significance of this laboratory observation for clinical medicine and public health is more open to debate. In this review current laboratory, epidemiological and clinical data concerning the effects of tuberculosis on HIV disease progression are examined, and conclusions are drawn about further research requirements and public health implications.

From *Implications and future research.*

A better understanding of the temporal sequence of laboratory and clinical events could be obtained from frequent measurements of plasma HIV-RNA, CD4 lymphocyte count, and markers of immune activation in HIV-infected persons with and without incident tuberculosis followed over time, ideally in seroconverter cohorts. A nested case–control study within such a cohort followed for some other purpose would offer the most efficient way of evaluating risk factors and outcomes related to incident tuberculosis. A further study design would have been the same regular measurement of these laboratory parameters, viral load, activation markers, and CD4 lymphocyte counts, in HIV-infected persons participating in a trial of preventative therapy for tuberculosis. Groups for comparison would be those with incident tuberculosis and those without, stratified according to treatment status. Because preventative therapy is known to be effective, such studies are unlikely to be repeated. A third approach would involve laboratory and clinical follow-up of HIV-infected persons successfully treated for tuberculosis, but at high risk of recurrence, with comparisons between persons suffering recurrences and those who do not. This would allow the distinction between relapse and re-infection, if strains of *M. tuberculosis* are stored and characterized by restriction fragment length polymorphism. In conclusion, despite the biological evidence of an adverse interaction, epidemiological evidence is less clear concerning the effect of tuberculosis on the progression of HIV disease. Although HIV-infected patients with tuberculosis have a high mortality rate, it is not certain that this results from the effect of tuberculosis itself on immune progression, and there is no evidence that progression of immune deficiency is influenced by tuberculosis prevention, nor that the immunological or virological effects associated with tuberculosis are specific to this infection. Nevertheless, the rates of co-infection with HIV and *M. tuberculosis* are highest in countries where antiretroviral drugs are largely unavailable, and few interventions would benefit the health of HIV-infected people internationally more than the effective control of tuberculosis, the commonest AIDS indicator disease world-wide.

Leishmania and HIV co-infection

A publication entitled *Leishmania and HIV in gridlock* from UNAIDS and the (previous) Division of Control of Tropical Diseases in the World Health Organisation (WHO/CTD/LEISH/98. Add 1 UNAIDS/98.23) describes the emerging co-infection between these two diseases. The following paragraphs emphasize some of the main current concerns:

The co-infection with *Leishmania* and HIV is emerging as a new and frightful disease and is becoming increasingly frequent. Cases have been reported in 25 countries and are currently considered an ominous threat in Spain, Italy, France, and Portugal. In these countries, up to 70% of adult cases of visceral leishmaniasis are associated with HIV infection and, up to 9% of people with AIDS suffer from newly acquired or reactivated visceral leishmaniasis. Cases have also been

reported in Algeria, Brazil, Cameroon, Costa Rica, Djibouti, Ethiopia, Greece, Guadaloupe, Guinea-Bissau, India, Kenya, Malawi, Mali, Malta, Morocco, Panama, Peru, Sudan, Sultanate of Oman, Tunisia, Ukraine and Venezuela.

The number of cases of co-infection with *Leishmania* and HIV is expected to rise in South Asia, sub-Saharan Africa, South America and Southern Europe, owing to the simultaneous spread of both diseases and their increasingly overlapping geographical distribution—an urbanization of visceral leishmaniasis and a ruralization of HIV/AIDS. The incidence of AIDS in Brazil, for example, has risen from 4.3 cases per 100,000 inhabitants in 1986, to 18.4 in 1997. India is particularly vulnerable, with one-half of the world's visceral leishmaniasis cases, and HIV/AIDS on a sharp increase. East Africa is also of great concern, with the continued spread of AIDS and sporadic epidemics of visceral leishmaniasis.

And again:

AIDS and visceral leishmaniasis are locked in a vicious circle of mutual reinforcement. Visceral leishmaniasis accelerates the onset of full blown AIDS, and shortens the life expectancy of HIV-infected people, while HIV spurs the spread of visceral leishmaniasis. The gridlock produces cumulative deficiency of the immune response, as *Leishmania* parasites and HIV destroy the same cells, exponentially increasing disease severity and consequences. A person with HIV infection whose immune system is suppressed and is bitten by a sandfly infected with *Leishmania*, will develop severe cutaneous leishmaniasis, or the visceral form. Visceral leishmaniasis, once developed in the HIV-infected person, impairs the patient's condition by further suppressing more of the same immune response cells. As a consequence of this severe immunosuppression, the subject quickly becomes an AIDS patient with associated diseases, otherwise known as opportunistic diseases such as tuberculosis, often found in co-infected patients.

Further information: WHO, 1211 Geneva 27, Switzerland.

Report calls for the elimination of tuberculosis in the USA by the year 2000

From the *British Medical Journal*, volume 319, August 1999, page 535:

Ten years after issuing its 'Strategic plan for the elimination of tuberculosis in the United States', the Advisory Council for the Elimination of Tuberculosis has revisited the topic with a new report calling for 'new and improved diagnostic, treatment and prevention methods, including a new vaccine'.

The new report, *Tuberculosis Elimination Revisited: Obstacles, Opportunities, and a Renewed Commitment*, is upbeat in tone, coming on the heels of seven years of declining numbers of tuberculosis cases. As the report catalogues, the number of cases reported annually in the United States dropped from 84,304 in 1953 to 22,201 in 1985 but then climbed to 26,673 in 1992. In 1998, the number fell to a record low of 18,361 (6.8 per 100,000).

This recent progress, the current report suggests, came from a 15-fold increase in spending—from $5m (£3m) to £75m—on tuberculosis research after the release of the 1989 report. The new report says that the United States should set a goal of 3.5 cases per 100,000 by the year 2000 and an 'elimination' rate of less than one case per million by 2010.

Van Gysel Foundation for biomedical research

The van Gysel Foundation for biomedical research, a public utility establishment, was founded in Belgium in 1989 on the initiative of the industrialist Baron Jean-Paul van Gysel de Meise, for the purpose of promoting the development of higher teaching and research in the biomedical field.

The Foundation triannually awards the van Gysel Prize for Biomedical Research to teams of

researchers that have made an important contribution to the biomedical sciences. When instituting the Prize, Baron van Gysel de Meise wanted to protect the intellectual heritage of the European Economic Union by restricting its award to researchers from the current European Union.

Since 1990, the Foundation has awarded a Prize of 2,000,000 BEF. The van Gysel Foundation for biomedical research has decided, from the year 2000, to increase the value of the Prize to 4,000,000 BEF (100,000 EUROS).

Further enquiries: The van Gysel Prize for Biomedical Research, Fonds National de la Recherche Scientifique, Rue d'Egmont 5, B-1000 Bruxelles, Belgium. Fax: +32 (0)2 504.92.92; e-mail: mjsimoen@fnrs.bn

WHO: diagnostic discovery operations, with emphasis on TB

The following is taken from *TDR News*, no. 60, October 1999, page 7:

> Diagnostics, a previously under-represented area at WHO, has become increasingly important for disease control, outbreak detection, and epidemiological surveys. It will now have a focus in TDR, where the portfolio of the Product Research and Development team, led by Dr Win Gutteridge, has been expanded to include a diagnostics component, complementing sister activities in drug and vaccine discovery. The diagnostics operation is managed by Dr Mark Perkins; it will focus initially on previously determined priority areas, but will grow with time to include new diseases as priorities are identified.
>
> The current centrepiece of diagnostic activity is an initiative in tuberculosis. New diagnostics are badly needed to improve detection of both smear-positive and smear-negative cases and to rapidly and inexpensively detect antibiotic resistance. Existing technologies are usually slow, insensitive, or laborious, and delays and errors in diagnosis significantly hamper disease control efforts. The WHO TB diagnostics initiative (TBDI) was launched to accelerate the exploitation of technical advances for the development of new products appropriate for use in low-income countries, TBDI has partnered with industry, academic researchers and public health workers to identify obstacles to the development of tests, to elaborate product performance guidelines and to frame TB diagnostic priorities.
>
> A major focus of TBDI has been the development of the WHO TB specimen bank, a collection of clinical reference materials from well-characterized patients, and the formation of a network of field sites for specimen collection and test evaluation. At present, four sites with experienced personnel in TB diagnosis, care and clinical trials, are enrolling TB patients and symptomatic controls, according to detailed standardized protocols, to collect clinical specimens for the bank. Already more than 6000 aliquots of serum, sputum and saliva (along with associated clinical information) have been collected, processed and cryopreserved. The specimen bank gives test developers access to high-quality pedigreed specimens, a service that will facilitate quality control and speed the development of tests appropriate for settings of endemic disease. A number of promising assays are under development, including simple multi-antigen serologic tests, phage-detection assays, antigen capture systems, and nucleic acid amplification or probe tests; WHO will use the specimen bank and the field site network to perform laboratory and clinical evaluation of the most promising of these in the near future.
>
> The need for improved diagnostic tools for malaria has also been identified as critical in some geographic regions. The new diagnostics programme is co-sponsoring, with Roll Back Malaria and the US Agency for International Development, an international consultation to define the role of rapid diagnostic tests for falciparum and vivax malaria in disease control. The current commercial availability in low-income countries of sensitive qualitative blood tests for plasmodial antigens increases the urgency of defining their most appropriate use.
>
> The TDR diagnostics operation also collaborates with the WHO Communicable Diseases cluster (CDS) on initiatives in other key areas, such as sexually transmitted infections.

Further enquiries: UNDP/World Bank/WHO Special Programme for Research & Training in Tropical Diseases (TDR), WHO, 1211 Geneva 27 Switzerland.

What is a quantum?

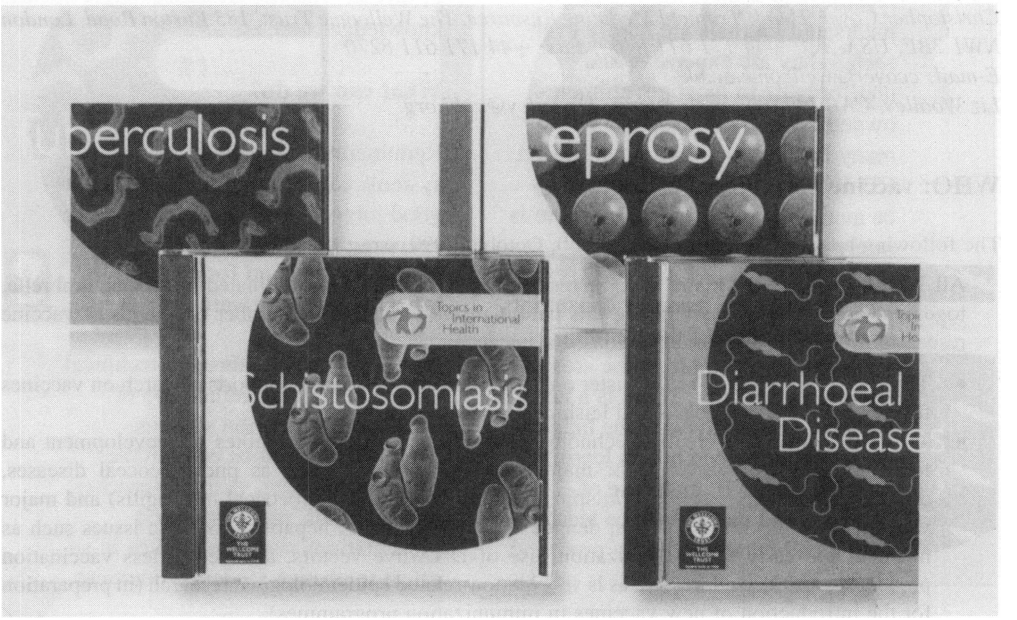
The words quantum and 'quantum leap' are being used quite frequently these days in medical and scientific publications. John Gribbin, in his intriguing *The little book of science* (Penguin Books Ltd, London, UK), comments as follows:

> 'One of the scientific terms that has entered popular language is the 'quantum leap'. Curiously, it has almost the opposite meaning in popular language to its scientific meaning. In science, the quantum's most important feature is that it is the smallest possible change that can be made to a system. The other crucial feature of a quantum leap is that if a system, such as an atom, has a choice of states to leap into, it makes its choice about which way to go entirely at random. So a quantum leap is the smallest change it is possible to make, and has been made entirely at random ...'

CD-ROMs: Topics in International Health

The following is taken from the latest issue of *INASP Newsletter*, no. 12, May 1999, pages 8–9.

> Many readers of the *INASP Newsletter* will already be aware of the *Topics in International Health (TIH)* series of CD-ROMs, which were published last year by the Wellcome Trust. The first four disks were launched at the Trust in April 1998 (malaria, STDs, trachoma and sickle cell disease) and were followed by four more titles in December. The series has proved to be a major success, reaching some 1500 users in 69 countries around the world in just nine months. The most recently published disks cover leprosy, tuberculosis, diarrhoeal diseases and schistosomiasis.
>
> The disks are aimed at healthcare professionals and students in both the developed and developing



world, but it is distribution into the poorer regions that is of most importance to the Wellcome Trust. In this way, we are able to provide accurate and accessible health information to support coordinated health improvement programmes.

The Wellcome Trust chose CAB International (CABI) to be their publishing partner and distributor for the *TIH* series. CABI is a not-for-profit intergovernmental organization which is owned and governed by its 40 member countries, the majority of which are in the developing world. It is both a scientific research organization and a scientific publisher and, like the Wellcome Trust, has a mission to spread scientific knowledge in developing countries. CABI has a special Information for Development (IFD) programme whose aim is to make health and agricultural information more readily accessible to users in the South, for example by obtaining sponsorship from a variety of donors to supply information resources, computer hardware, and training.

Since the launch of the *TIH* series, staff from CABI's IFD programme have been actively making contact with a broad range of donor and partner organizations worldwide, in order to expand the use of the disks in developing countries. Potential partners include NGOs, professional associations, universities and teaching hospitals, research institutes and government agencies. Potential sponsors are bilateral and multilateral donors, government departments, foundations and the private sector.

Recent success stories include the adoption of the trachoma disk as a programme resource by the International Trachoma Initiative, which is jointly funded by the Edna McConnell Clark Foundation and Pfizer Inc. In addition, a total of 125 copies of the leprosy and tuberculosis disks have been bought by Netherlands Leprosy Relief for distribution to their project managers in the field. An initial 50 CDs (malaria, sexually transmitted diseases, tuberculosis and diarrhoeal diseases) have been procured by the JHPIEGO Corporation, a non-profit training organization affiliated with Johns Hopkins University and funded by USAID. These are for use by their Learning Centres in Nepal, Bolivia, Indonesia and Haiti, along with JHPIEGO's own reproductive health training materials. The *Topics in International Health* series continues to be developed, with three more titles in preparation for publication in November 1999. These new disks will cover HIV/AIDS, nutrition and leishmaniasis.

The Wellcome Trust and CABI are keen to expand the sponsored distribution of the *TIH* series in developing countries and any readers with views or ideas on this subject are asked to contact the authors:

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WHO: vaccine research

The following appeared in *TDR news*, no. 60, October 1999, page 7:

All WHO-supported efforts in vaccine research will in future be coordinated under one umbrella, together with UNAIDS activities in this field. Currently there are a number of strands of vaccine research throughout both organizations, for instance:

- TDR (from within the WHO cluster on Communicable Diseases) supports research on vaccines for malaria, schistosomiasis and leishmaniasis.
- The WHO cluster on Health Technology and Pharmaceuticals promotes the development and field evaluation of vaccines for major bacterial diseases (such as pneumococcal diseases, diarrhoea caused by e.g. *Shigella* spp. and cholera, TB, meningococcal meningitis) and major viral diseases (such as rotavirus, dengue, measles, Japanese hepatitis). Generic issues such as mucosal and early life immunization, use of DNA/live vectors, and needle-less vaccination procedures, are also addressed, as is vaccination-related epidemiological research (in preparation for the introduction of new vaccines in immunization programmes).

- UNAIDS promotes the discovery, development and field evaluation of vaccines for HIV infection.

A unified inter-cluster vaccine research (IVR) initiative will allow more streamlined management of activities, avoiding duplication of effort, reducing the number of steering and advisory committees, and providing opportunities for joint projects which justify high priority and additional resources. The work will be managed functionally by the IVR Coordinator, a post jointly resourced by TDR and V&B (the WHO department of Vaccines and Other Biologicals). Vaccine research will be managed in three categories:

- Exploratory research, concerned with discovery of candidate vaccines for agreed priority diseases (including malaria and TB) and new vaccination approaches (e.g. mucosal immunization).
- Pre-regulatory research, concerned with preclinical and clinical studies of candidate vaccines to assess safety, immunogenicity and efficacy prior to regulatory approval.
- Post-regulatory research, concerned with field studies of new vaccines and development and assessment of new vaccination strategies.

A Global Vaccine Research Forum will meet annually in Montreux, Switzerland, to allow key private and public sector players to share information on the development and application of new technologies and approaches, discuss what needs to be done and make recommendations on global priorities.

'Eliminating debt will not save the poor'

The following is from the *Guardian* newspaper, UK, of 11 October 1999:

> God is in his heaven. The Pope has pronounced, and Third World debt has been redeemed. I have to say that I think the whole affair has been a giant red herring. More precisely I think it is a major distraction from the task of reducing world poverty. Why?
>
> First, the distribution of the benefit is highly distorted. The campaigners have a list of 52 countries that qualify for their support. But these countries contain only one fifth of the total of people whom the UN classifies as being in absolute poverty. Nearly half of all the debt to be cancelled is due from some 30 small African countries located south of the Sahara and north of the Zambesi. We all know that this is a very unhappy part of the world. It is certainly very poor: income per head ranges between 60% and 70% below the Third World average. But fortunately, in terms of population, the region is also quite small. It contains less than 200 m absolutely poor people. That may seem a large number but it is dwarfed by the poverty population of south and east Asia, which at over a billion, is five times as large. Yet south and east Asia will get only about a quarter of the total debt relief. Furthermore, within that region, the relief is peculiarly distributed. Bangladesh, large and very poor, gets little. Nearly half the regional total goes to the Philippines and most of the rest goes to Vietnam.
>
> What is it that the left-out poor have in common? Basically it is that they reside in countries, such as India and China, which did not get into major debt. These left-out countries tend to be large, with total populations measured in hundreds, rather than tens of millions. It is a persistent fact of the aid business that the smaller the country the more aid it tends to get per head. This is not because small countries necessarily have greater economic needs than large countries, but because aid goes to governments, not people, and each little government is a political lobby. Thus Amartya Sen and Jean Dreze wrote, 'Uttar Pradesh, in north-east India, has a population of nearly 150 millions, larger than any other country bar China, Indonesia, Brazil, Russia and the United States. If it had been an independent country, it would have been one of the most deprived in the world.' But because Uttar Pradesh is in India and India has a low level of debt per head, the 100 m extremely poor people who live in Uttar Pradesh get no benefit from the debt-relief campaign at all. In contrast, the no-poorer

people of sub-Saharan Africa, divided by the accidents of colonial history into a large number of tiny countries, fare much better.

My second grievance is that the anti-debt campaign seems to cast a general slur on the role of international capital in the task of global poverty reduction. The repayment problem is exaggerated. The total debt of a typical Third World country today is equivalent to about 6 months' national income. A developing country with this amount of debt which has taken off into brisk economic growth—say population growing at less than 2% a year and total GDP at 5% or 6%—can pay off the whole amount in 20 years and still halve its total poverty population over the same period. Those figures are typical of what has been happening in east Asia for the past 2 decades and what on recent trends seems currently possible anywhere in south Asia. (Of course they are not typical for sub-Saharan Africa.)

Finally, I suggest that the whole rhetoric of the anti-debt movement distracts attention from the fundamental challenge in the next century. It is possible to eliminate all absolute poverty, as currently defined by the UN, in the Third, Second and First Worlds by 2050. It is also possible to equalize the average standard of living in all three worlds by the century's end. Despite the obvious environmental dangers, these targets are feasible, but they require positive action. The debt lobby, the green lobby and many other like-minded groups speak as if they believed that the poor must always be with us; therefore we will always need charity. In my opinion, charity is not involved. Poverty need never exist. The problem is essentially practical rather than moral. One practical need is a massive increase in what is called 'net' aid, that is the flow of new money less the reverse flow of repayments and interest. To that end, because the cancelled loans could not in any case be serviced, the current redemption programme will contribute nothing. Indeed, because some governments may pretend otherwise and thereby justify continuing to reduce gross aid, the total effect on world poverty could actually be adverse. What would the Pope say to that?

The author, Robin Marris, is emeritus professor of economics at Birkbeck College, London, UK.

'Professional Fundraising': a journal for charities and the non-profit sector, London, UK

The following is extracted from the covering letter with the latest issue:

Professional Fundraising is published on the first Thursday of every month and has a circulation of 4500. With almost three readers per copy, our readership is just under 13,500. *Professional Fundraising* is read by fundraising professionals working within the charity and not-for-profit sector including theatres, arts organizations, local councils, universities, sports organizations, etc., and is also circulated to directors, chief executives, personnel managers and trustees throughout the industry.

Published on the third Thursday of the month, our newsletter *PF Plus* also reaches the leading professionals working within all aspects of revenue generation, including legacy officers, donor support workers, corporate fundraisers, sponsorship/development executives and events organizers both regionally and nationally.

Current issues (about 40 pages) contain a wealth of information on all aspects of fund raising, ranging from the use of the internet and other forms of information technology (IT) to down-to-earth advice for small and medium-sized charities. The activities and strategies of many well known agencies and their contributions to recent conferences are described in detail. A typical entry, which may be of interest to readers in the UK and other parts of Europe is the following:

The Charity Commission for England and Wales is a government department with responsibility for registering, monitoring, supervising and advising charities. It also investigates allegations of wrong doing, and can use a range of powers to protect charity assets if causes for concern are found.

The Commission also has responsibility for maintaining the Public Register of Charities (more than 187,000), which members of the public can consult for detailed information about a charity.

Alternatively, details of all registered charities can be viewed on the Commission's website at http://www.charity-commission.gov.uk. Publications cover all aspects of running a charity. Contact 01823 345427 for publication details or Harmsworth House, 13–15 Bouverie Street, London EC4Y 8DP, UK. Fax: +44 171 674 2310.

For *Professional Fundraising*, the address is United House, North Road, London N7 9DP. Fax: +44 207 700 2049; e-mail tmd-press@btinternet.com.

Improving malaria information support for health professionals in Southern Africa: 'Red Malaria Reference Initiative'

The following information on this important new initiative comes from the *WHO-Southern Africa Malaria Control Programme and the University of Zimbabwe Medical Library* and is dated August 1999. The main content is reproduced here since it is possible that the approach used for malaria may be applicable to other major diseases, including leprosy.

Health information support in most Southern African countries is extremely limited with the majority of libraries, hospitals and clinics lacking essential reference books, manuals and journals. This shortage of information inhibits effective malaria control and prevention activities within countries at all levels and, in particular, at the district level.

The *WHO–Southern Africa Malaria Control Programme (SAMC)* in collaboration with the *University of Zimbabwe Medical School Library* has launched the Malaria Red Reference Initiative to provide information support on malaria to health professionals working at the national level down to the subdistrict level. Four types of support are planned:

1. **The Southern African Malaria Red Information Resource Centre**
   A centralized resource centre housing a comprehensive collection of journals, manuals and books on malaria control and prevention is being established at the University of Zimbabwe Medical Library in Harare. The library is Zimbabwe's national medical library and has an Outreach Service available to health professionals throughout the country. Soon, with assistance from WHO and the US National Library of Medicine, the library will be able to deliver a wide range of information on malaria control and prevention by e-mail and mail from an expanded range of printed and electronic services and sources. These information sources will include journal articles, book contents pages and chapters, and CD-ROM and internet website searches. This service will be available to all health professionals working in malaria control and prevention within Southern Africa.
2. **The Malaria Red Trunk**
   The Red Trunk is modelled on WHO's Blue Trunk mini-library. The Blue Trunk is designed to be delivered to district hospitals with a core collection of health literature in a lockable blue-painted trunk.

   The Malaria Red Trunk is initially targeted at malaria control managers and houses an essential collection of books and manuals on malaria diagnosis and case-management, vector control, epidemic response and surveillance, malaria health education, operational research, and general texts on malaria and epidemiology. In the medium term the intention is to extend the Red Trunk coverage to the provincial level and targeted districts (see Annex 1: Red Trunk booklist).
3. **The Malaria Red File**
   The Red File is a compilation of basic information on malaria for health professionals working at the district level and below. It is intended to be a personal resource for district medical officers, environmental health officers and senior nurses.

   Collated into a red ringbinder file are therapeutic and diagnostic guidelines; epidemiological and historical background material on malaria; details of the information sources and services available at the Malaria Information Resource Centre; and addresses for e-mail conferences, listserves and internet websites (see Annex 2: Red File Contents).

   Red File holders will receive regular Malaria Updates. The updates will include new and relevant

malaria control research findings compiled by the Malaria Red Information Resource Centre using Medline searches as well as other news on malaria control and prevention likely to be of interest to frontline health professionals. In the future a smaller version of the Red File may be distributed to health centre personnel.

4. **E-mail and electronic sources of information**
   This initiative aims to improve access to electronic sources of information on malaria control. These may include increasing access to malaria listserves, internet access to Medline and other electronic databases and regular compilations of malaria control research abstracts distributed on floppy disks and/or through e-mail.

The four levels of information will allow health professionals to have basic and essential material accessible 24 hours a day via their personal Red File; more detailed information from the Red Trunk; and less urgent and more specialized information from the Malaria Information Resource Centre by e-mail, fax, phone or mail. Lastly, increasing the use of e-mail and the internet will facilitate information exchange between different malaria control programmes and the research community.

Phase One of the Malaria Red Reference Initiative is currently underway. Between September and December 1999;

- The first 50 Red Trunks will be distributed to National Malaria Control Programmes (NMCPs), WHO country offices, university libraries and research institutions.
- Red Files will be sent out to NMCPs and district health personnel for pretesting.
- The Malaria Information Resource Centre will be officially opened.
- The SAMC website will be launched.

Please send us your comments and suggestions so we can provide health professionals engaged in malaria control with the information they need to roll back malaria.

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Global Alliance for Leprosy Elimination

On the occasion of the final meeting on 12 November 1999 of the Board members for the Leprosy Fund of the Novartis Foundation for Sustainable Development (previously Ciba-Geigy Leprosy Fund), the following information was presented:

a) *A Media Release entitled 'Novartis is the pharmaceutical partner in alliance to eliminate leprosy worldwide':*

Basel, 15 November 1999—Novartis has pledged to donate approximately USD 30 million in medication to cure all the leprosy patients in the world detected over the next 6 years. This is the company's key contribution to the Global Alliance, announced today by the World Health Organization (WHO), that aims to eliminate leprosy as a public health problem from every country by the year 2005. Novartis will make additional resources available to help implement this final push towards eliminating the disease.

'For centuries leprosy has plagued mankind, mutilating people who are then often discriminated or

even excluded by society. So much suffering results from this disease, but early treatment can prevent its disfiguring and crippling effects and achieve cure. As the pharmaceutical partner in the Global Alliance, we are most pleased to donate the drugs needed to eliminate leprosy', said Daniel Vasella, Chairman and CEO of Novartis.

Novartis has a long tradition in the fight against leprosy, extending from the research laboratory to the clinic in the field. The company played a key role in developing two of the three drugs used in multidrug therapy. Since 1986, its Foundation for Sustainable Development has been involved in implementing practical and innovative strategies for leprosy elimination.

The Global Alliance and its partners aim to detect and cure the estimated 2.5–2.8 million leprosy sufferers by the end of 2005, thus achieving elimination of the disease. 'Elimination' is defined as a prevalence of less than one case per 10,000 population in every country. The current prevalence in the most endemic countries, which account for 90% of cases, is more than 4.5 times this target. Efforts will focus on detecting all cases by generating and meeting demand for free treatment through improving awareness and access. Over the past 15 years, an estimated 10 million people have been cured of leprosy and the disease has been eliminated from 98 endemic countries. This concerted final push will consign this dreaded disease to history.

Other members of the Alliance are governments of leprosy endemic countries, the Nippon Foundation, and the International Federation of Anti-Leprosy Associations (ILEP). The Alliance will cooperate closely with non-governmental organizations, the Danish International Development Agency (DANIDA) and the World Bank. The government of India has agreed to chair the Global Alliance during the year 2000.

'We are grateful for the strong support of our partners, both old and new, in the final years of the fight against leprosy. Let us join hands and make a final push to consign a dreaded disease to history', said WHO Director-General Dr Gro Harlem Brundtland. WHO will further intensify its work in guiding and monitoring field operations, while verifying the implementation of the Global Alliance's strategy.

Novartis is a world leader in Life Sciences with core businesses in Healthcare, Agribusiness and Consumer Health. In 1998, Novartis Group sales were CHF 31.7 billion. The group annually invests more than CHF 3.7 billion in R&D. Headquartered in Basel, Switzerland, Novartis employs about 82,000 people and operates in over 140 countries around the world.

Further information on:
The Novartis Foundation for Sustainable Development: www.foundation. novartis.com
Novartis: www.novartis.com

b) *More detailed background under the heading 'The Final Push':*

An alliance to eliminate leprosy ...
On November 15th 1999, representatives of leprosy endemic countries, the World Health Organisation (WHO), the Nippon Foundation, Novartis and the International Federation of the Anti-Leprosy Associations (ILEP) announced a Global Alliance to eliminate leprosy as a public health problem from every country by the year 2005. The Alliance will work closely with patients, communities and all agencies interested in leprosy such as the Danish International Development Agency (DANIDA) and the World Bank.

The Alliance and its partners aim to detect and cure all the remaining leprosy cases in the world—currently estimated at 2.5–2.8 million—over this 6 year period. Efforts will focus on generating 'demand' for treatment through improved awareness of leprosy in conjunction with better access to diagnosis and treatment.

The term 'elimination' means bringing down the disease burden to a very low level. This will lead to a reduction in the source of infection so that the disease will disappear naturally as it did in many parts of the world. This level has been defined by WHO as a prevalence rate of less than 1 case per 10,000 inhabitants.

Achievements so far...
Significant progress has been made since the 1991 World Health Assembly resolution to eliminate leprosy by the year 2000. Over the past 15 years, about 10 million people have been cured of leprosy, the

prevalence has dropped by 85% to reach 1.4 per 10,000 inhabitants and leprosy has been eliminated from 98 countries. At the end of 1998, there were 820,000 registered patients in the world and in the course of that year, about 800,000 new cases had been detected. The progress made is far more than simply statistical—the alleviation of human pain and suffering is immeasurable.

... but still a long way to go

With just 1 year to go before the original elimination deadline, the established prevalence of leprosy is still over four times the target level in the 10 most endemic countries. These countries represent approximately 90% of the global leprosy burden. The reasons for missing the deadline are varied and include the high prevalence itself, the intensity of disease transmission and limited geographical coverage with MDT services. In a few countries experiencing civil strife, elimination efforts are seriously undermined by a damaged health infrastructure.

Most importantly, there is a substantial hidden caseload, as suggested by the high numbers of new cases emerging with the widening coverage of elimination campaigns. The reasons for these hidden cases are complex and include inadequate access to diagnosis and treatment; poor awareness of the early signs of leprosy and delay in seeking treatment for fear of social consequences. The consequences of this delay can be devastating to individuals and their families, as leprosy can lead to progressive and irreversible deformities, often resulting in social exclusion.

The Focused Strategy ...

The fundamentals of the original elimination strategy will remain the same, namely detecting and curing all patients with multidrug therapy (MDT). MDT has proved to be highly effective in curing leprosy, is well tolerated, while the relapse rate has been extremely low. Moreover, through early treatment, MDT prevents disabilities.

The success of this final push demands synchronized implementation of all the core elements as well as some refinement to accommodate local variables.

... core elements

- Improving access to leprosy services by enabling all health facilities in endemic districts to diagnose and treat leprosy
- Ensuring availability of free MDT drugs at health centres through improved logistics
- Motivating people to actively seek treatment by creating better community awareness of the early signs and dispelling fear of the disease
- Ensuring high cure rates through innovative and patient friendly drug delivery systems
- Active monitoring and taking timely corrective action.

... standardization

- devising general 'elimination kits' comprising templates, texts and visual aids, which should be adapted to the local context on:

- *Capacity building* to enable general health care staff to diagnose and treat leprosy as well as its complications.
- *MDT and logistics* to ensure that adequate stocks of MDT are available at the peripheral level.
- *Information and advocacy* to create a positive image for leprosy elimination in communities and generate support for its elimination at all levels.
- *Monitoring systems* to keep track of new caseload, cure rates and progress towards elimination.

... prioritization

Based on current prevalence rates, countries have been classified into three groups: intensification, acceleration and consolidation. Priority clearly has to be given to countries in the 'intensification group'.

Immediate steps to be taken

'Intensification' countries:

– Set up national task forces comprising representatives from the respective Ministry of Health, WHO and other partners in order to

- conduct a situation analysis; adapt the strategy to field reality; develop a detailed plan of action with clear timeframes.
- to play a catalytic role and develop a network of focal points at national and sub-national levels; assist with data collection and analysis; put into place improved MDT distribution systems.
- provide managerial, technical and logistical support to local health services.

'Acceleration' and 'Consolidation' countries:
Identify geographical areas where leprosy has not been eliminated and implement the core activities of the focused strategy.

Put into place a simple and integrated surveillance system as well as referral mechanisms.

Clear benchmarks

– *Year 2000*: Ground work including situation analysis, development and adaptation of the generic kits and creation of national task forces.
– *Years 2001–2003*: Intensive implementation at the district level, including integration of leprosy services into the general health services. Close monitoring of progress.
– *Years 2004–2005*: Phasing out and validation of elimination at national level and ideally at sub-national levels.
– *Years 2006 and beyond*: Local health services will deal with the new cases of leprosy that will continue to occur even after 'elimination'. In addition, a significant number of individuals disabled because of past leprosy will need attention. National programmes, in partnership with all relevant agencies working in leprosy, will continue to provide best possible care through integrated health systems at the most peripheral level.

Roles of the partners in the alliance

National health ministries will continue to play the key role in eliminating leprosy. They will be responsible for developing plans, mobilizing resources, coordinating the activities of various partners, implementing the strategy and monitoring progress. Their commitment and leadership will remain crucial.

WHO will continue to provide technical and strategic leadership to the elimination programme as well as deal with MDT logistics. It will further intensify its efforts to guide and monitor field level operations in order to ensure effective implementation. WHO will keep the war against leprosy high on its agenda and will continue to generate political commitment for elimination, particularly in the endemic countries.

The Nippon Foundation and the Sasakawa Memorial Health Foundation will contribute USD 24 million to WHO towards country level activities. Their past contributions have played a decisive role in leprosy elimination: they have enabled WHO to provide free treatment to all leprosy patients in 80 countries from 1995 to 1999 as well as to carry out special programmes and field activities.

IELP members will make a significant contribution to the Global Alliance particularly through their extensive and long-standing experience of leprosy project work in the field. The Federation's 19 members pledge USD 19.5 million for the year 2000 towards the Global Alliance strategy. ILEP members believe that the Global Alliance is an essential part in the fight against leprosy and all its consequences.

Novartis will donate MDT, worth approximately USD 30 million, to WHO for the treatment of all the leprosy patients over the 6 year period. Novartis Pharma has developed two of the three key drugs in MDT: Rimactane® (rifampicin) and Lamprene® (clofazimine). The Novartis Foundation for Sustainable Development, actively involved in field programmes, will provide additional resources to help implement the focused strategy.

How the Alliance will function

A Collaborative Coordinating Committee, comprising members of the Alliance and representatives of the major leprosy endemic countries, will review progress towards elimination and guide future

activities. The Government of India, the most endemic country in the world, will chair the Committee in the first year. WHO will form the Secretariat for the Committee.

A historic opportunity

The elimination of leprosy is no longer a complex medical problem. Leprosy can easily be diagnosed on clinical signs alone with minimal training; the treatment is highly effective and easy to use under field conditions. Our strategy is in place, as are most of the resources and the commitment to eliminate leprosy. It is now simply a case of making it happen.

It is hoped that this final push will consign a dreaded disease to history.

'District laboratory practice in tropical countries': Tropical Health Technology, UK

This is a 454-page manual, reinforced paperback, written by Monica Cheesbrough of Tropical Health Technology (14 Bevills Close, Doddington, March, Cambridgeshire PE15 OTT, UK. Fax: +44 1354 740 0130) and published by Cambridge University Press.

The author's Preface reads as follows:

> Changes in the organization of health services in developing countries have led to the district level assuming more responsibility for the planning, delivery, and quality of community health care. Reliable and well managed district laboratories have a major role in improving and sustaining the quality of community health care, reducing morbidity and mortality, and providing information that can lead to a more efficient and cost-effective use of district health resources. With laboratory support, diseases can be diagnosed more accurately, drugs used more selectively, and disease surveillance improved. It has also been found that the confidence of the community in its health services increases when laboratory facilities are available.
>
> *District Laboratory Practice in Tropical Countries* has been produced to help those working in district laboratories in developing countries and those responsible for the organization and management of community laboratory services and the training of district laboratory personnel. As with the previous publication *Medical Laboratory Manual for Tropical Countries* which this new book replaces, the author has been guided in the choice of contents by the suggestions and requests of those working in the developing countries. Accordingly, Part 1 includes comprehensive chapters on the organization, management, safety, and equipping of district laboratories. How to provide both a reliable and quality laboratory service are described in detail as part of the modern approach to the total quality management of medical laboratory services.
>
> Part 1 also includes an up to date laboratory diagnosis of parasitic infections with colour illustrations and the clinical chemistry investigations that can be performed in district laboratories. At the request of those involved in training, a special *Supplement* is included on how to design and implement a job-orientated training curriculum for district laboratory officers.
>
> The author hopes that this new publication will help to motivate those working in district laboratories in developing countries and lead to the growth of reliable and relevant community laboratory services. Recognition and support of district laboratory services are key to improving community health care in developing countries. The views of those using the book will be warmly welcomed by the author.

And the back cover comments as follows:

> Changes in the organization of health services in developing countries have led to the district level assuming more responsibility for the planning, delivery and quality of community health care. District Laboratory Practice in Developing Countries has been produced to help those working in the district laboratory, and those responsible for the organization and management of community laboratory services and the training of district laboratory personnel.

Replacing the previous publication Medical Laboratory Manual for Tropical Countries, this book provides an up-to-date practical bench manual, taking a modern approach to the provision of a quality medical laboratory service.

It includes practical accounts of: organization and staffing of district laboratory services; total quality management; health and safety; equipping district laboratories; parasitological tests, illustrated in colour; clinical chemistry tests; how to plan a training curriculum for district laboratory personnel.

Part 2, published in late 1999, covers microbiological tests, haematological tests and blood transfusion tests.

This manual is almost certainly the most up to date, comprehensive and informative publication of its kind currently available and Part 2 (released in December 1999) will be of similar quality. The author is to be congratulated on a massive project of potentially great importance for district hospitals worldwide. Details of price, postage, etc. may be obtained from the author at the above address, or from Cambridge University Press, the Edinburgh Building, Cambridge CB2 2RU, UK. http//www.cup.cam.ac.uk

What is 'meta-analysis'?

The term 'meta-analysis' is being used increasingly in current medical and scientific literature, sometimes without definition. The following, from WHO Reproductive Health Library, 1999, Issue 2, Page 2, may be helpful:

> Meta-analysis is the statistical method used to integrate results from more than one study to produce a summary estimate of the treatment effect across studies (typical relative risk). It is an application of a statistical technique used in observational studies (case-control studies and cohort studies) during stratified analysis. The difference is that in a meta-analysis in a systematic review of RCTs each stratum is an individual randomized controlled trial. In a stratified analysis of observational studies, on the other hand, a stratum is a category of the variable under consideration (for example age <20 years versus >20 years). This technique is commonly known by the names of those who developed it for case-control studies (Mantel–Haenszel) although several variations of it also exist. Meta-analysis is only an analytical tool in a systematic review and not all systematic reviews necessarily include a meta-analysis. In the presence of disparities among trials meta-analysis can help by stratifying different characteristics, to identify the sources of such disparities. Meta-analysis is conducted in a systematic review when the review includes more than one trail, although it does not necessarily follow that a summary estimate of the treatment effect is obtained. When there are clinical or biological disparities (heterogeneity) between trials, then using meta-analysis to produce a single summary estimate may be misleading and should be avoided.

Disability in cross-cultural perspective: rethinking disability

This article, by N. E. Groce, appeared recently in the *Lancet*, August 28, 1999.

> Our understanding of disability has changed substantially over the past two decades. Revolutionary changes in medicine and technology now enable clinicians to understand and treat people with disabilities in ways undreamed of even a few years ago. However, arguably the most substantial change in the understanding of disability is not in the realm of clinical services, but in the growing body of research that finds that while disability is universal, there is marked variation in how cultures interpret disability. This research shows that the lives of individuals with disability around the world are usually far more limited by prevailing social, cultural, and economic constraints than by specific physical, sensory, psychological, or intellectual impairments.

Disability has always been part of the human condition. Indeed, it precedes human beings—the earliest known example of a severely disabled individual is that of an aged multiply-disabled Neanderthal. There has yet to be found a human society that does not have a complex system of beliefs and practices concerning disability. All societies have explanations for why some individuals and not others are disabled, how individuals with disabilities are to be treated, what roles are appropriate and inappropriate for such individuals, and what rights and responsibilities individuals with disability are either entitled to or denied.

These social beliefs seem to be based upon three categories that appear regularly cross-culturally: 1) causality, 2) valued and devalued attributes, and 3) anticipated adult status.

Causality is the cultural explanation for why a disability occurs. Individuals with disability are treated well or poorly, based in part on cultural beliefs about how and why they became disabled. Explanations related to divine displeasure, witchcraft or evil spirits, reincarnation, tainted blood, and genetics all appear in the ethnographic record.

Valued and devaluated attributes are those qualities a society finds important. For example, in societies in which physical strength and stamina are valued, individuals with physical impairments are at a disadvantage. In places where intellectual endeavours such as literacy and the ability to use technology are important, the fact that one is a wheelchair user may be less limiting. Similarly, as in some Pacific island societies, in which a man's status (but not a woman's) is determined in part by his ability to speak well in public, deafness or a speech impediment will be judged particularly disabling. However, traditional beliefs about disability are not always negative. For example, studies from northern Mexico and Botswana report that the birth of a disabled child is viewed as evidence of God's trust in specific parents' ability to care well for a delicate child.

The willingness of any society to allocate resources for individuals with disabilities, including resources for clinical care and rehabilitation efforts, will also depend in large measure on the anticipated role that the individual with disability will have in the community as an adult. Will most adults with disabilities be participating members of society, with families of their own, jobs, and a right to participate in social, religious, and political debate, or will they be denied such inclusion?

Cross-cultural differences in the interpretation of disability show that the lives of individuals with disability are limited not so much by their specific type of disability as by the social interpretation of that disability. If this is the case, then the issue of interpretation of disability moves from one of health to one of human rights.

The United Nations estimates that some 10% of the world's population (500 million people) have substantial disability; 80% of these people live in the developing world. For millions, their lives are hard indeed. Their medical needs are great, although the United Nations estimates that only 3% of all those in need of rehabilitative care actually receive any treatment. But medical needs are far outweighed by social and economic needs. Those with disability are among the poorest and most marginalised of all the world's citizens. They are generally denied not only adequate health care, but also education, employment, and social equality. UNESCO estimates that the global literacy rate for those with disability is 3%; for women with disability, this figure is near 1%. The most common form of employment for individuals with disability worldwide is begging. Furthermore, disability is generally unrecognized as a component of other social and economic issues. For example, UNICEF estimates that half of all street children have some type of disability before coming to the streets. Recent studies show that women with disability are twice or three times more likely to be victims of physical and sexual abuse as their non-disabled sisters.

Health-care professionals can help to change this state of affairs, because in many countries they have a strong voice in making decisions and policies that directly affect people with disability. They have the potential to insist that health policies and programmes for those with disability are tied to broader social and economic policies and programmes. Whether the issue is community-based services in urban American or rural development schemes in Pakistan, health professionals who work on disability issues must extend their perspective beyond the bounds of traditional clinical-based services and programmes if they are to help make a meaningful difference in the lives of those they serve.

But health-care professionals cannot do this alone. Globally, a growing Disability Rights movement has brought ardent and articulate disability-led groups to the fore. These groups have bee instrumental in advocating social, economic, and political inclusion in national and international arenas, and their insistence that they be permitted to speak for themselves in these arenas is an important development.

What health-care professionals can contribute to this growing international debate is their expertise and their already established voice in national and regional programmes and policies. They are not there to speak for those with disabilities, but to work in conjunction with these people and their families to strengthen their voice in the arena of human rights.

Bombay Leprosy Project observes World Disabled Week

Bombay Leprosy Project (BLP) commemorated World Disabled Week on Sunday, December 5th 1999.

The concept of leprosy control programmes observing World Disabled Day (WDD) with as much enthusiasm as they show in celebrating World Leprosy Day (January 30th) was generated by Bombay Leprosy Project in the year 1992 and propagated and practised regularly since then. What was specially significant in BLP's commemorating WDD this year was that the venue of this function held on 4 December 1999, to commemorate the event was the heart of a Bombay slum where BLP's field research in Community Based Rehabilitation (CBR) is in progress.

The Guest of Honour was none other than an elderly disabled patient who distributed calipers and other aids and appliances to his fellow handicapped in the slum of Bharat Nagar, Bandra (East). It is to be noted that some of the victims of leprosy and other disabling diseases learn computer technology in this slum centre. There were 172 beneficiaries of physical rehabilitation in this slum of 72,170 citizens, of whom 18 were leprosy disabled, all of whom were identified by volunteers of the same slum community.

Dr R. Ganapati, BLP's Director, remarked that if our experience regarding the challenging nature of the training and rehabilitation of all these handicapped in a single slum offers any indication, it is that the resources needed to do 'reasonable' justice to solve the entire problem in this megacity with its sprawling slums, would indeed be enormous.

Though the transmission of leprosy is reasonably contained, the predicament related to disability of leprosy victims and their rehabilitation in an integrated manner with the general handicapped is likely to prove a gigantic task.

Mr A. P. Tripathi, physiotherapist, helped the patients to apply the aids and demonstrated their usage. Dr V. V. Pai, Deputy Director, Bombay Leprosy Project, proposed the vote of thanks.

Instructions to Authors

Article submission. Articles submitted for publication in Leprosy Review should be sent to the Editor at the following address: Diana Lockwood, LEPRA, Fairfax House, Causton Road, Colchester CO1 1PU, England. The name(s) of the author(s) and the place where the work was done should be indicated clearly below the title of the article. Degrees and diplomas are not to be included.

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