

milk fortified with ferrous gluconate and zinc oxide reduced anaemia and iron deficiency.

Notwithstanding the benefits, milk fortification is expensive, and central processing and commodity costs are high. The usefulness, cost effectiveness, and sustainability of this approach must be evaluated at scale in representative populations. A few examples are available of efforts to improve complementary feeding practices as a way of increasing micronutrient intake. The remarkable benefits on growth seen in Peru after a nutrition and health education intervention delivered by the health system suggest that this may be feasible in communities where food availability and choice are not a problem.¹⁴ However, this approach may not work in places like India, where poverty and religious beliefs preclude adequate intake of micronutrient containing foods such as meat and poultry products. If the availability of food can be ensured through appropriate financial support and social insurance schemes, these interventions are the most logical way to provide iron and zinc to young children.

Availability of fortified milk poses a risk to programmes for the support of exclusive breastfeeding in such countries, so their use and promotion must be strictly targeted and monitored. There is therefore a pressing need to evaluate such interventions in large scale community studies before they can be recommended.

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Tuberculosis in resource poor countries

Better access to antiretroviral therapy and isoniazid prophylaxis offer new opportunities for control

In most countries with limited resources the epidemics of HIV and tuberculosis continue to grow.¹ Even with optimal treatment of active tuberculosis, the absolute number of tuberculosis cases will continue to rise if the HIV epidemic is not controlled.¹ In this week's *BMJ*, Zar and colleagues report a randomised controlled trial performed in South Africa on the effect of isoniazid prophylaxis on mortality and the incidence of tuberculosis in children infected with HIV.² The results of this study suggest that isoniazid prophylaxis may be an effective public health intervention to reduce mortality in HIV infected children in settings with a high prevalence of tuberculosis.²

Today, antiretroviral therapy programmes also offer new opportunities to control tuberculosis.³⁻⁵ Highly active antiretroviral therapy was shown to decrease the incidence of tuberculosis in HIV positive people by 70% in South Africa⁴ and 80% in Brazil.⁵ Although antiretroviral therapy is likely to reduce the incidence of tuberculosis in people infected with HIV, mathemati-

cal models have suggested it has limited potential to reduce the burden of tuberculosis within the general population.³ However, these models did not take into account the potential effect of antiretroviral therapy on the health seeking behaviour of populations with a high seroprevalence of HIV.

Better access to antiretroviral therapy makes people more willing to be tested for HIV.⁶ This has resulted in a greater awareness of HIV and a reduction in the stigma associated with the disease.⁷ Moreover, voluntary counselling and testing sites are suitable places to screen for tuberculosis and initiate tuberculosis chemoprophylaxis.⁸

HIV seropositive adults with no clinical evidence of tuberculosis benefit from isoniazid prophylaxis.⁹ This protection is less effective in tuberculin skin negative patients, probably not because they are not latently infected with tuberculosis, but because they have such serious cellular immunodeficiency that even chemoprophylaxis cannot protect them. The study by Zar and

RESEARCH p136

Robert Colebunders

head
HIV/STD Unit, Clinical Sciences
Department, Institute of
Tropical Medicine
2000 Antwerp, Belgium
bcoleb@itg.be

Ludwig Apers

clinician
Epidemiology Unit,
Public Health Department,
Institute of Tropical Medicine

Greet Dieltiens

epidemiologist

William Wordria

clinician
HIV/STD Unit, Clinical Sciences
Department,
Infectious Diseases Institute,
Kampala, Uganda

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colleagues shows that isoniazid prophylaxis in children (most of whom were not taking antiretroviral therapy) reduced mortality compared with placebo (median follow-up 5.7 months: 11 (8.3%) v 21 (16%); hazard ratio 0.46, 95% confidence interval 0.22 to 0.95) and reduced the incidence of tuberculosis. Antiretroviral therapy reactivates the immune system and therefore may increase the protective effect of tuberculosis chemoprophylaxis. A study in Brazil showed that a combination of highly active antiretroviral therapy and isoniazid prophylaxis reduced the incidence of tuberculosis to 0.6 per 100 person years of follow-up.¹⁰

Effective case finding and treatment are crucial to controlling tuberculosis. However, in most instances the diagnosis of tuberculosis in people with HIV is delayed, which may foster its transmission in the community. Many factors contribute to this delay such as insufficient awareness about tuberculosis, stigma associated with tuberculosis and HIV, insufficient access to good health care, lack of confidence in healthcare services, and difficulties in diagnosing tuberculosis, particularly in people with HIV. Increased access to antiretroviral therapy could positively influence some of these factors. Indeed, in many countries where free antiretroviral therapy is available, treatment centres are overwhelmed by patients. Moreover in countries with a high seroprevalence of HIV and increasing access to antiretroviral therapy, community efforts to fight both HIV and tuberculosis are growing.

Before initiating antiretroviral therapy patients should be evaluated for signs or symptoms of tuberculosis. If tuberculosis is diagnosed, treatment for the disease should probably be started before initiating antiretroviral therapy, as this would decrease the risk of the tuberculosis immune reactivation inflammatory syndrome.¹¹ Thus, an increase in the capacity to diagnose tuberculosis is needed for the successful implementation of antiretroviral therapy.

In countries with limited resources, antiretroviral therapy is usually not started until patients have advanced HIV disease. Consequently, many people with HIV already have tuberculosis. For example, at the Infectious Diseases Institute in Kampala, Uganda, the mean CD4 lymphocyte count of patients starting antiretroviral therapy is $65 \times 10^6/l$ and 14% of these patients have a history of tuberculosis.¹² With increasing access to antiretroviral therapy, more asymptomatic patients with HIV may have access to such treatment. To facilitate early antiretroviral therapy, CD4 lymphocyte counting should be available wherever HIV testing is performed.

Decentralising CD4 lymphocyte counting will lead to earlier initiation of antiretroviral therapy. This will decrease the risk of patients developing tuberculosis and potentially reduce the incidence of tuberculosis in communities where HIV and tuberculosis are prevalent. However, this decentralisation will require extra staff, including qualified nurses and counsellors, and even lay counsellors if not enough health staff are available.

As a way of achieving this objective the World Health Organization developed the integrated management of adolescent and adult illnesses (IMAI) guidelines

and IMAI training modules.¹³ These are currently implemented in a growing number of settings, such as Uganda and Senegal, which will report back on their effectiveness in operational circumstances.

Antiretroviral therapy programmes could also favour the transmission of tuberculosis. Firstly, nosocomial transmission of tuberculosis could occur, especially in large scale and centralised HIV treatment centres that lack proper preventative measures. Secondly, the total number of people living with HIV and at increased risk for developing tuberculosis in the region will increase. Finally, if patients do not adhere to their treatment, if inappropriate retroviral regimens are used, or if a reliable supply of antiretroviral therapy is not maintained some patients may remain severely immunodeficient and susceptible to developing tuberculosis and drug resistance.

The increased access to antiretroviral therapy in resource poor settings offers important opportunities for controlling tuberculosis. Access to antiretroviral therapy seems to be changing the health seeking behaviour of the population. This could lead to earlier diagnosis and treatment of HIV and tuberculosis. Collaboration between those implementing HIV and tuberculosis control programmes, needed to scale up the implementation of antiretroviral therapy, will hopefully lead to the strengthening of the healthcare infrastructure in general.

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