ditions—an inquiry possibly promising, but requiring much time for its prosecution and much space for its results.

One would expect to find that influences tending to depreciate the general vital resistance would be favourable to the development of tubercular infection, and it is a little surprising to find that the general effect is apparently so slight even on incidence, while as regards the course of the disease these local influences appear to be of still less importance.

TUBERCULOSIS IN THE INDIAN ARMY: Its Incidence as affected by Locality, Racial Proclivity, and Service Generally.

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“IT is unanimously agreed by all medical authorities that tuberculosis in native children in India is rare in any form, either as *tabes mesenterica*, strumous glands, or tubercular hip disease. Pulmonary phthisis is, on the other hand, very common in India among adults. Birch says that ‘Eurasians are affected more than any other class; next to them lower-class Mohammedans. Among well-to-do Hindus it is certainly not so common.’” This statement must be modified, and does not hold good at the present time, for, in my opinion, and as will be shown in this paper, tuberculosis is on the increase among the native population in India—at any rate, among the adults. No conclusive deductions can be made as regards the incidence of tuberculosis generally among the civil population of India, as statistics furnished by provincial Governments do not admit of any comparison being made between the prevalence of the disease in the civil population and the native troops in India and European countries; but from the Annual Reports of the Sanitary Commissioner for the Government of India precise figures and comparisons can be made regarding the armies and jails in India. At the outset it may be stated that tuberculosis is only met with in one form in the Indian army, and that is *phthisis pulmonalis*. It is possible that the final stages of some of these cases *do* result in general tuberculosis, but it is not so met with in the Indian army as a rule, as the cases are invalided out of the service before the final stages of the disease are reached, and they then drift to civil hospitals or die in their own villages. I give here a return showing admissions for tuberculosis of the lungs for the last twenty years as it occurred in the European and native troops in India as a whole.

TABLE I.—ADMISSIONS TO HOSPITAL FOR PULMONARY TUBERCULOSIS.
(*Ratios per Mille.*)

Year.	European Troops.	Native Troops.	Year.	European Troops.	Native Troops.
1885 ...	6·4	2·6	1896 ...	5·0	2·5
1886 ...	5·9	2·6	1897 ...	4·2	2·6
1887 ...	4·8	2·5	1898 ...	3·0	3·5
1888 ...	4·2	2·3	1899 ...	3·1	3·3
1889 ...	4·2	2·1	1900 ...	3·4	3·7
1890 ...	4·2	2·6	1901 ...	3·4	4·2
1891 ...	3·2	1·7	1902 ...	3·4	4·3
1892 ...	3·0	1·7	1903 ...	—	—
1893 ...	3·0	1·6	1904 ...	2·8	3·9
1894 ...	3·1	1·4	1905 ...	2·1	3·1
1895 ...	4·8	2·3			

It will be seen that for the period 1885 to 1897 the ratio of admissions for the British army was always higher than the Indian army; but from 1898 to the last year under review the figures have been reversed, the Indian army showing a higher ratio than the British.

The figures also show that tuberculosis in the British army has been decreasing greatly since 1885, whereas the same disease in the Indian army has been gradually on the increase for the same period (although the return for the last year under review is somewhat better than the previous year). Taking the two armies as a whole, one would naturally ask for the cause of this strange increase in one case compared with the decrease in the other army, both serving in the same country. My views on the subject can be gathered from the subsequent statements regarding accommodation, for whereas the barracks and living generally of the British army have been greatly improved within the last decade, the improvements on these lines for the native army (although there have been some) have not kept pace with those in the British army. But this explanation alone cannot account for the individual increase in the ratios for the Indian army from 1885 to 1905, although it might account for stability or slight decrease of the ratio for the same period. Therefore, further reasons for this individual increase must be sought for, and the only explanations that are offered (for this individual increase) are that it is due in a measure to, *firstly*, better clinical means of diagnosis in the recent years, whereby more cases of tuberculosis are diagnosed and returned as such. In former years many cases were returned as chronic lung complaints, and not tuberculosis (no verification of diagnosis as a rule can be produced, as it is exceedingly difficult to obtain post-mortem examinations in the native army). *Secondly*, a greater number of Gurkha

regiments have been formed in recent years (and the Gurkha, as will be shown later, is very susceptible to the disease), thereby introducing a more susceptible element, that would tend to increase the ratio. *Thirdly*, and lastly, it seems evident that tuberculosis is on the increase now among the native population generally.

Tuberculosis among Native Soldiers and Prisoners.

The incidence of tuberculosis in the Indian army with that of the jails of India is seen in the attached tabular statement for each quinquennium :

TABLE II.—PREVALENCE OF PULMONARY TUBERCULOSIS AMONG
NATIVE SOLDIERS AND PRISONERS.

(*Ratios per Mille.*) *a* = admissions. *d* = deaths.

Year.			Indian Army (Native Troops).	Prisoners in Jails.
1886	...	...	$\left\{ \begin{array}{l} a \\ d \end{array} \right. \begin{array}{l} 3\cdot0 \\ 0\cdot69 \end{array}$	$\begin{array}{l} 5\cdot0 \\ 2\cdot45 \end{array}$
1891	...	...	$\left\{ \begin{array}{l} a \\ d \end{array} \right. \begin{array}{l} 1\cdot7 \\ 0\cdot42 \end{array}$	$\begin{array}{l} 2\cdot6 \\ 1\cdot17 \end{array}$
1896	...	...	$\left\{ \begin{array}{l} a \\ d \end{array} \right. \begin{array}{l} 2\cdot5 \\ 0\cdot65 \end{array}$	$\begin{array}{l} 7\cdot3 \\ 2\cdot99 \end{array}$
1901	...	...	$\left\{ \begin{array}{l} a \\ d \end{array} \right. \begin{array}{l} 4\cdot2 \\ 0\cdot84 \end{array}$	$\begin{array}{l} 8\cdot6 \\ 3\cdot54 \end{array}$
1904	...	...	$\left\{ \begin{array}{l} a \\ d \end{array} \right. \begin{array}{l} 3\cdot9 \\ 0\cdot51 \end{array}$	$\begin{array}{l} 8\cdot4 \\ 3\cdot09 \end{array}$
1905	...	...	$\left\{ \begin{array}{l} a \\ d \end{array} \right. \begin{array}{l} 3\cdot1 \\ 0\cdot5 \end{array}$	$\begin{array}{l} 8\cdot7 \\ 3\cdot19 \end{array}$

The morbidity of the disease in the Indian army, as will be seen, is very much less than among prisoners in jails, and the death ratios in the Indian army are apparently much less than in the jails, but this is accounted for by the sepoys being invalided out of the service before death overtakes the individual, whereas in the jails a greater proportion of them die before their term of imprisonment is over. The ratios of recoveries are not necessarily greater in the Indian army than in the jails. After working out the figures for a series of years, it is interesting to note the relative liability in percentages to tuberculosis in the European troops, native troops, and jails of India consecutively. This is brought out in the next table :

TABLE III.—RELATIVE LIABILITY TO PULMONARY TUBERCULOSIS.
(*Expressed in Percentages.*)

European Troops.	Native Troops.	Prisoners in Jails (excluding Andamans).
10	15	75

**Incidence of Pulmonary Tuberculosis in Different
Presidencies.**

The incidence of pulmonary tuberculosis in soldiers and prisoners in jails as affected by the presidencies can be studied from the following tabular statement of each quinquennium :

TABLE IV.—INCIDENCE OF PULMONARY TUBERCULOSIS IN DIFFERENT
PRESIDENCIES. (*Ratios per Mille.*)

Year.	Native Troops.			Jails.		
	Bengal.	Madras.	Bombay.	Bengal.	Madras.	Bombay.
1886 ...	3·4	2·6	2·1	5·0	6·0	3·0
1891 ...	2·8	0·4	0·7	3·2	2·5	1·7
1896 ...	3·5	1·6	1·5	7·3	7·7	9·9
1901 ...	5·5	1·7	3·5	8·9	12·0	9·3
1905 ...	4·1	1·2	2·4	10·0	10·8	8·3

The army of Madras shows throughout the smallest ratios of incidence and mortality and Bengal the highest, the only exception being in 1886, when Madras recorded a higher ratio than Bombay ; but it must be noted that during this year six regiments of Madras troops were on active service in Burma, and some were also at Suakin, so a good many regiments of Madras troops were not serving in their presidency during this year. Although the Madras regiments show such a low record compared with other armies, yet the Madras jails, by a strange coincidence, show a higher ratio generally than the other presidency jails, and the Bengal jails in the recent years give the lowest ratio, whereas the native troops in Bengal show the highest ratio. These comparative statements, therefore, do not *apparently* admit of any conclusion being come to regarding the incidence of the disease as affected by the presidencies.

The Influence of Climate.

“No law can be pointed out as indicative of the influence of the climate on the prevalence of tubercle of the lungs in India.” Such was the opinion expressed by Lieutenant-Colonel A. Crombie, late of the Indian Medical Service, and his arguments were based on the following reasons : “From statistics furnished by the figures for the year 1896, among European troops the highest rate of admissions was in the Deccan (7·7 per 1,000), and lowest in the West Coast regions (0·6). Among native troops it was highest in the hill stations (3·7), and lowest

in Southern India (0·9). Among prisoners it was highest in Southern India (15·1), and lowest in inland Burma (1·2 per 1,000). In other years the figures have been entirely different." Since his statement was made the figures remain in the same relative proportion, with the exception of the admission-rate for the Deccan, which shows a very small percentage at the present day. The chief climatic conditions of India, as indicated under such headings as rainfall, humidity, sunshine, and temperature, are graphically portrayed in the accompanying map.

TABLE V.—ANNUAL AVERAGE RAINFALL (INDIA).

DIAGRAM INDICATING AVERAGE ANNUAL RAINFALL IN INDIA.¹

As regards the *rainfall*, it will be seen that the highest rainfall occurs in the following areas: Tenasserin, Konkhan Ghats (Bombay), Malabar Ghats (West Coast of Madras), Assam, and Cachar. These have an average rainfall of over 100 inches. The lowest rainfall is in the Sindh and Kutch districts, and the next lowest the Punjab plains, Bellary, and Deccan.

As to *humidity*, the following table shows the mean annual humidity

¹ Reproduced from "Practical Guide to the Climates and Weather of India, Ceylon, and Burmah, and the Storms of the Indian Seas," by H. F. Blanford, by the courtesy of the publishers, Messrs. Macmillan and Co.

for several provinces, and it will be noted that the areas of humidity agree with the areas of rainfall.

TABLE VI.—INDICATING MEAN ANNUAL HUMIDITY IN DIFFERENT DISTRICTS OF INDIA.

North-West Himalaya (lower ranges) 62	Assam 80
Nepal 72	Chota Nagpur 57
Sindh and Kutch 50	Deccan 55
Punjab plains 55	Hyderabad and Bellary ... 54
Rajputana 48	North Circars and Godavery 71
Central India Plateau ... 50	Carnatic 67
North-West Provinces and Oudh 59	Mysore 66
Behar 65	Malabar and Coorg 79
Bengal 80	Ceylon 80
	Pegu 80

Sunshine.—According to Mr. H. F. Blanford,¹ Madras and Southern India have the least amount of sunshine in the year, and the greatest amount is met with in Allahabad, Central and North-West India.

Temperature.—The mean highest is met with at Jacobabad, Deccan, Sialkot, Agra, Peshawar, North-West Rajaputana generally, then Central Provinces, Secunderabad, Karachi, Madras (East and South), and Calcutta. The mean lowest temperature is met with at Leh (-4° F.), Quetta, Simla, Darjiling, Pindi, Peshawar, and Sialkot.

From the above statements we find that the greatest rainfall and relative humidity are in the West Coast of India (where the number of Madras troops stationed are few), the West Coast of Burma, Assam, Lower Bengal, the Himalaya ranges, and Nepal—in these last four areas the Gurkha regiments are stationed. The climate of India varies considerably in the different quarters of Hindustan, and we find the highest rainfall and relative humidity occur in the very areas where the highest ratio returns for tuberculosis occur in the native troops. Thus, Eastern Bengal and Assam have a very high relative humidity, and the troops stationed there show the highest return for tubercle; so do the Himalaya ranges, Konkhan Ghats, and the West Coast of India. In the last place—Malabar coast of Madras—only two regiments in former years (now only one) were stationed—viz., at Quilon (which now no longer exists as a military station) and Cannanore, and the regiments that were stationed at these towns show a higher ratio generally than the other regiments in the Madras Presidency. By referring to the following table, which shows the incidence of tuberculosis “by geographical areas,” we will have a further opportunity of seeing what effect climate is capable of producing on the incidence of this disease.

¹ “Practical Guide to the Climates and Weather of India, Ceylon, and Burmah, and the Storms of the Indian Seas.” By H. F. Blanford. London: Macmillan and Co. 1889. Price 12s. 6d.

TABLE VII.—INDICATING PREVALENCE OF PULMONARY TUBERCULOSIS ACCORDING TO GEOGRAPHICAL AREAS.

(Average Ratio per Mille for the Years 1891 to 1905.)

Areas.	Native Troops.	Jails.
1. Burma, coast	1·9	6·6
2. Burma, inland	2·3	8·0
3. Assam	5·2	2·8
4. Bengal and Orissa	3·3	10·2
5. Gangetic Plain and Chota Nagpur	3·8	6·6
6. Upper Sub-Himalaya	5·5	6·1
7. North-West Provinces and North-West Rajputana	5·2	5·1
8. Central India and South - East Rajputana	3·0	6·8
9. Deccan	1·5	3·2
10. West Coast	2·2	9·0
11. South India	1·76	10·0
12. Hill stations	6·1	2·5
All India	3·6	6·7

Pulmonary Tuberculosis and Geographical Areas of India.

Hill Stations.—The troops suffer far more in hill stations than the prisoners. This fact is due to the Gurkha regiments, which are the most susceptible, being stationed in the hills; but it is to be noted that the admission-rates for the Gurkhas in the Assam hills for the year 1905 (under the head of geographical area—Assam) fell very considerably, and gave the return 1·1 per mille, the previous year being 7·5 per mille; Assam jails returned 3·6 per mille for the same year. This diminution of the ratio for the troops was due to the number of Gurkhas in the Assam district being reduced.

Deccan.—The Deccan is possibly the healthiest geographical area *now* for troops and prisoners in all India, and their returns generally remain steady and small, prisoners returning twice as many as troops.

West Coast of India.—This area is apparently healthy for troops, although it has to be qualified by the fact that very few troops are stationed on the West Coast; prisoners, on the other hand, show a heavy return for this area, and the jail figures are apparently on the increase. This is accounted for by the small jails of the West Coast having been enlarged and converted into large central jails during the last few years.

South India.—In this area Madras troops return a steady and small

ratio, whereas the jails return a very high ratio, the cause of which is said to be due to the excessive overcrowding in the Madras jails, which probably is the factor for giving this very high ratio. It is only within the most recent years that the Madras jails have given such a high ratio, one cause for which is an influx of Burmese convicts, this race being very prone to the disease.

Housing and Clothing.

Government clothing is issued to all the troops, and is generally suited and adapted for the various climates. As regards the housing and accommodation, I think there is much to be desired. The Indian army was originally given a grant for the purpose of building its own hutting lines, which the individual regiments themselves keep up by means of a hutting allowance, taking steps gradually to repay Government the original grant. I believe now it is the intention of Government to take over all the hutting lines, and legislate for their proper upkeep by the Military Works Department; and if the hutting lines are all reconstructed on an up-to-date sanitary plan, there ought certainly to be a reduction in the incidence of some of the diseases, especially so of tuberculosis. As they exist at present the hutting arrangements in the native army do not meet with the necessary modern sanitary requirements, all being defective in some way, either in ventilation, floor-space, or overcrowding, especially so in the married quarters; but some lines are better than others. To meet the defects a standard plan of barrack accommodation for the bachelors, and properly designed quarters (limited in number) for the married men, ought to be laid down and given effect to, after which, I have no doubt, we will find that the incidence of tuberculosis in the native army will diminish in ratio in the same manner as it has done in recent years in the British army (*vide* Table I. and the preamble attached thereto). Till such time as this improvement in the hutting lines can be carried out the following recommendations are suggested. Every case of tuberculosis in the regimental lines ought to be segregated, pending invaliding, and the hut that contained the case ought to be thoroughly disinfected. This can very easily be done as regards bachelor sepoys themselves, but when it involves the married men, especially Mohammedans, with their purdah women, we are met with an Oriental obstacle that is hard to overcome; and the only practical way of overcoming this difficulty is to invalid the husband (the sepoy) out of the service, whether it is he himself or one of his family who has the disease. This seems rather a sweeping recommendation to make, but if the order was that the affected female only must leave the lines, this would either entail hiding the cases and no notification; or, if notified by the husband or his non-commissioned officer and the order given effect to, the female would be sent out of the lines, and, under strict discipline,

back to her village, and in the ordinary course of the man's service he would get furlough to the same village and house, and would be exposed to the same infection, and probably under worse conditions; thus he would be just as likely to contract the disease while on furlough and bring it back to the regiment with him. Thus, the source of contagion to the regiment would be only "once removed" from the original source. I think the above argument is strong enough to justify the advice being given to invalid the married sepoy from the service in the event of his wife or family developing the disease, or at least to remove him to the reserve.

Racial Proclivity.

What effect racial conditions have in the Indian army on the incidence of tuberculosis can be gathered from studying the subjoined table. In this table I have grouped together the different caste regiments, with their ratio returns of phthisis pulmonalis for the years 1886 to 1899, extracted from the Annual Return of the Sanitary Commission for the Government of India. (I have no other data at my disposal to go on beyond these years.)

TABLE VIII.—INCIDENCE OF PULMONARY TUBERCULOSIS IN CASTE REGIMENTS. YEARS 1886-1899.

GURKHAS. (*Ratio per Mille, 73.*)

Regiments.	Total Strength.	Total Admissions.
1st Battalion 1st Gurkhas	10,380	146
2nd " " " " " " " " " " " "	10,495	105
1st Battalion 2nd Gurkhas	10,482	144
2nd " " " " " " " " " " " "	10,190	103
3rd Gurkhas ... " " " " " " " " " "	10,746	32
1st Battalion 4th Gurkhas	10,401	82
2nd " " " " " " " " " " " "	10,301	79
1st Battalion 5th Gurkhas	10,617	60
2nd " " " " " " " " " " " "	8,615	50
6th Gurkhas ... " " " " " " " " " "	10,676	84
2nd Battalion 8th Gurkhas	11,205	51
1st " " " " " " " " " " " "	11,229	31
9th Gurkhas ... " " " " " " " " " "	8,973	32
10th Gurkhas (1890-1899)	6,542	29
Totals	140,852	1,028

RAJPUTANA RAJPUTS. (*Ratio per Mille, 6.63.*)

Regiments.	Total Strength.	Total Admissions.
13th Rajputs	10,254	68

TUBERCULOSIS IN THE INDIAN ARMY

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TABLE VIII.—INCIDENCE OF PULMONARY TUBERCULOSIS IN CASTE REGIMENTS. YEARS 1886-1899—*continued.*

DOGRAS. (*Ratio per Mille, 5'94.*)

Regiments.							Total Strength.	Total Admissions.
37th Dogras	...	...	...	...	...	...	9,330	59
38th Dogras	...	...	...	...	...	...	8,518	45
Totals	...	...	...	...	...	...	17,848	104

JATS. (<i>Ratio per Mille, 3'7.</i>)			HINDUSTANI MUSSULMANS. (<i>Ratio per Mille, 3'45.</i>)		
Regiments.	Total Strength.	Total Admissions.	Regiments.	Total Strength.	Total Admissions.
6th Jat Light Infantry	9,202	54	1st Lancers	7,533	18
10th Jats	10,562	40	5th Light Infantry	10,450	46
12th Pioneers (one-half Jats, one-half Sikhs)	5,104	16	17th Infantry	10,263	17
14th Murray's Jat Lancers	7,038	9	18th Infantry	10,852	54
Totals	31,906	119	Totals	39,098	135

HINDUSTANI RAJPUTS. (<i>Ratio per Mille, 2'75.</i>)			SIKHS. (<i>Ratio per Mille, 1'78.</i>)		
Regiments.	Total Strength.	Total Admissions.	Regiments.	Total Strength.	Total Admissions.
2nd Rajput Light Infantry	10,664	24	14th (Ferozepore) Sikhs	10,337	13
4th Rajputs	10,728	22	15th (Ludiana) Sikhs	9,368	19
7th "	10,799	19	23rd Sikh Pioneers (Mazbi Sikhs)	10,433	13
8th "	10,950	60	32nd Pioneers (Mazbi Sikhs)	10,655	24
11th "	10,609	20	34th Sikh Pioneers (Mazbi Sikhs)	8,122	14
16th "	10,101	31	35th Sikhs (Jat Sikhs)	9,042	6
Totals	63,851	176	36th Sikhs (Jat Sikhs)	8,962	20
"OTHER CASTE" PARIAHS. (<i>Ratio per Mille, 1'9.</i>)			45th Rattray's Sikhs	9,381	28
			Totals	76,300	137
Regiment.	Total Strength.	Total Admissions.			
2nd Queen's Own Sappers and Miners	14,427	25			

TABLE VIII.—INCIDENCE OF PULMONARY TUBERCULOSIS IN CASTE REGIMENTS. YEARS 1886-1899—*continued*.

BRAHMINS. (<i>Ratio per Mille, 1'6.</i>)			GHARVALLIS. (<i>Ratio per Mille, 1'36.</i>)		
Regiments.	Total Strength.	Total Admissions.	Regiment.	Total Strength.	Total Admissions.
1st Brahmins	9,388	13	39th Garhwal Rifles ...	8,054	11
3rd „	10,834	20			
Totals	20,222	33			

PATHANS AND PUNJABI MUSSULMANS. (<i>Ratio per Mille, 1'7.</i>)			MAHARATTAS (<i>Ratio per Mille, 1'5.</i>)		
Regiments.	Total Strength.	Total Admissions.	Regiments.	Total Strength.	Total Admissions.
15th Lancers	7,187	11	105th Bombay Infantry	9,959	22
17th Cavalry	7,352	7	110th „ „	10,146	10
18th Bengal Lancers (one-fourth Sikhs) ...	5,088	11	114th „ „	9,234	21
19th Punjabis (one-half Sikhs)	5,126	7	116th „ „	8,977	7
22nd Punjabis (one-half Sikhs)	4,853	11	117th „ „	10,086	20
33rd Punjabis (one-fourth Sikhs) ...	7,126	17	121st „ „	10,435	23
40th Pathans (one-fourth Dogras) ...	7,430	15			
Totals	44,362	79	Totals	58,837	93

The races most subject to pulmonary tuberculosis can be arranged in the following order :

Gurkhas	7'3	Other caste men (Pariahs)	1'9 ²
Rajputana Rajputs ...	6'63	Sikhs	1'78
Dogras	5'94	Punjabi Mussulmans ...	1'7
Jats	3'7	Brahmins	1'6
Hindustani Mussulmans ...	3'45	Maharattas... ..	1'5
Hindustani Rajputs ...	2'75	Madrassis	—

HINDU RACES.

If I was to parade in line a representative of each of the castes of India, and ask any physician to select the best physique, and the one

¹ All these regiments have two companies of Dekani Mohammedans.

² This return must be considered as doubtful.

least liable to contract pulmonary tuberculosis, I feel sure he would select the Gurkha, for he is a veritable pocket Hercules, and probably the Madrassi as most likely to fall victim. On looking at the accompanying table, one is surprised to find this selection does not bear out the looked-for results—the Gurkha has suffered most and the Madrassi least from tuberculosis.

The following habits are common to all the Hindu races: They never eat beef under any circumstances, but mostly goat flesh, and it is known that the goat is most refractory to tuberculosis. On this ground the Hindus should show a smaller liability to the disease than the Mohammedans (who are beef-eaters), but the returns given do not bear this out, for the Hindus seem to suffer more than the Mohammedans. All the Hindus do not seem liable to the same degree, the difference being apparently due to some other individual factor, such as individual racial habits, etc. Every native of India drinks milk, but this vehicle of contagion cannot be taken into account, as the natives, as a rule, drink the milk after boiling it, chiefly on account of economy, as the milk does not keep fresh very long in the East. Bovine tuberculosis in India is uncommon, according to Professor Simpson, of Calcutta, but I think this statement must be modified nowadays. In the place I am at present stationed in, tuberculosis is rife among the families of beef butchers.

Brahmins.—These high-class Hindus are supposed to be the cleanest race in India; they are pure vegetarians, and never eat meat of any kind, and they do not indulge in tobacco or alcohol; as a result of these qualifications, they apparently show the least liability to tuberculosis. Their susceptibility is certainly small.

The *Gurkhas*, on the other hand, have just the opposite qualifications, being great meat-eaters, and their habits are far from cleanly; the result is they suffer from tuberculosis more than any other race in India. Some medical officers in charge of Gurkha corps say that the Gurkha has a greater hereditary predisposition to tuberculosis than any other race, and their susceptibility is partly hereditary and partly acquired, the latter being due to absence of domestic cleanliness and to defective ventilation in their barracks and quarters. These partly acquired reasons can be understood if one remembers that the Gurkha resides during most of his service in the hills, where the climate is very cold (damp and humid), and he is apt to block up most of his ventilation to produce a degree of warmth. It is stated that the disease is more prevalent among the married Gurkhas than the bachelors.

Dogras.—These are mainly hill Hindus inhabiting the lower ranges of the Himalayas, and as a race they show a great proclivity to the disease—in the table of figures they stand third highest as regards susceptibility; they are not usually said to be specially dirty in their

habits, so the individual factor for this liability must be due to their being hill-men from the Lower Himalayas, suffering frequently from lung complaints, with a distinct racial susceptibility, and they have the usual failing of keeping out ventilation from their dwellings during the colder months.

Rajputs.—This race really embraces a large number of sects, which are returned as Hindus, but some of the race adopted the Mohammedan faith, thus becoming Mussulman Rajputs, and yet they are all supposed to be descended from a Hindu King, or Raja, so adhere to their Raja origin by calling themselves Rajputs, whether they are really Hindu or Mussulman. But what is generally understood now by Rajputs is the Hindu race of Rajputs, and these are again divided into those coming from Rajputana and those from the rest of Hindustan. Strange to say, this last distinction seems to have a distinct bearing on the incidence of tuberculosis among them, for the Rajputana Rajputs appear to be very susceptible to the disease. The 13th Bengal Infantry is the only regiment that is purely a Rajputana Rajput regiment, and their ratio return for the period 1885-1899 is absurdly high—in fact, second highest on the scale—whereas the other Hindustan Rajputs show a very small ratio. On searching for an individual factor as an explanation for this high ratio among Rajputana Rajputs, I can come to no conclusion beyond that the race is highly susceptible to the tuberculous disease; the climate of their district is very dry (relative humidity lowest in India), geographical area a vast sandy plain, plenty of sunshine and small rainfall, but they have extremes of heat and cold. Beyond this I can offer no explanation why they should suffer so much from tuberculosis.

Sikhs.—The Sikh caste seems to be a hardy race as regards tuberculosis, and, although their habits are not too cleanly, and though they are, in addition, great eaters of pork (a flesh particularly liable to tuberculosis), their ratio return for the disease is very small; hence we can conclude that their susceptibility to the disease is exceedingly small, for they apparently give themselves just as many chances for developing the disease as the other races of the North. But it must be mentioned they are not betel-leaf or tobacco chewers and do not smoke, although they indulge in alcoholic beverages.

Garhwalis.—This race of Hindus from the district round Bareilly is somewhat similar to the Gurkha, but are a taller race of men, and not unlike the Dogra. There is only one regiment of them—a second battalion has just been raised—and the ratio return for this regiment is small. Although they are hill-men, and practically subservient to the same drawbacks as Gurkhas, their susceptibility must be considered as being small.

Jats.—This race of Hindus are essentially agriculturists; their

district borders on Rajputana on the one hand, and the Dogra district on the other, and their position in the racial scale as regards liability to tuberculosis is next to the Dogras. They indulge freely in all kinds of meat except beef, and are addicted to alcoholic liquor, and often indulge freely in unboiled milk; their habits are not very cleanly, and their susceptibility to the disease is derived apparently from their Rajputana ancestors.

Mahrattas.—This caste is mostly found in Hyderabad, the Deccan State, and the country west of it towards Bombay. They are generally cleanly in their habits, and usually conform to strict Hindu habits. Their geographical area is greatly composed of a dry, arid district, where the rainfall and humidity are small (excepting the hilly range), and their liability to the disease naturally appears small.

Madras Hindus and "Other Caste" Hindus.—This sect really consists of the Tamils and Telegus of Madras, and also a lower-caste community returned as "other caste" officially, but called generally Pariahs. The Tamils and Telegus usually eat all kinds of meat (except beef and pork), and indulge in alcohol (native liquor) freely. Most of the Madras regiments (except Burma battalions) have half their strength composed of Madras Hindus, and as the return ratios for Madras regiments are the smallest of all armies, it is only natural to suppose that the Madras Hindu is not very susceptible to the disease; but the Madras Sappers and Miners show a very high ratio return compared with the rest of the Madras army. Their average ratio return for the years 1885–1899 is 1·9 per mille compared with the rest of the Madras army, which is 1·47 per mille. The individual factor in this case is due to very many men of the lower-caste Hindus ("other caste") being present in the regiment whose personal habits are not of the best. But it must be noted that one company of the Sappers is composed of Burmans (a race very liable to the disease), and one of the companies is always serving out of their own presidency in the furthest North of India—Chitral, etc.—and these two companies will always tend to increase the ratio return of the Madras Sappers and Miners.

The Mohammedan Races.

The Mohammedan races can be studied under three divisions—the Punjabi Mussulmans and Pathans, Hindustani Mussulmans, and the Mussulmans of the Deccan and South India. The habits of the Mohammedan race generally are more cleanly, and they are generally a more hardy race than the Hindus. They are all meat-eaters, including beef, but alcoholic beverages are not indulged in by them. Their position in the racial proclivity scale is, in the case of the Deccani Mohammedans, lowest of all, but the Hindustani Mohammedan inhabiting the Gangetic and sub-Himalayan districts appears to be more

liable to the disease than his other brethren in the race, the individual factor in their case being, I think, due to the geographical area they live in, for, given a certain degree of susceptibility, the climate, rainfall, and humidity of this area would predispose them to the development of tuberculosis.

Chewing, Expectorating, and Tuberculosis.

A general habit that exists throughout India (except in the Khalsa race, Sikhs) is the habit of chewing betel-leaf; this gives rise to that loathsome habit, "spitting," which is now recognized by all Western countries as a great factor in the spread of tuberculosis. If it were not for the actinic and heating rays of the sun being amplified in this country, there is no doubt that this habit of expectorating would tend to cause a greater spread of the infection of tuberculosis than it does, and one is apt to seek this as a cause of the increase of tuberculosis in those regions where the sun does not exert its powerful rays all the year round—*e.g.*, the hilly ranges of Northern India and Assam (the sub-tropical region)—for it is from the class of men that inhabit these regions that we get the heaviest ratio return of tuberculosis, and the habit of betel and tobacco chewing is indulged in more freely in these regions than further south. In Southern India the women chew the betel-leaf more than the men; and in support of this argument, the only race that do not indulge in this habit are the Sikh race, and they are seen to be less liable to the disease than the others. On the other hand, the jails of Southern India show a higher ratio than those in the North, and in neither of these regions are the convicts allowed to indulge in this habit; so this is apparently an argument against taking this habit into consideration when studying the cause of the incidence of tuberculosis; but I think it would be a legitimate counter-argument to say that as the chewing habit is not indulged in by either of these territorial jails, therefore no comparison can be drawn on this point, and it could only be compared if the chewing habit was not indulged in by the prisoners in Madras and was indulged in by those in the Northern jails.

In conclusion, we can safely assert that tuberculosis in the Indian army is most prevalent among those races which inhabit the sub-tropical regions, more especially in the hill ranges, and is least prevalent in the *tropical regions* (torrid zone), and diminishes progressively the nearer the equator is reached. Climate and race combined seem to have a distinct bearing on the incidence of tuberculosis—at any rate in the Indian army.

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