TUBERCULOSIS IN GURKHAS
Is There a Greater Incidence in Those From East Nepal?

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SUMMARY: Chest X-rays of 1057 potential Gurkha recruits from East Nepal and 964 from West Nepal were examined. Seventy-four X-rays from Eastern Nepalis showed changes suggestive of past or present tuberculosis (including 18 with calcified primary complexes) but only 34 (five with calcified primary complexes) from Western Nepalis suggesting that there is a higher tuberculosis infection rate in men from East Nepal. There was nevertheless no difference in the Heaf test gradings nor in the incidence of clinical tuberculosis between a regiment of Gurkha soldiers from East Nepal and one from West Nepal. The difference in tuberculosis rates between the two parts of the country seems to have no practical implications for the Brigade of Gurkhas.

Introduction
Nepal is one of the poorest countries of the world and in common with most other underdeveloped nations has a very high incidence of tuberculosis (TB). Accurate disease statistics are not available for the country as a whole but TB in its many manifestations is the commonest medical condition encountered in the British Military Hospital in Dharan (personal observations).

Fifteen years ago the Nepal Health Survey1 on the basis of Tine tests and chest X-rays carried out on small groups of people in various parts of the country suggested that the Western and Central Mountain regions were relatively free from the disease as compared to the rest of Nepal.

The Brigade of Gurkhas carries out simultaneous recruiting drives in the hills of East Nepal (mainly among the Rai and Limbu peoples) and of West Nepal (among the Gurungs and Magar Thapas). This provided us with an opportunity to compare the rates of radiologically apparent pulmonary tuberculosis between young men from the two parts of the country. We also studied two Gurkha regiments recruited from East and West Nepal respectively to see whether there was any difference between them in the incidence of TB in serving Gurkha soldiers.

Methods
Recruits
Potential recruits between the ages of 17 to 19 years who appear to be in good health and otherwise to meet the requirements of the Brigade of Gurkhas are selected by recruiters in the hills of Nepal. Those from East Nepal are brought

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to the recruiting centre in Dharan while those from the West are taken to Pokhara for further assessment, including medical examination and full plate chest X-ray. During the two recruiting periods of 1980 all the X-rays from both centres were read by one observer (JHJ). The numbers with radiological pulmonary abnormalities which could have been due to TB were noted. Those which had infiltrates or cavitation, usually in the upper lobes, or with pleural effusions, were classed as having active disease. Those with fibrosis or calcification in the lung parenchyma suggestive of healed post primary infection or with pleural fibrosis suggestive of healed TB effusions were classed as having inactive disease. Those with calcification in the hilar lymph nodes or with calcified Ghon foci were classed as having calcified primary complexes. The large numbers to be dealt with in a short period precluded the taking of any other measures to confirm the radiological diagnosis; those men who were failed because of apparent active disease were given a letter to take to their doctor and advised to have investigations and treatment as indicated; medical services for TB are supplied free of charge by the Nepalese Government.

Serving soldiers

The 6th Queen Elizabeth's Own Gurkha Rifles (6 GR) is recruited largely from the hill tribes of West Nepal and the 7th Duke of Edinburgh's Own Gurkha Rifles (7 GR) from East Nepal. At the time of the study both were stationed in Hong Kong. We noted the grading of Heaf test reading done after enlistment (as recorded on the FMed 4 of each soldier) and compared the numbers in each regiment who had a 0, I or II grade and those who had a III or IV grade reading. The rationale for this arbitrary division was two-fold; it is known that a low grade of tuberculin sensitivity is often non-specific, perhaps due to infection with non-tuberculous mycobacteria and it has been established that in Gurkha soldiers the incidence of clinical TB is very much higher in those with a grade III or IV Heaf reading.

We also studied the Infectious Disease Register of each battalion to find out the incidence of disease during the five year period 1975 to 1979 inclusive. At the time of the study there were 694 soldiers in 6 GR and 621 in 7 GR and we have assumed for our calculations that these were the approximate strengths of the regiments throughout the five year period.

Statistical methods

An $\chi^2$ test was used to determine the statistical significance of differences between the data for the two groups in each study.

Results

X-ray signs of TB in recruits

A total of 2021 chest X-rays were carried out; 1057 in Eastern recruits and 964 in the Western. The numbers with radiological signs suggestive of TB infection are given in Table I. The difference in active disease between the two regions is not of statistical significance but there is a significant difference in
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Table I

<table>
<thead>
<tr>
<th></th>
<th>East Nepal</th>
<th>West Nepal</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1057</td>
<td>964</td>
<td>NS</td>
</tr>
<tr>
<td>Active TB</td>
<td>28 (2.6%)</td>
<td>18 (1.9%)</td>
<td>NS</td>
</tr>
<tr>
<td>Inactive TB</td>
<td>28 (2.6%)</td>
<td>11 (1.1%)</td>
<td>p&lt;0.025</td>
</tr>
<tr>
<td>Calcified 1st complex</td>
<td>18 (1.7%)</td>
<td>5 (0.5%)</td>
<td>p&lt;0.025</td>
</tr>
<tr>
<td>Total TB</td>
<td>74 (7%)</td>
<td>34 (3.5%)</td>
<td>p&lt;0.005</td>
</tr>
</tbody>
</table>

the numbers with inactive disease and in those with calcified primary complexes. The frequency of all manifestations of TB is also significantly greater in the East, being double that in the Western Group.

Heaf test in serving Gurkhas

Table II shows the numbers in 6 GR and 7 GR who had a O, I or II grade Heaf test and those with a III or IV grade Heaf test. The percentages in each group are identical in the two regiments.

Table II

<table>
<thead>
<tr>
<th>Regiment</th>
<th>Grading O, I, II</th>
<th>Grading III, IV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 GR</td>
<td>542 (78%)</td>
<td>152 (22%)</td>
<td>694</td>
</tr>
<tr>
<td>7 GR</td>
<td>482 (78%)</td>
<td>139 (22%)</td>
<td>621</td>
</tr>
</tbody>
</table>

Incidence of TB in serving Gurkhas

Fourteen soldiers from 6 GR developed clinically apparent TB in the five year period studied (annual incidence 4/1000). Seventeen men from 7 GR developed TB during the same time (annual incidence 5.5/1000). The difference is not statistically significant.

Discussion

The X-ray findings indicate that the frequency of radiological pulmonary tuberculosis in young men from East Nepal is higher than in those from the West. To a certain extent the diagnoses were subjective and no measures could be taken to confirm them. It is possible, for instance, that some cases of simple pneumonia were wrongly classified as active TB and that pulmonary scarring in some men was due to non-tuberculous disease. It is unlikely however that any other lesions could be mistaken for calcified primary complexes and these were detected in Easterners more than three times as frequently as in Westerners. We believe this to be good evidence that pulmonary tuberculosis is indeed commoner.
in East Nepal and our results suggest that the Nepal Health Survey's findings still hold good.

The reason for the difference is not altogether apparent. Aspin who studied Gurkha Regiments in India towards the end of the Second World War was of the opinion that Nepal had only relatively recently experienced TB and that the disease was slowly spreading through the country. The authors of the Nepal Health Survey also supported this view and thought that the lower incidence in the West might be due to the greater difficulties in communication with the outside world in that part of the country. Aspin's study was of Westerners only and if his theory was correct the frequency of TB in our survey 35 years later might have been expected to have been greater than in his. Indeed the numbers with active and inactive radiologically apparent disease (1% in his series, 3% in ours) are certainly higher in our group. The two studies cannot really be compared however; there is likely to have been subjective variation between his criteria and ours in this respect: he used a primitive mass miniature technique for initial screening and would perhaps have been more fastidious about diagnosing disease which prevented men from joining the British Army at a time when manpower was urgently needed. However, he found 6% to have calcified primary complexes (as opposed to 0.5% in our group) and agreement might have been expected to be close in this respect.

It might be thought that there would have been a lower number of Western recruits with a strongly positive tuberculin test but we found this not to be the case. The testing is not carried out however until the soldier has joined his training unit some weeks after he has left his native village. By then he will, during the long journey from his home, have travelled for several days or weeks. He will probably have stayed in the overcrowded, poorly ventilated, guest houses of Nepal where he will have been subjected to close contact with strangers, many tuberculous. The standards of hygiene in Asia are low and ostentatious public expectoration is a habit widespread throughout the continent. It would be surprising under such circumstances if many recruits had not inhaled some tubercle bacilli by the time they emplaned from Nepal; it may even be that much of the TB which develops in Gurkha soldiers in the British Army has actually been implanted during the journey to the recruiting centre. This hypothesis cannot be tested without carrying out tuberculin skin tests before the men leave their villages but is supported by Large's findings that most cases of TB in Gurkhas present in the first year after enlistment. Sufficient time elapses between the soldier leaving his village and arriving at the training centre for a negative skin test to convert to a positive one. If the Westerners had a lower rate of contact with the disease in their villages and thus were more likely to be infected with tubercle bacilli for the first time before recruiting it might be expected that they would have a higher incidence of the disease after joining the Army, but this is not so. Perhaps the recruiting system which ensures that only robust-looking men are selected from the villages, coupled with the exclusion of those with suspicious chest X-rays, is sufficient to equalise the number of those susceptible to the disease from the two regions.

The Gurkha has long been known to be more prone to TB than other
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soldiers in the British Army and the incidence in serving Gurkhas in this study is not much different from that in other series in the past twenty five years. The disease is less common now than it was before 1955 however, almost certainly due to the careful surveillance, contact tracing, selective vaccination and other public health measures intensified at that time. These measures may also be partly responsible for the lack of any difference in incidence of disease between the two regiments studied.

We conclude, therefore, that there is a higher rate of pulmonary tuberculosis in young men from East Nepal than in those from West Nepal, but that this has no practical application for the Brigade of Gurkhas. It may be important to the Government of Nepal in the provision and deployment of Public Health Services.

REFERENCES

Honorary Consultants

Dr D A H Yates, MD, FRCP, has been appointed Honorary Consultant in Rheumatology and Rehabilitation to the Army, with effect from 14 July 1981, in succession to Dr Stephen Mattingley, who has retired.

Mr. R. Haskell, MRCP, FDS, RCS, has been appointed Honorary Consultant in Dental Surgery to the Queen Elizabeth Military Hospital, with effect from 30 April 1981, but remains in the appointment of Honorary Consultant in Dental Surgery to the Army.

Dr Michael Norman Maisey, MD, FRCP, has been appointed Honorary Consultant in Endocrinology to the Army, with effect from 1 June 1981, in succession to Dr J D N Nabarro, MD, FRCP, who has retired.

Dr N Jones, MD, FRCP, has been appointed Honorary Consultant Physician to the Army, in succession to Professor H de'Wardner, MD, FRCP, who has retired.
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