Review article

Trends in the epidemiology of tuberculosis—a physician's view

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SUMMARY It is likely that the incidence of tuberculosis will continue to decline, although there will be problems in areas with large numbers of immigrants from third world countries. They will present problems only if they come from countries with high incidence of primary drug resistance. In the indigenous population there is one problem group—middle aged and elderly men often with sputum positive disease. Diagnosis tends to be delayed, they may not co-operate with treatment and there is a significant death rate.

Despite the very substantial decline in incidence, it is probably premature to abandon BCG vaccination, although this will have to be reconsidered within the next 10 years.

In each of the last three decades the incidence of tuberculosis in England and Wales has approximately halved.

Year	Notifications	Rate/100 000	% previous rate
1950	42 435	96.4	—
1960	20 799	45.4	47
1970	9 457	19.5	43
1980	6 672	13.5	69

These figures show a remarkable reduction in the number of cases, and there has been a similar reduction in deaths from tuberculosis.

Year	Deaths	% previous mortality
1949	19 797	—
1959	3 360	17
1969	1 271	38
1979	606	48

Will the progress in the control of tuberculosis be maintained? Is there some significance in the reduction of the rate of decline in incidence in the last decade, or have special factors been operative which will in future no longer apply? Are there still major problems despite this generally satisfactory picture, and in particular what is the significance of a significant continuing death rate from what should be a completely treatable disease?

While spectacular progress in the control of

tuberculosis has become commonplace in the developed countries, in the underdeveloped countries of the world, the situation is much less encouraging.^{1,2} The incidence of tuberculosis in these countries remains high and may even be increasing. A disease for which excellent treatment is now available, which is becoming so uncommon in the developed world that it can be considered as potentially eradicable, continues as a major cause of morbidity and mortality. The reduction in rate of decline in incidence of tuberculosis in the United Kingdom in the 1970s reflected a brief exposure to these world problems. That decade saw the impact of an increase in immigration from the Asian sub-continent and East Africa, both countries where the incidence of tuberculosis is considerably higher than in the United Kingdom. The survey of notifications in England and Wales in 1978³ showed clearly the effect of this immigration. The estimated rate for the indigenous population was 10.7/100 000. Immigrants from India/East Africa had an annual rate of 382/100 000; if their notifications were subtracted from the total, the previous rate of decline would have been generally maintained. There is no reason to think that the reduction in rate of decline of incidence in tuberculosis in this country was other than a temporary aberration caused by our brief exposure to world problems. The immigrant population will stabilise unless there is a new and unexpected wave of immigration similar to that of 1972; the disease experience of the immigrants already settled here will progressively come to resemble that of the indigenous population. We can probably expect some-

thing in the order of a further halving of the incidence of the disease in the next decade, giving a total of 3–4000 cases a year by 1990, with a rate between 5 and 10/100 000.

Within this optimistic overall picture a number of problems lie concealed. Firstly in areas characterised by high immigration from third world countries tuberculosis will continue to be a problem in the foreseeable future. Secondly in the indigenous population there has been a change in the pattern of incidence of the disease so that different age groups are affected creating new problems in diagnosis and management. Thirdly in some areas the disease has become so uncommon that the skills of prevention diagnosis treatment and control may no longer be adequate. Finally the fact that there is a significant continuing mortality from what should be an eminently treatable condition must create some anxiety.

The problems of immigrant communities generally reflect the difficulties of the country of origin of the patients. The clinical patterns vary a little depending on both country and place of origin. Groups from different areas tend to cluster together so that each locality will have a different pattern of disease and there is variation in problems from community to community. For reasons which are not entirely clear disease most often becomes clinically manifest within five years of arrival in this country.⁴ The overall level is clearly set by the disease experience of the country of origin. There may be a temporary increase as a result of the stresses of immigration, but it is possible that the initial apparently excessive rate may merely be that of the country of origin, and the subsequent fall only be the first part of the move towards the lower United Kingdom rate. Florid disease at the time of immigration is not common.⁵ Screening at entry has little contribution towards control, unless the immigrants are unusual groups likely to have a high incidence of active disease, and perhaps also a high incidence of drug resistance as is a well recognised problem with some far eastern countries. The Vietnamese boat people posed these problems,⁷ and there is no reason to believe that this experience will be unique. Each immigrant community must be carefully considered in its own right and action to meet its needs individually planned. It is generally true that although tuberculosis is common in the Asian immigrant community the infectious pool of sputum positive patients with extensive pulmonary disease is relatively small.⁸ Attention tends to be concentrated on active disease. It is also important to remember that immigrant communities contain in their number susceptible individuals with negative tuberculin tests who are exposed to particular risk by close association with infectious cases often in overcrowded con-

ditions; their identification and BCG vaccination may be almost as great a priority as the identification of those requiring treatment.

From the point of view of the pathologist, the increased incidence in immigrants has provided few surprises. The histopathologist may receive tuberculosis material from unexpected sites with an increased tendency to lymph node involvement and caseation—the “tropical” pattern of disease.⁹ The organisms have been almost entirely human strains with no increase in virulence, and phage typing shows a predominance of East African and Indian types of organism,¹⁰ suggesting either infection in the country of origin or subsequent infection from an individual previously infected in Asia or East Africa. A recent survey¹¹ of the organisms isolated from lymph node disease confirms the rarity of infection with *M bovis* (65 of 2339—3%). Of the 2339 isolations from patients with lymph node disease 1529 (65%) were from patients of Asian origin, 80% of whom were aged between 10 and 50 yr.

There have also been striking changes in the native community and these have considerable implications for disease control. In particular the change of pattern of incidence in men is striking. That the disease which used to be the scourge of adolescence has become a problem of aging is clearly shown by the OPCS statistical returns.

*Respiratory tuberculosis, England and Wales (males)
Age-specific tuberculosis incidence/100 000 population*

Age (yr)	1954	1974	% fall
0–4	42.8	7.4	83
5–14	40.4	5.8	86
15–24	149.0	13.4	91
25–44	121.6	18.3	85
45–64	128.7	28.1	78
65+	84.7	31.4	64

The most striking reduction in incidence has been in the age group 15–24 yr, and the pattern is similar up to the age of 44 yr. Above 45 and particularly above 65 yr the fall has been much less marked. This change in age of maximum incidence makes diagnosis more difficult. There are few causes of cough and sputum in the young adult, but many in the middle aged and elderly male. Thresholds of suspicion are low and probably inadequate. The cases reported by Edlin¹² and McCulloch and Malone¹³ illustrate these problems. There is the further problem that compliance with treatment of many of these middle aged and elderly men is not all that might be desired. Failure of effective diagnosis and treatment of this group could leave a persistent pool of infectious individuals as well as continuing to contribute to morbidity and mortality. The survey of notifications

has clearly shown that the infectious pool of patients with active sputum positive disease is mainly a problem of the indigenous population. The slow breakdown of primary infections acquired in this country in the 1920s and 1930s may present the major problem in the 1980s and 90s. Interestingly this change in age specific rates has not been seen in women, in whom the highest incidence in 1978 as in 1954 is in the age group 15–24 yr.

A third problem lies in the inevitable loss of skills in the management of a disease that is becoming rare. The data from the notification survey show that in 1978–79 23 counties and 186 local authority areas had an annual notification rate less than 10/100 000. In the six-month period of the survey there were no notifications at all from 32 local authority areas. In 1980, in 8 of the 14 regions in England there were fewer than 500 cases. With such low case numbers diagnostic thresholds alter and management skills atrophy. Clinical radiological and laboratory services are affected. Centralisation of microbiological laboratory services has helped to maintain high standards of identification and sensitivity testing¹⁴ but these depend on initial isolation of the organism. The organisation of the chest services has been substantially changed and they may prove unsatisfactory. Attention has repeatedly been drawn to poor drug use as a cause of treatment failure, a failing from which chest physicians are by no means exempt.^{15 16} Recent surveys have shown very poor use of antituberculous drugs by other medical specialties.¹⁷ The suggestion was made that the advice of the chest physician should always be taken. In districts with the incidence of the disease at the very low level documented in 1978–80 many chest physicians must be beginning to lack experience. Some of the problems encountered in the notification survey suggest that this is already happening.¹⁸ Various different approaches to this problem are possible. In Scotland with its smaller population and simpler organisation a national surveillance system has been introduced.¹⁹ This has brought not only more accurate information on case numbers but also an element of quality control on both diagnosis and treatment. Crofton²⁰ has noted that since its introduction the rate of decline of incidence of tuberculosis which had been slowing has reverted to its previously more rapid level, and that there has been a fall in incidence of drug resistance presumably as a result of better chemotherapy. Perhaps Horne's somewhat draconian suggestion²¹ of rigid enforcement of the use of standardised drug regimens may not prove to be required, but clearly the problems of management are likely to show a paradoxical increase as incidence declines.

Prevention still requires emphasis, perhaps as

much in areas where incidence is low as in the areas where the disease remains relatively common. Two recent outbreaks of the disease have occurred in areas of low incidence; of these only one has been documented.²² It may be that in these communities there has been a loss of immunity from a combination of lack of natural exposure and perhaps also lack of enthusiasm about BCG vaccination. Whatever may be the situation elsewhere, it still seems that in this country BCG vaccination offers a 75% protection.²³ It is probably premature to abandon this, although the temptation to do so is great particularly in areas where the incidence of tuberculosis is now very low.

As the figures previously given show, the death rate has been falling at about the same rate as the incidence of the disease. It is however disturbing that in 1979 OPCS attributes 606 deaths to tuberculosis. This figure is probably accurate. In the notification survey, which covered essentially the same year there were 1309 cases of sputum positive tuberculosis with 160 deaths (12%) of which 72 (5.5%) were primarily attributed to tuberculosis.²⁴ Both the OPCS figures and the notification survey show that deaths occurred predominantly in older men; in the notification survey death was commonest in the first month of treatment. This information is compatible with the belief that deaths are related to late presentation of advanced disease, often in older patients with other medical problems. This belief may not be entirely accurate. The last analysis of deaths in this country¹⁴ showed that failure to follow established high standards of treatment was a significant factor in many of the deaths, and the subsequent published work already quoted does not suggest that there has been a major improvement.

The attitude for the eighties must be one of cautious optimism. The means for the solution of the problems are freely available. The difficulties lie in our ability and enthusiasm to use them.

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