

TUBERCULOSIS.

BY

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DEFINITION AND HISTORY.

THE term tuberculosis is derived from *tuber* a roundish swelling or nodule, or *tubercle* a little lump, such lumps or nodules being a characteristic of the disease. Lumps of this character are known to appear in various parts of the body such as the lungs, lymphatic glands, bones, serous membranes, mucous membranes, intestines and liver. The most notable of these affections is the tuberculosis of the lungs. In scientific language this is known as pulmonary tuberculosis. *Pulmona* means a lung, thus pulmonary means affecting a lung. This disease is also called phthisis or consumption, both of which terms mean wasting away or decay. These terms exactly coincide with the Sanskrit term *Kshaya* (क्षय), which too means wasting away or destruction. Pulmonary phthisis is called *Rāja Yakshma* (राजयक्ष्मा) in Sanskrit which means the king of wasting diseases. It was called the white plague in Western medicine. Thus in the East as well as the West the disease was believed to consist in a wasting away of the tissues. This is by no means an incorrect description of the disease, but it gives no indication as to its true cause. Consequently treatment was then more or less a groping in the dark. The disease resulted in heavy mortality, and there was a general feeling of helplessness and fatality. Social misery and heredity were generally considered the chief causes, and there was a prevailing and fixed belief that the disease was incurable and ineradicable. It was in 1865 that the labours of a French scientist showed the first ray of hope, but it was not until 1882 that the true cause was spotted and fixed upon. Dr. Koch, the eminent German scientist, discovered the existence of a bacillus in all tuberculous affections which he named the *tubercle bacillus*. Ever since this discovery the scientific knowledge about tuberculosis has advanced rapidly. A like *tubercle bacillus* has been discovered in domestic animals, especially cattle, and an inter-relation between human and bovine tuberculosis has been established. Congresses have been held at Berlin and London for the consideration of the whole subject of tuberculosis. There have been Royal Commissions in England, the latest of which issued its report a few months ago. The reports of the London Congress held in 1901, which occupy four volumes, afford very interesting reading, and show the lively and intense interest felt in this subject in Europe and America. It is most essential that the public opinion of this country should be aroused, and a lively sense of the potentiality for good which is possessed by advanced European science in this regard should be brought home to our people. One incident in the proceedings of the London Congress on Tuberculosis is characteristic of the acute interest and activity shown by European scientists and European Governments in this subject. Dr. Koch read a paper expressi-

doubts as to the risk of infection from cattle to man. This was treated by all as a most startling heresy. Nevertheless out of deference to Dr. Koch's eminent position it was agreed to treat the question as still open, while continuing the measures about the regulation of meat supply as a matter of safety. But soon a fresh Royal Commission was appointed in England to have the question examined once more, and that Commission has reaffirmed the previous opinion as to the infectiousness of bovine tuberculosis, and the necessity of strict regulations on that account in respect to milk and meat. Thus the discovery of the *tubercle bacillus* by Dr. Koch in 1882 has effected a revolution in the scientific attitude towards the disease. It is now generally recognised that tuberculosis is caused by the *tubercle bacillus* being lodged in the part affected, where it causes a breaking-down and destruction of tissues. Such breaking-down of tissues is a characteristic of all tuberculous diseases.

PATHOLOGY.

The pathological effects of tuberculosis consist in irritation caused by the bacilli and consequent growth of epithelioid cells from the normal fixed cells of the tissue affected. Thus are formed tubercles which are collections of morbidly grown cells. There is a large or "giant" cell in the centre. It is surrounded by smaller epithelioid cells, and outside these there is a zone of leucocytes. The bacilli are scattered amongst the cells. In the earliest stages the tubercle is microscopic, but in the process of growth the smaller cells coalesce into larger ones, and then the cells become large enough to be seen by the naked eye. In their form they resemble millet seeds, and are consequently called miliary at that stage. In the next stage the cells degenerate and appear like cheese, and the process is called "caseation." This degeneration is supposed to be induced by the toxin of the bacilli. Then the cheesy tubercles soften and break down, form abscesses, leave ulcers, and the whole process results in extensive destruction of tissue. There is a contrary process also in progress by which new fibrous tissue is formed. Thus a struggle ensues between the destructive and healing processes by which on the one hand lung tissue is rapidly destroyed and cavities formed, and on the other patches or knots of fibrous tissue are formed for replacing the original tubercles or enclosing the remaining ones. At this stage the disease is called fibroid phthisis. To effect a cure the effort of the physician must be to produce a capacity to resist the destructive process and to help the healing process as far as possible.

DISTRIBUTION.

There seems to be no limit to the prevalence of tuberculosis in point of climate or geographical situation. It prevails in the coldest countries like Greenland and Siberia as well as in the hottest ones like India and Australia. The conditions most favourable to immunity are sunshine, abundant fresh air currents, dry soil, and a certain altitude. Hence an open-air life is most congenial to health, while large centres of population with the worst air conditions

are more subject to tuberculosis. The disease is highly destructive. It is estimated to account for one-seventh of the total human mortality of the world, and in some countries like Russia the proportion is as high as one-fourth. It is a germ disease, but, unlike other germ diseases like plague, it has no periodic remissions. It is ever active and ever destructive. Its world-wide distribution and the relative susceptibility of different countries to its ravages is well illustrated by the rates of mortality prevailing in different countries.

MORTALITY FROM PHTHISIS ACCORDING TO SEX AND AGE.

Another point of view from which the figures of mortality from phthisis need to be considered is the effect of the disease as regards age and sex. According to the experience in European countries, the incidence of phthisis ranges from 15 to 75 years, females being rather less liable than males at ages under 5 years, and more liable at the age of 5 to 20, and again less liable at subsequent ages. Among males phthisis is said to attain its maximum at the age of 45 to 55 and among females at the age of 35 to 45, the real liability commencing between the 15th and the 20th year. The comparative immunity of children under 5 is to be understood as being with reference to phthisis only, other tuberculous diseases such as *Tabes Mesenterica* or tuberculosis of the bowels, and tubercular meningitis being pre-eminently diseases of childhood. In Bombay the same rule is observable with a slight variation. The mortality among females greatly preponderates over that among males between the ages 5 and 30. Beyond 30 up to 60 and over, the balance is generally in favour of females, the mortality in several of the age-periods being less than that of males, except a slight excess in two periods 35 to 40 and 45 to 50. But the total mortality from phthisis of females vastly preponderates over that of males, being as high as 5.66 per thousand as against 2.44 among males. Between the age periods of 5 and 30 the discrepancy between the deaths among males and females is most striking. Thus from 5 to 10 the respective figures are 21 and 73, from 10 to 15 they are 88 and 203, from 15 to 20 they are 254 and 426, from 20 to 25 they are 265 and 425, and from 25 to 30 they are 287 and 377. Between 15 to 25 is the period of the highest death-rate, the period which coincides with the most active period of maternity.

PREDISPOSING CAUSES.

Let us now consider the predisposing causes of phthisis. Certain influences, internal or external, may make a man specially susceptible to an attack from a disease. In medical parlance this is called predisposition. Such causes are occupation, over-crowding and density of population, insanitary dwellings, poverty of living, alcoholism, heredity, and social customs and habits.

HEREDITY.

Heredity was at one time considered a very important element in the development of phthisis. The occurrence of several deaths in a family from

the same disease led to a belief that the disease was due to a taint in the family blood. The discovery that phthisis is due to infection from a foreign substance has led to a revision of the previous view. In the Berlin Congress on Tuberculosis in 1899 Professor Virchow first sounded the note of dissent. He said : " I dispute this heredity absolutely," and cited the cases of new-born infants showing no tuberculosis in them. Experiments have proved the improbability of congenital tuberculosis and of germs remaining latent in the off-spring of tuberculous parents. The occurrence of phthisis among persons of the same family is ascribed to infection arising in the house itself. It is however denied by some writers that children of consumptive parents are specially predisposed, and there is even a theory that the frequent occurrence of phthisis in a family acts as a prophylactic and enables the persons to resist the attack of the poison rather than make them susceptible. But the evidence in support of such a theory is not yet considered sufficient to warrant the conclusion. Though the theory of hereditary transmission is not now generally accepted, family predisposition is still recognised as implying an " increased vulnerability of tissues."

OVER-CROWDING AND DENSITY OF POPULATION.

Over-crowding is a most potent factor in the propagation of phthisis. The relation of the death-rate from phthisis to over-crowding has been definitely ascertained in European countries. Dr. J. B. Russell has shown from a comparison of the mortality returns of Aberdeen, Edinburgh, and Glasgow that " a diminution of the size of dwellings tends to increase the mortality. In Glasgow it was ascertained that excess in the phthisis death-rate over the mean coincided with excess in room-density." It is estimated that 2,000 c. ft. of room-capacity is necessary for a human being. When the occupants of a room are found to exceed that proportion to room-capacity the density is said to be increased. Over-crowding in Bombay is a matter of daily experience. It has reached its acme, and its gravity is brought home to us in a striking manner by the following contrast of the density of population in London and Bombay respectively. It is estimated that out of every 10,000 residents in London, 22 live in rooms occupied by six persons, 21 in those occupied by 7 persons, and 8 in rooms occupied by 8 persons ; whereas in Bombay 2,492 live in rooms occupied by 6 to 9 persons, 1,174 in rooms occupied by 10 to 19 persons, and 288 by 20 or more persons. The respective figures of death-rates from phthisis are equally striking.

INSANITARY DWELLINGS.

Insanitary dwellings is an incident of over-crowding and almost a necessary result of it. In the densely populated parts of Bombay, the surroundings of houses are excessively squalid and stinking. In spite of the efforts of the Health Department, Bombay presents, especially in the thickly

populated parts, a very unclean appearance. The operations of the Improvement Trust are directed towards clearing some of these insanitary areas, but it may take many years before there is a complete renovation of the slums of the city. Living in such conditions must be a fruitful cause of such a disease as phthisis.

ALCOHOLISM.

Alcoholism or drunkenness has been recognised as a powerful predisposing cause of phthisis. The habit of drunkenness debilitates the system, and makes it susceptible of catching tuberculous poison. The atmosphere of the public house adds to the susceptibility. In a paper on Tuberculosis read by Professor Brouardel of Paris before the British Congress on Tuberculosis in 1901, the connection of alcoholism with phthisis was insisted on with considerable emphasis. "Alcoholism," said the Professor, "is the most potent factor in propagating tuberculosis. The strongest man who has once taken to drink is powerless against it." He quotes a pithy saying of J. Simon: "The wretched lodging is the purveyor of the public house," and adds a corollary of his own "that the public house is the purveyor of tuberculosis." He gives a variety of statistics showing that the number of deaths from tuberculosis and from alcoholism are nearly identical, and concludes: "This invasion of alcoholism ought to be regarded by every one as a public danger, and this principle, the truth of which is incontestable, should be inculcated into the masses that the future of the world will be in the hands of the temperate." In another paper read at the same Congress, Alderman McDougall of Manchester remarked: "Drinking to excess causes susceptibility to phthisis." A writer in the *Encyclopædia Britannica* in the article on Tuberculosis controverts the position of Dr. Brouardel, but in my view Dr. Brouardel's estimate is the correct one. It is possible, as is contended, that intemperance acting by itself may cause fewer deaths than phthisis acting alone, but that does not militate against the position that intemperance so weakens the system as to make it an easy prey to tuberculosis. All medical as well as lay experience points to the same conclusion. Dr. Brouardel gives the warning that "any measures, state or individual, tending to limit the ravages of alcoholism will be our most precious auxiliaries in the crusade against tuberculosis." This ought to serve as an additional stimulus to temperance workers, and should give a new direction to their energies.

MEASURES RELATING TO SPITTING.

As observed above, the principal source of infection is inhalation, and the chief medium of communication is the sputum of consumptive persons. The sputum is expectorated matter, either actually spit out or thrown out in the course of coughing or speaking. It may thus be moist as when thrown out into the air in little drops while coughing or speaking, or dried when the sputum thrown out on the ground or walls, is left uncollected and uncleaned,

In the moist form it can at once infect persons who happen to be near the patient, whereas in the dry form it settles as dust in the air or on linen or on the floor. Thus the infected lung produces phlegm and pus containing tubercle bacilli, and the moist or dry particles of the sputum penetrate into other healthy lungs, and create fresh centres of disease and infection. Hence the need of guarding against infection from sputum is most insisted on. The use of the spittoon is strongly advocated for the use of patients as well as healthy persons in their daily life. The spittoon is a familiar household utensil in India, and its use will not need any strenuous advocacy here. The use of the handkerchief for spitting which is much denounced in the Reports is not commonly in vogue in India. The warning against indiscriminate spitting is however not superfluous. In some towns in America spitting in public places is made penal. Various patterns of portable spittoons are devised and elaborate precautions for their cleaning and disinfection are provided. Where public spitting is prohibited, a person is required to carry a spittoon in his pocket. In the Post Office in Paris spittoons are placed in convenient positions, and notices are hung up prohibiting spitting on the floors. A like measure is advocated for the British Post Office, and I presume has been carried out. Such precautions need to be taken in all places where people congregate. In any case it is most essential that the people should be made aware of the danger of indiscriminate spitting. In the interest of the consumptive patient himself the need of precautions is all the greater. Whether in the private room or in the hospital the use of the spittoon with all its attendant precautions about disinfection should be enforced, and the persons in attendance upon a patient should be trained to protect themselves from the effects of coughing and the like.

(To be continued.)

A LABRADOR CATECHISM.

[As part of the crusade against the great white plague which is so sadly decimating the ranks of the fishermen who catch the cod for half the world, Dr. Wilfred T. Grenfel has written a curious "Catechism" which has been printed for use in the Newfoundland and Labrador schools. We print the "Catechism" by permission of the *American Journal of Nursing*.—Editor.]

A CATECHISM.

That is to Say in Instruction

To be Learned by Every Person.

THE AIR.

- (1) Is fresh air good for me? I cannot live without it.
- (2) Is air ever bad? Yes, it gets very poisonous.
- (3) What makes it poisonous? Every time any one breathes, he throws poison into the air.
- (4) What are these poisons like? Some are poisonous gases; some like tiny poison seeds.