PAPERS AND ORIGINALS

National survey of tuberculosis notifications in England and Wales 1978-9

Report from the Medical Research Council Tuberculosis and Chest Diseases Unit*

Summary and conclusions

A survey of all tuberculosis notifications in England and Wales for a six-month period showed that 70% of 3732 newly notified, previously untreated patients had respiratory disease only, 23% had non-respiratory disease only, and 7% had both. Fifty-seven per cent of patients were of white and 35% were of Indian subcontinent (Indian, Pakistani, or Bangladeshi) ethnic origin, the latter group contributing over half the cases of non-respiratory disease. The estimated overall annual notification rate per 100 000 population for 1978-9 was 16·4 for England and 13·5 for Wales. The rates differed considerably between the different ethnic groups in England, the highest rates occurring in the Indian and in the Pakistani and Bangladeshi groups and the lowest in the white group; the differences in the non-respiratory rates were the more striking. Nearly a quarter of patients with respiratory disease had large pulmonary lesions, the proportion being higher for the white group than for the Indian subcontinent group. Over half the patients had positive cultures for tubercle bacilli and over a third had positive smears; both proportions were higher for the white group.

This survey has identified many of the problems which tuberculosis presents in England and Wales today. These include the substantial number of patients with sputum-positive disease, the considerable variation in the rates in the different ethnic groups, and the not uncommon occurrence of childhood tuberculosis.

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Introduction

In England and Wales doctors have a statutory duty to notify cases of tuberculosis, not already notified, to the appropriate local authority by name, age, sex, address, and site of disease. A survey was undertaken to obtain further information on every case notified in England and Wales from 1 October 1978 to 31 March 1979 including bacteriological status, radiographic characteristics of respiratory disease, and the patient's ethnic origin, all of which are relevant for identifying groups at special risk and for organising appropriate control measures.

Methods

All medical officers for environmental health (proper officers) (MOEHs) in England and Wales sent a photocopy of every tuberculosis notification form received by their authority to the Tuberculosis and Chest Diseases Unit (TCDU), Brompton Hospital. At the end of the survey the TCDU sent each authority a list to check for accuracy and completeness.

All notifying doctors were asked to send to the TCDU a completed patient form for each patient and a pretreatment posteroanterior chest radiograph for independent assessment of all patients with respiratory disease (including patients who had a pleural effusion or mediastinal lymphadenopathy without a lung lesion). The forms were matched with the photocopies of the notification forms to ensure that no patient was overlooked.

Information on the patient form included (*a*) race or ethnic group descent and, for patients born abroad, the country of birth and year of first entry to the United Kingdom (UK); (*b*) type of disease: respiratory, non-respiratory, or both, and the site(s) of non-respiratory disease; (*c*) date when chemotherapy was started and dates and results of bacteriological tests (if no positive culture results were recorded, further results were requested four months after the date of notification); (*d*) whether the patient had ever been treated for tuberculosis.

To ensure confidentiality only those who were co-ordinating the survey had access to the documents and the copies of the notification forms were destroyed when the analysis was completed.

Sensitivity tests to antituberculosis drugs—The results of sensitivity tests given are from the six regional centres for tuberculosis bacteriology and the Mycobacterial Reference Unit of the Public Health Laboratory Service (PHLS) because they all use standard techniques and definitions. The Communicable Disease Surveillance Centre of the PHLS co-ordinated their contribution to the survey.

Results

The check at the end of the survey indicated that the 4838 notifications received by the TCDU were all the notifications for England and Wales for the six months. The TCDU removed the duplicate notifications for 71 patients who were notified twice and three who were notified three times. The following categories of patients were excluded: those already notified before the survey (34); those receiving chemoprophylaxis (363); those in whom the diagnosis was changed (174); those who were notified after death but whose disease was inactive (18); and those who had had previous treatment for tuberculosis (440). The main analysis was thus restricted to 3732 newly notified, previously untreated patients (including 131 patients with active disease who were notified after death, 45 of whom had started treatment). Patient forms were received for 99·8% of the 3732 patients—that is, all except 7.

TABLE I—*Ethnic origin and type of disease. Results are numbers (percentages) of patients*

Ethnic origin*	Total	Respiratory only	Non-respiratory only	Respiratory and non-respiratory
White	2125 (57)	1696 (64)	340 (40)	89 (35)
Indian	897 (24)	502 (19)	296 (35)	99 (39)
Pakistani and Bangladeshi	426 (11) (35)	248 (9) (29)	137 (16) (51)	41 (16) (55)
West Indian	76 (2)	52 (2)	21 (2)	3 (1)
African	50 (1)	31 (1)	13 (2)	6 (2)
Arab	40 (1)	25 (1)	11 (1)	4 (2)
Chinese	33 (1)	22 (1)	9 (1)	2 (1)
Other†	76 (2)	48 (2)	18 (2)	10 (4)
Unknown	9 (<1)	6 (<1)	3 (<1)	0 (0)
Total in 6 months	3732 (100)	2630 (100)	848 (100)	254 (100)

*Based on *National Dwelling and Housing Survey*.[1]
†Including patients of mixed origin.

There were differences between the TCDU figures and the corrected total of notifications submitted in the two relevant quarterly returns to the Office of Population Censuses and Surveys (OPCS) by the MOEHs. The TCDU, however, had much fuller information about the patients. The TCDU's total number of *patients* notified (including the previously treated group) was 4172 compared with the 4496 notifications received by the OPCS, the latter being in excess by 8%. If the patients notified after death are excluded the figures were 4021 and 4395, respectively, the latter being in excess by 9%.

CLASSIFICATION OF DISEASE

The disease was classified as respiratory only in 2630 (70%) of the 3732 patients, non-respiratory only in 848 (23%) patients, and both in 254 (7%) patients. Thus, 77% had respiratory lesions and 30% non-respiratory lesions.

ETHNIC ORIGIN AND TYPE OF DISEASE

Most of the patients were either of white or of Indian subcontinent (Indian, Pakistani, or Bangladeshi) ethnic origin (table I). All other ethnic groups together contributed only 8%. The Indian subcontinent patients contributed nearly one-third of the respiratory cases and over half of the non-respiratory cases. Of the 2125 white patients, 80% had respiratory disease only, 16% non-respiratory disease only, and 4% both, whereas the proportions for the 1323 Indian subcontinent patients were 57%, 33%, and 11% respectively.

NOTIFICATION RATES

To estimate the notification rates for each ethnic group (table II) the population figures were derived from a *National Dwelling and Housing Survey*[1] of England (thus Wales could not be included). The differences between the rates for the different groups were considerable. The highest rates occurred in the Indian and in the Pakistani and Bangladeshi groups and the lowest in the white group. The differences in the non-respiratory rates between the white group and the Indian subcontinent ethnic groups were even more striking. The West Indians had the lowest rates of the non-white groups, for both respiratory and non-respiratory disease.

As 92% of the cases in the analysis were of white, Indian, Pakistani, or Bangladeshi ethnic origin, the rates are given in table IIIm by age and sex for these groups, and the rest of this report concentrates on them. The overall rates and the respiratory rates were higher for white males than for white females, the highest rates occurring in older men, whereas the rates among the Indian and the Pakistani and Bangladeshi groups were consistently higher in females than in males.

PATIENTS UNDER 15 YEARS OF AGE

Of the 3732 patients, 353 (9%) were aged under 15 years, including 176 (8%) of the white, 74 (8%) of the Indian, and 61 (14%) of the Pakistani and Bangladeshi groups. Overall 10% of respiratory cases and 10% of non-respiratory cases were in this age group. The rates of respiratory disease were 3·0 per 100 000 for the white group compared with 63 for those of Indian subcontinent ethnic origin born in the UK and 114 for those born abroad. (The findings were similar for the Indian and the Pakistani and Bangladeshi groups.) The rates for non-respiratory disease were 1·0 for the white group, 21 for those of Indian subcontinent ethnic origin born in the UK, and 98 for those born abroad.

SITES OF NON-RESPIRATORY LESIONS

Lymph nodes were the most common non-respiratory site (table IVm), particularly in Indian subcontinent patients. In contrast, the proportion of patients with genitourinary disease was much higher in the white group, as was the proportion with disease affecting the central nervous system.

MINIPRINT TABLES III-VI

IIIm

TABLE III—*Estimated annual notification rates for 1978-9 of newly notified, previously untreated cases per 100 000 population of England by age and sex for the main ethnic groups*

Age (years)	White M	White F	Indian M	Indian F	Pakistani and Bangladeshi M	Pakistani and Bangladeshi F
All cases						
<15	3·4	3·4	75	108	116	150
15-34	7·5	6·5	381	516	380	695
35-54	13·8	6·5	353	562	380	690
55 or more	25·9	8·9	810	979	428	676
All ages	12·4	6·7	297	420	286	464
All respiratory cases						
<15	3·0	3·0	52	73	97	103
15-34	6·3	5·4	270	363	259	442
35-54	12·6	4·7	241	397	257	466
55 or more	23·8	6·0	618	593	362	423
All ages	11·2	4·9	210	268	204	303
All non-respiratory cases						
<15	0·8	1·3	25	47	37	62
15-34	1·4	1·4	138	222	150	310
35-54	1·5	2·0	160	221	145	351
55 or more	2·9	3·4	343	475	99	338
All ages	1·6	2·1	116	201	105	213

IVm

TABLE IV—*Sites of non-respiratory disease in 1102* patients with or without a respiratory lesion for the total and main ethnic groups. Results are numbers (percentages) of patients*

Site	Total	White	Indian, Pakistani, and Bangladeshi
Lymph nodes:	511 (46)	134 (31)	323 (56)
Cervical	467 (42)	121 (28)	297 (52)
Other	55 (5)	14 (3)	33 (6)
Bone and joint:	163 (15)	55 (13)	97 (17)
Spine	61 (6)	17 (4)	40 (7)
Knee	23 (2)	9 (2)	11 (2)
Hip	11 (1)	6 (1)	4 (1)
Elbow	9 (1)	3 (1)	6 (1)
Ankle	15 (1)	5 (1)	10 (2)
Wrist	11 (1)	8 (2)	2 (<1)
Other	38 (3)	10 (2)	25 (4)
Genitourinary tract:	154 (14)	127 (30)	23 (4)
Kidney and urinary tract	103 (9)	85 (20)	15 (3)
Female genital	30 (3)	26 (6)	4 (1)
Male genital	31 (3)	26 (6)	4 (1)
Abdominal	116 (11)	37 (9)	66 (12)
Central nervous system:	52 (5)	35 (8)	12 (2)
Meninges	48 (4)	33 (8)	10 (2)
Other	5 (<1)	3 (1)	2 (<1)
Miliary	25 (2)	12 (3)	10 (2)
Abscesses	61 (6)	25 (5)	32 (6)
Pericardium	14 (1)	2 (<1)	12 (2)
Cutaneous	24 (2)	17 (4)	5 (1)
All other sites	44 (4)	16 (4)	21 (4)
Total number of patients in the 6 months	1102 (100)	429 (100)	573 (100)

*Eighty-four patients had more than one non-respiratory lesion.

Vm

TABLE V—*Independent assessment of posteroanterior chest radiographs in patients with respiratory disease for the total and main ethnic groups. Results are numbers (percentages) of patients*

Radiographic assessment	Total	White	Indian, Pakistani, and Bangladeshi
Respiratory			
Pulmonary lesion*	2026 (78)	1381 (87)	500 (60)
Enlarged nodes only	205 (8)	30 (2)	161 (19)
Effusion only	161 (6)	80 (5)	71 (9)
Enlarged nodes and effusion	3 (<1)	0 (0)	3 (<1)
Calcification only	12 (<1)	9 (1)	3 (<1)
Within normal limits	183 (7)	85 (5)	89 (11)
Total number of patients assessed	2590 (100)	1585 (100)	827 (100)
Pulmonary			
Extent of disease:			
Miliary	25 (1)	9 (1)	15 (3)
Gross	37 (2)	32 (2)	5 (1)
Extensive	242 (12)	203 (15)	37 (5)
Moderate	277 (14)	197 (14)	64 (13)
Limited	643 (32)	314 (23)	92 (18)
Slight	930 (46)	585 (42)	274 (55)
Trivial	72 (4)	41 (3)	24 (5)
Extent of cavitation:			
Extensive	52 (3)	40 (3)	7 (1)
Moderate	126 (6)	105 (8)	16 (3)
Slight	304 (15)	214 (15)	66 (13)
Nil	1544 (76)	1022 (74)	411 (82)
Total number of patients with pulmonary lesions	2026 (100)	1381 (100)	500 (100)

*In addition to a pulmonary lesion enlarged nodes were present in 76 of the patients including 20 of the white and 49 of the Indian, Pakistani, and Bangladeshi patients).

VIm

TABLE VI—*Results of smear and culture examinations in patients with respiratory disease only* and pulmonary disease only.† Results are numbers (percentages) of patients*

	Respiratory disease only: Total	White	Indian, Pakistani, and Bangladeshi	Pulmonary disease only† Total	White	Indian, Pakistani, and Bangladeshi
Culture positive	943 (36)	714 (42)	166 (22)	880 (46)	666 (50)	156 (36)
Smear positive	415 (16) (58)	290 (17) (66)	102 (14) (41)	303 (16) (69)	219 (16) (73)	65 (15) (57)
Smear negative	162 (6)	108 (6)	39 (5)	128 (7)	85 (6)	29 (7)
Culture negative	640 (24)	351 (21)	290 (32)	411 (22)	258 (19)	123 (28)
No culture result	470 (18)	233 (14)	204 (27)	176 (9)	103 (8)	64 (15)
Total number of patients assessed	2630 (100)	1696 (100)	750 (100)	1898 (100)	1331 (100)	437 (100)

*Because bacteriological results from both sites were not always available for patients with a non-respiratory lesion as well.
†Based on numbers of patients considered by the independent assessor to have a pulmonary lesion.

RADIOGRAPHIC ASSESSMENTS

A posteroanterior radiograph taken between six weeks before and four weeks after the start of chemotherapy was available for assessment for 2590 (90%) of the 2884 patients with respiratory disease. Of the 183 patients whose radiographs were considered by the assessor to be within normal limits (table Vm), 51 had positive bacteriological results and 11 had a non-respiratory lesion. Of the remainder, 112 were thought by the clinician (who often had other radiographs) to have a radiographic abnormality and 9 patients were treated because of symptoms.

A higher proportion of the white patients had a pulmonary lesion, whereas nodal enlargement only was more common in Indian subcontinent patients. "Moderate" (based on ref[3]) or larger lesions were reported in a higher proportion of white patients than Indian subcontinent patients. Cavitation was more common and more severe in the white patients. Among those with cavitation 40% of the white patients had "moderate" or "extensive" (based on ref[4]) cavitation compared with 26% of the Indian subcontinent patients.

BACTERIOLOGICAL RESULTS FOR PATIENTS WITH RESPIRATORY DISEASE

Smear and culture—More than half of the patients with respiratory disease had a positive culture (table VIm), nearly all from sputum, and 36% had a positive smear, the proportions being higher in white patients than in Indian subcontinent patients. The differences between the ethnic groups remained for patients with a pulmonary lesion at independent assessment.

white ethnic origin born in the UK is increasing, the information about the ethnic origin of the patients is also of special value.

In a Medical Research Council survey of new cases of bacteriologically confirmed pulmonary tuberculosis in adults in 1955-6[5] fewer than 1·9% of the patients came from countries other than Britain and Ireland, but in 1963[6] this proportion had risen to 10% (out of the 4% of the population born abroad). The British Tuberculosis Association found[7] that for 1965 14·3% of all respiratory notifications in England and Wales were from the 4% of the population born abroad, and for 1971[8] the corresponding figures were 26·2% and 5%. In 1978 individuals of non-white ethnic origin born in the UK were estimated to comprise 1·4% of the population of England and those born abroad 2·4%. These two groups contributed 4% and 34%, respectively, of the respiratory cases in the present survey.

This survey provides, for the first time, valid estimates of the annual notification rates for the different ethnic groups in England. These rates for 1978-9 were much lower for the white than for any other ethnic group. Rates per 100 000 population for previously untreated respiratory disease were: white 7·9, West Indian 21·5, Indian 237, Pakistani and Bangladeshi 241. The corresponding rates for non-respiratory disease were lower, particularly in the white group: 1·9, 9·3, 156, and 147, respectively.

The 353 children (under 15 years old) in the survey comprised 9% of the total number of patients in the survey. The rates, both

TABLE II—*Estimated annual notification rates for 1978-9 of newly notified, previously untreated cases per 100 000 population of England by ethnic origin, and total for Wales.*

Ethnic origin	Population estimate* (thousands)	All cases		All respiratory cases		All non-respiratory cases	
		Notifications per 100 000	Ratio to white rate	Notifications per 100 000	Ratio to white rate	Notifications per 100 000	Ratio to white rate
White	43 320	9·4	1·0	7·9	1·0	1·9	1·0
Indian	525	354	38	237	30	156	82
Pakistani and Bangladeshi	248	353	38	241	31	147	77
West Indian	514	29·6	3·1	21·5	2·7	9·3	4·9
African	79	124	13	92	12	47	25
Arab	39	205	22	153	19	74	39
Chinese	65	102	11	74	9	35	18
Other	242	63	7	48	6	23	12
Total for England	45 779†	16·4		12·7		4·9	
Total for Wales	2 768	13·5		10·8		3·7	

*Based on *National Dwelling and Housing Survey*[1] for England and on *OPCS Monitor*[2] for Wales.
†Including 747 000 whose ethnic origin was not properly classified.

Sensitivity tests—Of the 1070 strains with sensitivity test results to streptomycin, isoniazid, rifampicin, and ethambutol, 1038 (97%) were fully drug-sensitive, 24 (2·2%) were resistant to a single drug (12 to streptomycin, 12 to isoniazid), 7 were resistant to both streptomycin and isoniazid, and 1 was resistant to streptomycin, isoniazid, and rifampicin. Only 13 (1·6%) of the 801 strains obtained from white patients were resistant, 10 to a single drug (7 to streptomycin, 3 to isoniazid), and 3 to both. Of the 200 strains from Indian subcontinent patients, 15 (7·5%) were resistant, 12 to a single drug (4 to streptomycin, 8 to isoniazid), and 3 to both.

Discussion

The current system of notifying tuberculosis provides no information on the severity or characteristics of respiratory tuberculosis. This survey has established that sputum-positive pulmonary tuberculosis is still a substantial problem in England and Wales. Nearly a quarter of the patients with respiratory disease had large pulmonary lesions and well over half had positive cultures for tubercle bacilli, this proportion increasing to nearly three-quarters of those with pulmonary lesions. For the first time there are details for England and Wales of the sites of tuberculosis for a very large number of patients (1102) with non-respiratory disease. Because the number of people of non-

respiratory and non-respiratory, for children of Indian subcontinent ethnic origin born in the UK were much higher than those for white children. For example, the rates for respiratory disease were 3·0 per 100 000 for white children and 63 for children of Indian subcontinent ethnic origin born in the UK and 114 for those born abroad. This may be due to a higher environmental risk, to a lower host resistance, or to exposure to infection during visits to their parents' country. These findings are paralleled by estimates of the annual risk of infection with tubercle bacilli, which were calculated from the results of a national tuberculin survey in Great Britain undertaken in 1971-3 in 6 and 12 year olds.[9] The estimated annual risk of infection was low (0·07%) for children born in the UK to parents both of whom were born in the UK, higher (0·50%) for children born in the UK to Asian parents, and highest (1·65%) for children born abroad of Asian parents. Tuberculosis in childhood is clearly still a problem in England and Wales, and policies for case-finding, BCG vaccination, and chemoprophylaxis must continue to take this into consideration.

There were many differences in the pattern of tuberculosis between the white and the Indian subcontinent patients. Among those with respiratory disease the Indian subcontinent patients less often had lung lesions on the posteroanterior chest radiograph but more often had solitary mediastinal lymphadenopathy.

Their lung lesions were on average smaller, owing partly to the age structure of the groups, and were less often and less extensively cavitated. Furthermore, white patients with pulmonary lesions more often excreted tubercle bacilli: 73% were culture-positive compared with 57% of Indian subcontinent patients; 50% and 36%, respectively, were smear-positive and so likely to be infectious.[10]

Non-respiratory lesions were more common in Indian subcontinent patients, and of those with lesions 56% had lymph node tuberculosis (cervical in most) compared with 31% of white patients, confirming the findings of the 1971 survey.[8] Both surveys have shown that genitourinary lesions comprise only a small proportion of the non-respiratory lesions in Indian subcontinent patients, compared with about one-third of those in white patients. Bone and joint lesions accounted for about one-seventh of the lesions in both the white and the Indian subcontinent groups and about a third affected the spine, suggesting that there are about 120 new cases of spinal disease a year in England and Wales. Tuberculous meningitis is still not rare (there were 48 cases in this six-month survey).

Possible explanations for these differences are: Indian subcontinent patients may be diagnosed earlier (some possibly on suspicion only) and a higher proportion may be detected, explaining in part the higher rates; there may be differences in the host-parasite relationship[11] (P J Cole, unpublished observations) and also in the balance between endogenous and exogenous disease[12] in the different ethnic groups.

Two surveys of initial drug resistance to antituberculosis drugs in pulmonary disease conducted by the MRC in 1955-6[2] and 1963[3] showed that resistance to isoniazid or streptomycin, or both, in the British-born was uncommon: 2·7% in the first survey and 2·4% in the second. In the present survey the frequency of resistance in respiratory disease was 3%; in white patients it was 1·6%, reflecting the high efficacy of chemotherapy in Britain over many years. Resistance was more frequent in Indian subcontinent patients but not markedly so (7·5%), and resistance was nearly always to a single drug, streptomycin or isoniazid. These, too, are reassuring findings.

People of Indian, Pakistani, or Bangladeshi ethnic origin are a small, easily identifiable, high-risk group, who tend to congregate in communal areas in certain cities. They are closely supervised by the medical services, including general practitioners, community medicine specialists, and the chest service staff, all of whom are aware of the importance of examining them as soon as possible after their arrival in Britain and at intervals thereafter. Furthermore, they co-operate well with health programmes. Clearly, the energetic programmes of case-finding and chemotherapy, supported by BCG and chemoprophylaxis, must be sustained and wherever possible intensified.

Middle-aged and elderly white men make up another high-risk group, as do the homeless and alcoholics, who require special and intensified efforts.[13,14] It is relevant that the number of white men aged 55 or more with respiratory disease in the survey was 615 compared with a total of 890 patients of all ages and both sexes of Indian subcontinent ethnic origin. The contrast for the smear-positive patients was even more striking: 281 and 166, respectively.

Although special efforts were made to try to ensure that every patient who should have been notified during the survey period was notified, there is no doubt that this did not happen (P Kilbane, personal communication). The chest service is in general aware of the importance of notifying patients, but this is more likely to be overlooked in other specialties and, therefore, in particular for non-respiratory disease. This survey has shown how valuable notifications are as a basic source and how important it is that they should be as complete as possible.

The success of this survey was due to the enthusiastic co-operation of all (over 200) medical officers for environmental health (proper officers) in England and Wales, all (nearly 450) chest physicians and general physicians with a special interest in chest diseases, and over 400 clinicians in other specialties who provided information and chest radiographs; and to nursing staff, secretaries, and records officers of many hospitals and chest clinics, and to the infectious diseases clerks and other local authority staff.

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Requests for reprints should be addressed to: MRC Tuberculosis and Chest Diseases Unit, Brompton Hospital, Fulham Road, London, SW3 6HP.

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ONE HUNDRED YEARS AGO Resulting from circumstances disclosed at three recent inquests held on the bodies of prisoners in Her Majesty's Prison of Clerkenwell, a Committee is announced to be in the course of formation with the object of bringing under the notice of the Government and the public the dietary and treatment of short-term prisoners, as well as the allegation that in the prison referred to there are cells unfit for delicate men. To this end, the aid of the Howard Association will be invoked. Two of the inquests were held last Saturday, one of the cases resulting from the suicide of a prisoner named Hellier, aged 17, a Great Northern Railway van-attendant, who, by reason of his term of imprisonment being only one month, received only bread and water for breakfast and supper, with porridge for dinner. In the other case, that of John Harvey, who died from acute pneumonia, and whose sentence was two months' imprisonment, the dietary was as follows: Breakfast daily—bread, six ounces; gruel, one pint. Dinner, Sunday and Monday—bread, six ounces; suet pudding, eight ounces; Friday—bread, six ounces; potatoes, eight ounces; Tuesday, Thursday, and Saturday—bread, six ounces; soup, half a pint. Supper—bread, six ounces; gruel, one pint. It is stated that the mortality among short-term prisoners in this gaol is very large on account of insufficient food, and that hence an inquiry is necessary. (*British Medical Journal*, 1880.)