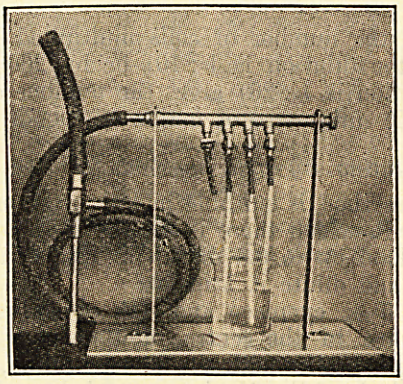
3. Remove alcohol with ether.
4. Pass air through to dry the pipette, so that the bead rolls freely in the bulb.

It is a very laborious process to clean the pipettes by blowing through them, further, one cannot dry them properly by blowing, as expired air is laden with moisture. The pipettes can be cleaned easily and dried by attaching them to a suction pump (figure 6), or when this is not available by attaching them to a syringe.

Fig. 6.



Suction pump for cleaning pipettes.

If the cells clog the tip or any part of the capillary tube, loosen them by inserting a stiff horse hair.

If there is albuminous matter in the bulb, fill it up either with saturated solution of NaOH or potassium bichromate cleaning solution, keep overnight in the 37°C. incubator, and clean next morning.

Cleaning counting chamber and coverslip

Wash the ruled side of the counting chamber and the coverslip in running water. Thoroughly dry, first with a clean cotton handkerchief and finally with a silk handkerchief or selvyt cloth or lens paper, but avoid rubbing the ruled area of the counting chamber.

From time to time the counting chamber and the coverslip should be wiped with alcohol or acetone to remove any grease and then dried with the silk handkerchief, but on no account should the counting chamber be immersed or freely cleaned with alcohol.

If the rulings become faint after long use, the lines may be made prominent by lightly rubbing with a silk cloth on which graphite (lead from a pencil) has been rubbed.

Normal standards

The number of red cells per c.mm. is usually given in textbooks as 5,000,000. This figure is too low for men and too high for women. The mean of a number of counts in different populations is given in the table.

It will be seen that there is a striking uniformity in the counts in different populations, compared for example with the hæmoglobin estimations in the same range of populations.

REFERENCE

These were given in part I (*I. M. G.*, February 1940).

HOSPITAL ORGANIZATION WITH SPECIAL REFERENCE TO CONDITIONS IN INDIA

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THE population of British India in 1936 was 281,866,639. The birth-rate and death-rate were 35 per mille and 23 per mille, respectively. The infantile death-rate per 1,000 live births was 162. As against this, in 1937 the birth-rate and death-rate in England and Wales were 14.9 and 12.4 per thousand, respectively, the infantile

Table showing the normal red cell counts of different populations

Sex	Age	Locality	Economic status	Number	Mean red cell per c.mm. in millions	Standard deviation	Authority
Males	19–30	Bombay	Students, etc.	121	5.110	± 0.380	Sokhey *et al.*, 1937.
	25–45	Calcutta	Mixed	50	5.362	± 0.633	Napier and Das Gupta, 1935*a*.
	20–45	„	„	30	5.533	± 0.490	„ „ „ 1936.
	19–30	Assam	Coolies	24	5.353	± 0.620	„ „ „ 1935*b*.
	19–30	„	„	20	5.270	± 0.710	„ „ „ 1936.
		Cachar	„	25	5.057	± 0.563	Napier and Majumdar, 1938.
	Adults	U. S. A.	..	..	5.400	..	Castle and Minot, 1936.
	„	Britain	..	..	5.690	..	Whitby and Britton, 1939.
	„	„	..	..	5.428	..	Price-Jones, 1931.
Females	16–30	Bombay	Middle class	101	4.470	± 0.330	Sokhey *et al.*, 1938.
	14–38	Calcutta	..	125	4.615	± 0.409	Napier, 1939.
	17–30	Delhi	Middle class	101	4.560	± 0.250	Benjamin, 1939.
		Cachar	Coolies	25	4.454	± 0.705	Napier and Majumdar, 1938.
		Assam	„	20	4.550	± 0.650	Napier and Bilimoria, 1937.
		Britain	..	..	4.800	..	Whitby and Britton, 1939.
		„	..	..	5.012	..	Price-Jones, 1931.
	18–22	Michigan	Students	50	4.750	..	Bethel, 1936.

mortality was 58 per 1,000. The average yearly deaths for British India for 1927 to 1936 were 6,326,893. The mean mortality figures from the principal diseases were as follows :—

Small-pox	82,529	
Plague	52,238	
Dysentery and diarrhœa	249,983	
Cholera	222,181	
Respiratory diseases ..	426,725	
Malaria	1,506,064	(1934–36)

These figures speak for themselves; there is no need to comment on the conditions prevailing in India. It must not be imagined that conditions have always been satisfactory in Great Britain. In this connection it would be of interest to review the development of the health services in England. England and Scotland throughout the Middle Ages and down to the nineteenth century were periodically ravaged by epidemics of plague, cholera and small-pox. During the period of the 'Black Death', it is estimated that about one-third of the population died of the disease. During a part of the eighteenth century one child out of every three under the age of 5 in Glasgow died of small-pox. The conditions began to improve in the nineteenth century.

In a recent paper in the *British Medical Journal* (25th February, 1939) the development of the responsibility of the State for public health in England was described. The first Sanitary Commission to investigate the general condition of the health of the labouring population of Great Britain was appointed and Chadwick was the author of the report which became, and has remained ever since, an authoritative presentation of the medical aspects and needs of the social life of the people. It was followed by a long series of public enquiries and Royal Commissions in which medical men played a prominent part. The result was that the state set up a central health organization (formerly the Local Government Board and now the Ministry of Health), divided the country into sanitary districts, and made each district self-governing, on lines laid down by Parliament with reference to sanitation, water-supply, sewage disposal, housing, nuisances, the suppression of the causes of disease, food inspection, and the correct certification of sickness and death; these legislative measures found expression in the Public Health Act of 1875 and four score of subsequent enactments. It is significant that as these acts succeeded one another, the measures they instituted became more personal, more direct and more medical, so that to-day the public health services administered by local authorities and their numerous medical officers are concerned, not only with the subject of external environment but with health and disease of the individual, *e.g.*, with industrial hygiene, maternity and infant welfare, the school medical service, the provision of the Cleansing of Person Acts, the direct treatment of communal diseases (including fevers, tuberculosis, venereal diseases, rheumatism, blindness and lunacy), the provision of institutions (clinics, hospitals, sanatoria, and special schools for defective children), a health and unemployment insurance system, medical research, the education of the people in health, international sanitary laws, and the imposition of statutory duties on the medical profession on behalf of preventive medicine. How great has been the expansion is indicated by the official report of the Treasury of the fact that in 1900 the nation spent 31 millions on public social services in England and Wales (education, public health, lunacy, poor relief) whilst in 1932, the sum had risen to 430 millions (including insurance and pensions). Here is a gigantic scheme of national, social, and health enterprises for the welfare of the people, and with this scheme the medical profession is now intimately associated as adviser or agent. If India is to solve her pressing medical and public health problems in a satisfactory manner an organization on similar lines to those in Great Britain, but modified with due regard to conditions in India, will have to be set up in the near future.

One of the most important of the many urgent problems in this connection is the provision of adequate hospital accommodation for the people, which is the only way in which expert medical aid can be administered to the people in case of sickness and debility of a serious nature.

A brief reference to the history of origin of hospitals will not be out of place here. In the early days of the Christian era no establishments were founded in Europe for the relief of the sick till the time of Constantine. The connection between monasteries and hospitals became well established between A.D. 1000 and 1050. The Caliph Harun-al-Rashid (A.D. 736–809) attached a college to every mosque and to that again a hospital. The Buddhists in India had their hospitals as early as 260 B.C.; Hindustan could then boast of many hospitals founded by

TABLE I

Average area and population served by each hospital or dispensary

Province	Total number of hospitals and dispensaries in the province	Average area served by each hospital or dispensary (sq. miles)	Average population served by each hospital or dispensary
Madras ..	1,134	126	41,217
Bombay ..	429	180	41,940
Bengal ..	1,449	540	34,585
United Provinces	597	178	81,087
Punjab ..	896	111	26,318
Central Provinces	343	291	45,212
Bihar ..	528	131	61,310
Delhi ..	24	24	26,510
Baluchistan ..	41	1,327	11,305
Ajmer-Merwara	10	271	56,029

the Emperor Asoka. The one at Surat, made famous by travellers, and considered to have been built under the Emperor's second edict, is still in existence. It will thus be seen that hospitals are by no means a new institution to this country, though the hospitals of Asoka were swept away with the revival of Brahmanism, and a complete hiatus exists between the hospitals he introduced and those that were refounded by the British many centuries later.

TABLE II

Expenditure on medical relief (per capita and per square mile)

Province	EXPENDITURE ON MEDICAL RELIEF DURING 1936	
	Per capita	Per square mile
	Rs. As. P.	Rs. As. P.
Madras ..	0 2 7	53 2 5
Bombay ..	0 4 9	65 7 0
Bengal ..	0 2 1	84 0 0
United Provinces	0 1 0	29 0 4
Punjab ..	0 5 7	51 12 9
C. P. and Berar	0 1 5	13 11 10
Bihar ..	0 1 3	35 11 8
Assam ..	0 1 8	14 5 5
Delhi ..	1 2 5	1,272 0 0
Baluchistan ..	0 8 8	4 9 9
Ajmer-Merwara	0 4 11	63 0 10

It has now been recognized on all hands that hospitalization is essential for the efficient treatment of various diseases. It has been estimated that 4.5 beds for sick and chronic cases per 1,000 of the population are required. In actual practice in more advanced countries this figure ranges from 1.5 in Japan to 5.8 in Sweden.

As regards India, the appended tables illustrate the various points raised herein. These tables have been prepared from the data provided in the *Indian Medical Review* by Major General E. W. C. Bradfield, Director-General, Indian Medical Service (Government of India publication, 1938), a book which contains a mine of information regarding hospitals and dispensaries in India and which has been freely used in this article.

The number of hospitals or dispensaries serving a certain number of people varies widely in India, the figures range from one institution serving 11,305 people in Baluchistan to 81,087 people in the United Provinces. The expenditure on medical relief during 1936 varied from one anna per capita in the U. P. to Rs. 1-2-5 per capita in Delhi. England spent £2-14-9 per head on health services in 1927. According to the Chief Medical Officer of the Ministry of Health there were 1,846 hospitals with 215,450 beds in England and Wales in 1933, exclusive of mental institutions and fever hospitals. The number of beds per 1,000 of the population was therefore roughly 5.3. There were 88,691 beds in the various hospitals of British India in 1937 (*vide* Table III). That the number of hospital beds per thousand of population was about 0.3, including fever hospitals and mental institutions, shows how important and urgent the problem of increase of hospital accommodation is to the country.

Out of the total number of 10,269 doctors (*vide* table IV) attached to various hospitals and dispensaries in British India, only 8,786 were stipendiary. Out of the total strength of 9,746 of the nursing staff (*vide* table V), there were only 6,317 nurses (including matrons, assistant matrons, sisters, staff nurses and probationers) to look after 88,691 beds, *i.e.*, 14 cases per nurse for 24 hours.

There is an undoubted and pressing need for improvement in the situation but how can this be effected. Hospitals, including dispensaries, can be run by several authorities acting more or less independently or in concert, *viz*, the State, the local authorities such as municipal bodies, and voluntary organizations. There is a tendency in India to expect the state to do everything, but even in Great Britain and other rich countries, such as the United States of America, the state is not able to shoulder the whole burden. The State already provides 39 per cent of the beds in the hospitals of British India, the figure being 60 to 100 per cent in some Provinces.

The British Medical Association has reviewed the whole position in England and made its recommendations. The Association recognizing that hospital accommodation in any given area may be provided by voluntary bodies or by statutory authorities or by any combination of these, believes that the continuance of voluntary hospitals in England is in the public interest. By reason of the Local Government Act 1929, there has been from April 1930 onward development of hospital services by local authorities. It is laid down in the Local Government Act 1929 that the local authority must recover (the position being slightly different in Scotland) from every hospital patient (save in the case of infectious diseases) the whole of the expense incurred in the maintenance and treatment of such patients, or, if the authority be satisfied that the person cannot reasonably pay the whole, then such part as that authority decides he, or she, is able to pay. The local authority may, however, by agreement with any association or fund (such as a hospital saving association or contributory fund) accept an agreed sum for the hospital expenses in respect of any member thereof. An extensive development of contributory schemes for hospital benefit should result from this. For a relatively small periodic contribution to such a fund, the payment of hospital expenses in time of illness can be insured against, and the patient or the person liable to maintain the patient will not then be called upon to meet the demand of the local authority for payment of the whole expense, either at once or in a series of instalments, during and after the illness, when

the financial capacity to pay is least. Complete co-operation of a voluntary and a council (municipal) hospital in an area will necessitate dealing with the question of patients' payments in a similar way in both institutions. In both the voluntary and council hospitals the worker and his dependents must be asked to pay the maintenance and treatment charges appropriate to their financial status. There is no doubt that, alike for the prospective patient and for the hospital, an agreed payment under a contributory scheme organized by a responsible committee in the area offers the simplest and most satisfactory method; it relieves the patient from irksome enquiries and financial stress at the time of the illness, lessens the administrative work of the hospital, and in the case of voluntary hospitals will solve the financial difficulties which beset so many hospitals in large industrial communities. Persons insured under the National Health Insurance Acts, and other persons below an agreed income, may be accepted for hospital treatment as contributing patients on a contributory scheme or on individual payment, or

TABLE III

Total number of beds in hospitals in various provinces of British India run by the State and other authorities

Province	Government	Municipal or District Board	Missionary	Private	Total	Percentage, Government
Madras	8,898	1,312	5,494	501	16,205	54
Bombay	4,612	2,821	2,409	2,289	12,131	38
Bengal	3,845	2,314	1,132	3,037	10,328	37
United Provinces ..	3,437	4,677	957	2,148	11,219	30
Punjab	4,768	7,080	1,647	835	14,330	33
Bihar	2,657	2,566	1,061	1,625	7,909	33
C. P. and Berar ..	1,478	1,476	1,838	577	5,349	25
Assam	1,939	507	435	331	3,212	60
Sind	787	657	78	358	1,880	41
Orissa	616	581	114	283	1,594	38
Delhi	462	216	140	528	1,346	34
N.-W. F. Province ..	591	676	377	73	1,717	34
Baluchistan ..	541	0	0	49	590	91
Ajmer-Merwara ..	244	0	0	0	244	100
Coorg	160	14	0	0	174	92
Central India Agency ..	64	37	0	362	463	13
TOTAL ..	35,099	24,934	15,682	12,976	88,691	39% (average)

TABLE IV

The total number of doctors employed in various hospitals in British India.

Province	Hospitals with in-patients		Hospitals without beds		Total
	Stipendiary	Honorary	Stipendiary	Honorary	
Madras	931	398	808	9	2,146
Bombay	762	389	132	4	1,287
Bengal	570	417	1,231	0	2,218
United Provinces ..	666	104	87	3	860
Punjab	1,101	26	119	1	1,247
Bihar	368	40	370	0	778
C. P. and Berar ..	375	38	101	3	517
N.-W. F. Province ..	87	1	34	2	124
Assam	155	1	247	0	403
Sind	124	11	21	1	157
Orissa	193	5	98	0	296
Baluchistan ..	49	0	0	0	49
Ajmer-Merwara ..	16	0	2	0	18
Coorg	10	3	8	0	21
Central India Agency ..	28	7	0	0	35
Delhi	84	17	9	3	113
TOTAL ..	5,519	1,457	3,267	26	10,269
	6,976		3,293		

TABLE V

Total number of nurses and midwives employed in the various hospitals of British India

Province	Hospitals with in-patients			Hospitals and dispensaries with out-patients only			Total
	Nurses	Midwives	Male nurses	Nurses	Midwives	Male nurses	
Madras	1,641	640	73	1	505	38	2,898
Bombay	1,308	388	111	13	28	7	1,855
Bengal	860	122	77	5	7	0	1,071
United Provinces ..	439	84	65	4	2	1	595
Punjab	651	331	47	8	1	0	1,038
Bihar	300	123	28	0	8	0	459
C. P. and Berar ..	381	110	30	1	12	1	535
Assam	201	65	16	0	2	0	284
Sind	106	74	0	3	1	0	184
Orissa	70	81	9	1	16	19	196
Delhi	247	20	2	3	0	0	272
N.-W. F. Province ..	56	3	94	0	1	2	156
Baluchistan ..	4	9	78	0	0	1	92
Ajmer-Merwara ..	17	4	23	1	0	2	47
Coorg	0	1	0	0	6	0	7
Central India Agency ..	36	19	2	0	0	0	57
TOTAL ..	6,317	2,074	655	40	589	71	9,746
	9,046			700			

under a financial arrangement made with public authorities, approved societies, employers of labour, insurance companies, and others. The great majority, probably 80 to 85 per cent of all hospital patients, can thus be dealt with and the hospital services can be adequately financed by one or other of these methods. All persons above the agreed income limit should be regarded as private patients and should be prepared to meet the special charges for maintenance and medical services appropriate to that class. Such persons do not normally constitute more than 5 per cent of applicants for hospital service.

A 'clearing house' (*i.e.*, a central bureau) to co-ordinate the distribution of cases requiring admission to the various hospitals and to provide information as to where and when special forms of treatment and other forms of diagnostic help are available, would be desirable under a system of co-ordination of grouped hospitals. It should also co-ordinate the hospital ambulance transport of the area.

In the year 1937, the number of insured persons entitled to the benefit of the Insurance Medical Services in England and Wales was 17,032,000, an increase of 712,000 on that for 1936, while the number of insurance practitioners was 16,800, an increase of 50.

The only way in which India can hope to solve the question of the extreme paucity of the hospital accommodation available for its inhabitants is to develop and finance its hospitals somewhat on the lines on which it is being done in Great Britain and other advanced countries of the world. Now that the old prejudice against hospital treatment is disappearing rapidly and the people are beginning to understand that when one is really ill there is no place better than the ward of a good hospital, there should be no difficulty about it. The only thing which is militating against the hospitals at the present time is the unsatisfactory manner in which many of these institutions are being run, all over the country. I have no doubt that the development of a contributory scheme for hospital benefit in India will succeed and is in fact the only way in which the hospitals can be made efficient with regard to their personnel, equipment and the required number of beds per thousand of population ensured. The state in this country is already doing a great deal towards supplying the hospital accommodation. It makes large grants-in-aid to private medical institutions, local boards and municipalities. Although the amount is substantial, yet it cannot meet the needs of the country. It is not possible for the state to make more contributions without any increase in taxation. Under the circumstances what should be developed further is the voluntary and municipal hospitals. The local authority provides as many as 124,169 beds in general hospitals in England.

The voluntary hospitals can derive their funds from the following sources :—

(*a*) Gratuitous contributions, *i.e.*, contributions from whatever source to which no such conditions are attached (either expressly or by implication) as would involve obligation of service on the part of the hospital, but are charitable contributions to be expended at the discretion of those to whom the management of the hospital is entrusted.

(*b*) Contributions for services rendered, or to be rendered, *i.e.*, contributions for hospital benefit made either by patients themselves or on their behalf by individuals or associations, or, in case of local authorities, payment made for the maintenance and medical treatment of patients for whom these authorities are responsible.

Persons applying for free treatment in such hospital service will have to be certified by the almoner or other officer of the hospital as unable to contribute in any way towards their maintenance and medical treatment. Only then will the hospital benefit be provided by the gratuitous contributions placed at the discretion of the hospital authorities and by the gratuitous services of the visiting medical staffs.

The contributory system has already been introduced in a rudimentary form in many of the provinces in India, though Bengal has not yet taken it up. Poor and indigent patients, both indoor and outdoor, are given free medical and surgical treatment in all provinces in India. They are not charged any fees, nor are they required to pay for any special treatment, or for drugs not ordinarily available at the hospital. Patients whose monthly income does not exceed Rs. 30 p.m. in Madras and Bombay, Rs. 150 in the Punjab, Rs. 100 in Delhi, and with an annual income of less than Rs. 2,000 in the United Provinces and Central Provinces fall into the category of those who are exempted from hospital fees.

In the case of persons employed in factories, mines, quarries, tea estates and railways in Madras, Bombay and Sind, if admitted as in-patients at the instance of their employers, a charge of As. 8 is levied from the employers, but if they attend government hospitals of their own accord they are treated as members of the general public for purposes of hospital charges.

In the Central Provinces and Berar the system of charging a fee of two pice to each new patient, except paupers, attending a hospital or dispensary had been in force since 1933. The amounts received on that account in most cases were insignificant and with a few exceptions there had been an undoubted fall in the out-patients' attendance. It was thought that if the system were conscientiously worked out it was bound to lead to a 'set-back' to the popularity of scientific medicine and the local government therefore allowed its discontinuance in the year 1936.

In the North-West Frontier Province an innovation of interest has been the starting of 'paisa' dispensary, where everybody is required to pay one pice for the day's medicine supplied, and the income thus derived goes towards the running expenses of the dispensary. The success of this dispensary has led to the opening of similar ones elsewhere.

India could with advantage copy the system followed by certain countries on the continent of Europe. The plan pursued is to demand payment from all patients who are admitted to the hospital under a scale of charges divided into three or four grades. The first grade pays a substantial sum and obtains anything or everything the patient may care to have or pay for, subject to the control of the medical attendant. The second pays much less, but a remunerative rate for all they receive at the hospital, and the third and fourth classes are very poor people or paupers, who are paid for on a graduated scale by the municipalities or corporations. The local authorities can levy a medical cess based on the amount of rent paid. Under this system well-to-do thrifty artisans and improvident paupers are all treated by one staff, controlled by one administration, and are located in immediate proximity to each other though in separate pavilions. This plan should be accompanied by a system of health insurance, whereby all classes who desire to be thrifty pay a small annual premium in the days of health, and secure adequate hospital treatment and care when ill. The details of the insurance scheme can be easily worked out by an expert committee. The state can be moved to enact the appropriate laws.

A complaint frequently made against the administration of Indian hospitals is that large numbers of patients who can really afford to pay are treated free of charge. The problem is not simple, because modern scientific medicine is costly, and, although a person may not be indigent as regards the ordinary necessities of life, he is often unable to pay for even minimum requirements when sick. In the absence of an almoner system, hospital abuse is not easy to detect, but is probably less common than is frequently suggested. The increasing employment of honorary medical officers in hospital out-patients departments will probably be a useful corrective, since the final decision as to the patient's eligibility for free treatment rests largely with the doctor.

In order to obtain more funds for the running of hospitals, an almoner system should be instituted in the existing medical institutions. The extension of hospital facilities must depend on a demand from the public. It is for the state to act as a co-ordinating agent between the state, municipal and voluntary hospitals.

BRITISH PHARMACEUTICAL PRODUCTS

Two lists of pharmaceutical products that are made in the United Kingdom are given below; in the first table are included those products which have essentially the same chemical composition as some well-known drugs of foreign, but not necessarily enemy-country, manufacture. The second table gives the drugs which have a similar therapeutic action to those mentioned in the foreign list. Many of the products included in the foreign list will be available in India and some of the British products may not, on account of the restriction in exports at present in force in Great Britain.