

Factors Leading to Success in Combating Tuberculosis

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MORTALITY STATISTICS

ROBERT KOCH (1) in discussing the subject of the epidemiology of tuberculosis before the Berlin Academy of Sciences in 1910, gave some statistics of mortality from tuberculosis in Sweden in ten-year periods from 1751 to 1891 (see table 1).

In table 1 the appalling mortality from this disease is shown for Sweden as a whole, and for the city of Stockholm. It will be noted that the mortality of the city was three and one-half times that of the country as a whole. The high point in mortality was reached in 1821-1830, when out of every 10,000 people in Sweden 27.7 died of tuberculosis and of every 10,000 people in the city of Stockholm 93.1 died of it. Statistics from other countries would likewise show a frightful mortality—some less and others probably more. It will be noticed that there was an increase of about 27 per cent in the death rate in Stockholm and 30 per cent in Sweden as a whole during the eighty years between 1751 and 1830. From 1830 to 1900 there was almost no decline in Sweden

¹ Abstract of an address read before the Tuberculosis Institute for Nurses, University of Minnesota, Minneapolis, June 14-19, 1926.

as a whole but a decline of 68.5 per cent in the city of Stockholm. This would indicate that the cause of the decline must be something which operated more particularly in the cities.

A table from Drolet's (2) analysis of the death rate from tuberculosis

TABLE 1
Mortality for tuberculosis per 10,000 inhabitants

| DECADES | IN SWEDEN | IN STOCKHOLM |
|-----------|-----------|--------------|
| 1751-1760 | 21.5 | 73.2 |
| 1761-1770 | 20.6 | 69.8 |
| 1771-1780 | 20.8 | 74.4 |
| 1781-1790 | 23.1 | 87.7 |
| 1791-1800 | 24.0 | 85.0 |
| 1801-1810 | 25.1 | 83.7 |
| 1811-1820 | 26.9 | 87.2 |
| 1821-1830 | 27.7 | 93.1 |
| 1861-1870 | 30.6 | 43.3 |
| 1871-1880 | 32.4 | 40.6 |
| 1881-1890 | 30.0 | 34.6 |
| 1891-1900 | 27.0 | 29.2 |

in England and Wales in decades from 1851 to 1920 is also illuminating (see table 2). This shows that there has been a steady decline in death rate since 1850 and that in 1920 there were 58.3 per cent less deaths from this cause than there were in 1850. It will also be seen that there was a steady decline in mortality percentage in

each successive decade from 1861-1911. The war and influenza period lessened the percentage of decline in the next decade, although it was still a substantial one.

We are not able to supply accurate statistics for the United States over so long a period, but it is usually stated that at the beginning of the nineteenth century one in every three, or 33.3 per cent of all deaths in the city of New York was caused by tuberculosis. In 1900, one in every nine deaths in the Registration area in the United States was due to tuberculosis;

It is most gratifying to note that whereas in the registration area of the United States 201 per 100,000 population died of tuberculosis in the year 1904; only 114.2 per 100,000 died in 1920, and only 86 in 1925. In the short space of twenty-one years the death rate from tuberculosis was reduced 57 per cent. One hundred and fifteen people in every 100,000 of our population were saved from death in 1925 who would have died had the death rate from tuberculosis of 1904 continued. To put it in what is probably its most striking way,

TABLE 2

| PERIOD | PULMONARY | | | OTHER FORMS | | | ALL FORMS | | |
|-----------|-----------|---------|---------|-------------|---------|---------|-----------|---------|---------|
| | Males | Females | Persons | Males | Females | Persons | Males | Females | Persons |
| 1851-1860 | 269.4 | 285.4 | 277.2 | 78.3 | 62.9 | 70.6 | 347.7 | 348.3 | 347.8 |
| 1861-1870 | 261.2 | 257.8 | 259.0 | 74.5 | 59.9 | 67.3 | 335.7 | 317.7 | 326.3 |
| 1871-1880 | 235.9 | 211.9 | 223.1 | 72.1 | 58.2 | 65.1 | 308.0 | 270.1 | 288.2 |
| 1881-1890 | 196.6 | 167.2 | 181.0 | 69.0 | 57.9 | 63.4 | 265.6 | 225.1 | 244.4 |
| 1891-1900 | 163.3 | 122.6 | 141.8 | 65.2 | 55.4 | 60.3 | 228.5 | 178.0 | 202.1 |
| 1901-1910 | 135.8 | 95.1 | 114.3 | 53.3 | 47.3 | 50.3 | 189.1 | 142.4 | 164.6 |
| 1911-1920 | 130.6 | 86.8 | 107.6 | 39.9 | 34.2 | 37.0 | 170.5 | 121.0 | 144.6 |

in 1910, one in ten; in 1923, one in fourteen.

DECLINE IN MORTALITY AND CAUSE OF SAME

The decline in death rate from tuberculosis in the United States in the past quarter of a century is truly phenomenal. The disease can no longer maintain its position as "captain of the men of death." It has been forced to give up this rank which it had held throughout historical time and drop back to fifth place, being outstripped by diseases of the heart, pneumonia, cerebral hemorrhage and softening, and cancer.

135,000 people who would have died of tuberculosis in 1925, had the death rate remained the same as it was in 1904, were saved. These figures must still further be analyzed before the real meaning of this saving in lives is fully realized. The highest mortality from tuberculosis occurs during the ages 15 to 35, probably the most important period in the lives of people—the period of education, marriage, childbearing and establishing occupations and business.

When we ask the cause for this decline it is not easy to determine, because the death rate has been declining steadily since the middle of

the last century. The fact is patent, however, that the degree of decline became greater following the discovery of the bacillus and still greater during the past twenty-five years, the period of intensive campaign on the part of anti-tuberculosis associations. By this I do not mean to imply that all the credit can be taken by such organizations. The tuberculosis death rate began markedly to decline in the world coincident with improved economic conditions which were established in the middle of the last century. This occurred before the infective nature of tuberculosis was known and seems to have been due to the establishment of better homes, better food and better hygiene. It is not strange then that the death rate should decline more rapidly as our knowledge of tuberculosis became greater and measures more particularly applicable to the prevention of tuberculosis were added to those general measures which had been previously operative.

It seems to me that in the decline in death rate from tuberculosis we must recognize the great broad principles which have been working out better standards of living during the evolution of our present industrial and economic life and that the more rapid recent decline must be considered as due to the elaboration and more intelligent application of these and other more specific principles to the particular tuberculosis problem, a program outlined and fostered by the tuberculosis associations.

The discovery of the tubercle bacillus gave a basis for an intelligent attack upon the disease from the standpoint of its infectiousness, but so overemphasized the bacterial as-

pects of the picture that we were almost lost for a time in the belief that legal control of the tuberculous patient was the chief aim of prevention. Anti-spitting ordinance with report of cases to the health bureaus, and fumigation of dwellings were considered of first importance in any preventive campaign. Our minds and eyes were upon the unfortunate victim and it is no wonder that a phthisiophobia was established.

One fortunate thing, however, was that in the era of bacterial domination the importance of better economic standards was constantly emphasized, although it was considered more of a secondary than primary matter.

What seems to have proved to be the crux of the more intelligent application of preventive measures dates from the conception of childhood being the time when infection takes place. This idea was revolutionary and changed the whole aspect of the tuberculosis problem. It withdrew a certain amount of attention from the bacillus and directed it toward raising the resistance of the individual. This conception is due primarily to the work of von Pirquet (3) in discovering the cutaneous tuberculin test, and making it possible to test out large groups of people, particularly children, in a way that was accompanied by neither discomfort nor danger; and to that of Romer (1) who by his careful experimental work was able to interpret the meaning of this widespread positive test found in childhood. He showed that there was a difference between infection and clinical disease, and that early infection produces an immunity or resistance to later infections. His work was made the basis of

our present conception of adult tuberculosis being an infection superimposed upon previous infection, and led us to look upon early infections as foci from which bacilli escape to produce later disease.

PROGRAM OF PREVENTION

These newer conceptions defined the main problems in the prevention and treatment of tuberculosis and directed energies in the channels which have been followed during the past fifteen years. The first problem is not necessarily the prevention of infection, as was formerly thought, but the prevention of massive infection. Infection alone is not serious. Infection with large numbers of bacilli, such as comes from intimate contact with open tuberculosis is serious. When an implantation of a few bacilli takes place, healing results with increased immunity. Such processes may be repeated numbers of times in the life of a child or an individual, but always result in the same thing—an increase in the patient's resisting power against tubercle bacilli.

Infection is not of serious consequence unless it becomes clinical disease. The more massive the infection the less the chances of healing, and the greater the danger of the disease remaining active and spreading. Clinical tuberculosis consists of tuberculosis sufficiently active and sufficiently extensive to make its presence known by symptoms. Clinical tuberculosis then is an expression of the fact that the bars of defense on the part of the individual have been lowered and the bacilli have been permitted to grow and develop.

We have learned by therapeutic

experiment that individuals manifesting early clinical symptoms can nearly all get well if they are able to raise their resisting power sufficiently high so that the body cells react with sufficient vigor to create and maintain a sufficient specific protective mechanism. Our problem then is to heal clinical tuberculosis as soon as possible.

The patient in ordinary life has shown himself to be able to take care of simple infections. The patient with a little more help such as is afforded by improving his method of living, is able to overcome larger infections. An individual with a carefully regulated regime of right living over a prolonged period of time is often able to overcome massive infection and extensive tuberculosis.

With the comprehensive program which has gradually evolved since the middle of last century, but which has been particularly emphasized and effectively put into practice during the first quarter of this century, there has evolved a progressive increase in the physical strength of the people, as a result of which there has been a marked reduction in the mortality from tuberculosis.

EFFECT OF ANTI-TUBERCULOSIS SOCIETIES

No one can study the decline in death rate without being impressed with the fact that the greatest decline has taken place during the period in which the great health movement led by the anti-tuberculosis associations has been most active. The tuberculosis associations should not be too modest in taking credit for this work. While there has been a general decline

in death rate, for diseases in general and for tuberculosis in particular, during the past half century, the decline in tuberculosis has been much more rapid than that of other diseases; and the marked decrease has occurred coincident with the activities of those anti-tuberculosis organizations.

It is impossible to single out individual factors in the anti-tuberculosis program and assign to each its true importance. The whole program is one of education, of familiarizing the people with the nature of the disease and the true sources of danger and of instituting preventive measures and of establishing agencies for mitigating the danger.

Education as carried on by addresses and publications; practical measures applied in the homes, such as are carried out by public health agencies; prevention in the school, the school nurse, medical inspection and examination, supplementary food, and especial attention to the undernourished; the dispensary, with the visiting nurse going into the homes and showing the people how to carry out the principles of prevention; preventoria; health camps; hospitals and sanatoria are all links in the chain of combating tuberculosis, each important in the complete program.

THE SANATORIUM'S PART IN PREVENTION

Inasmuch as the sanatorium has been the most costly factor in this broad scheme, it is well to discuss its contribution to prevention and cure. It is sometimes praised unduly and it is sometimes criticized in a manner that seems unwarranted. Let us see

what its contribution is and what it might be.

Sanatoria have not been able to cure as many of the patients who are treated therein as the curability of the disease warrants. This fact is bewailed by all who are intimately associated with such institutions. If patients suffering from the early symptoms of tuberculosis would enter properly conducted sanatoria and follow out the approved methods that have been devised, there is no doubt but that nearly all could get well. The sanatorium, on the other hand, has been used for the treatment of severe cases—those who have failed to get better while being treated at home or while remaining at home untreated—who have finally entered the institutions, hoping that the carefully planned régime might bring about an arrestment of their advanced and usually advancing disease. Failure in such cases is often a foregone conclusion and should not be held against the institution, for, of those treated early a large proportion are restored to health and usefulness.

Measured by other standards the sanatorium has had a tremendous influence on the decline in death rate. In the first place, it has educated patients with open tuberculosis who have entered its walls, in preventing the spread of infection. These patients have been taken away from the family and home and thus have minimized the contacts and reduced the successive massive infections. So in this way they have proved to be of tremendous importance in reducing tuberculosis morbidity and mortality.

According to the 1926 sanatorium directory of the National Tuberculosis

Association there are 67,270 beds available for the treatment of tuberculosis, and by including 3000 more, which were under construction at the time, we may say that there are roughly 70,000 beds. The death rate from tuberculosis is about 85 per 100,000 population. The death rate from tuberculosis is a little less than 100,000 per year throughout the United States. It is somewhat difficult to determine the actual number of cases of open tuberculosis in the United States at any given time, but we are probably safe in assuming that the number would be at least four times the number of deaths, or in the neighborhood of 400,000. The turnover in sanatoria is a little more than twice a year; consequently, 70,000 beds should be able to take care of about 140,000 people per year. A very large percentage of this number have tubercle bacilli in their sputum and are in a condition to infect others. Their isolation for a portion of the time, together with the training that they receive, is a potent factor in the

prevention of further infections. Many without positive sputum secure an arrestment of their disease and avoid open tuberculosis and the possibility of ever infecting others.

The treatment of patients suffering from tuberculosis in institutions affects the future morbidity and mortality in several different ways; first, by the cures that are obtained; second, by the removal of patients from home surroundings where they will scatter infection, and third, by the educational influence both upon the patient and those who come in contact with him so that the danger of scattering infection is reduced to a minimum.

So while we must recognize that the death rate has been reduced by many factors, some of which are general, operating to improve the health of the people as a whole, we must particularly recognize as potent those specific anti-tuberculosis agencies which have been so vigorously combating the disease during the past quarter of a century, for they are undoubtedly accomplishing the work which they set out to do.

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