

PROGNOSIS OF PULMONARY TUBERCULOSIS

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IN pulmonary tuberculosis the prognosis is, to say the least, uncertain. So many factors which may or may not be under our control directly or indirectly influence the disease that in any given case the course, duration or outcome must remain largely an uncertainty. As a rule it is most unwise to give a definite prognosis unless based upon at least one month's accurate observation of the clinical progress of the disease. And as quite a few of our deductions will later be shown to be erroneous, dogmatism in prognosis should not be practiced. Nevertheless, there are conditions and circumstances which in a general way influence the prognosis of pulmonary tuberculosis favorably or unfavorably and a few of these will be briefly discussed.

It is quite generally accepted that an implantation of tubercle bacilli upon virgin soil will produce an acute tuberculosis, if any at all. For this reason clinical tuberculosis in the very young—under two years of age—is very largely fatal. The tendency toward acuteness of the disease may be said to diminish as age advances until at or about the time of puberty at which time renewed activity of the disease may manifest itself in those previously affected or clinical disease may develop in those previously infected. After the age of puberty there is rather a great tendency for the disease to be of the chronic type and acute, widely disseminated, or miliary tuberculosis becomes less common. The prognosis then becomes more or less that of adult pulmonary tuberculosis. From the twentieth to the fortieth year as far as age itself is concerned the prognosis may be regarded as favorable. After the fortieth year recovery from the disease is not so likely to happen. However, the progress is more apt to be slow so that from the standpoint of duration the prognosis is more favourable than in earlier years.

Until about the time of puberty mortality from tuberculosis is about equally distributed among males and females. During the age period ten to fifteen years the mortality among females is almost double that of males. Mortality

among females remains in excess of that among males until about the twenty fifth year of age. After this period the males have a greater mortality than females until at least the fortieth year (U. S. Census 1914-1918, Hugh Wiley). Inasmuch as after the tenth year of life pulmonary tuberculosis becomes more frequent and meningitis less frequent it can be said that sex is of importance in prognosis particularly at certain age periods.

Pregnancy should be looked upon more or less as a complication and in the presence of active disease must be regarded as very unfavourable. The male generally the provider of home and comforts, must or will often continue in his work, unable to take proper treatment for financial reasons and of course, when this is so, the prognosis becomes unfavourable. The habits of life in the male also influence the prognosis unfavourably in many instances.

Outdoor workers becoming ill with pulmonary tuberculosis perhaps have a less favourable prognosis than indoor workers. Those leading an inactive mental or physical life and those accustomed to all the comforts and luxuries of life, when other things are equal usually have a less favourable prognosis than those physically or mentally active previous to the onset of the disease, or those to whose life the rest and comfort of proper treatment prove quite a change. And it is probably the stimulus of mental change as well as the rest from physical or mental exertion which favourably influences the prognosis.

Environment unquestionably influences the course of the disease. Yet it is most wonderful under what unhygienic mental and physical environment a patient may symptomatically recover from the disease.

The mind plays an important rôle in recovery from pulmonary tuberculosis. Proper treatment requires a willingness to co-operate—a willingness to do what, to the patient, often seems needless and contrary to common logic or sense. Why should he, feeling so well, remain in bed, an invalid? Not only willingness but determination

and perseverance are necessary. For this reason a proper knowledge of the disease is a necessity for the patient. Needless to say cheerfulness adds to the chances of recovery. Those who react strongly to the small worries and disappointments of life necessarily have a less favourable prognosis than those who react normally to these stimuli. A lack of proper regard for the seriousness of the disease and recklessness in heeding advice in treatment mean an unfavourable prognosis.

When the onset of the disease is sudden, the patient perhaps seeks medical advice earlier and discovery of the cause of illness may be earlier ascertained than when the onset is slow and indefinite. Large losses of weight are unfavourable. A loss of one-fourth the usual weight should be regarded as very unfavourable and a loss of one-third the usual weight is usually accompanied by fatal disease. If, under ordinary feeding, the patient gains weight especially when steady gains are made, the prognosis is good from this standpoint. When forced feeding is necessary to regain lost weight the prognosis is less favourable. Failing digestion is, of course, unfavourable. However, lack of appetite, strange to say, is fairly often accompanied by good assimilation.

The presence of fever or rapid pulse, not due to other causes, is of unfavourable significance. Activity of the disease is present and the prognosis must be accordingly made. Persistent elevation of temperature is less favourable than when recurrent although both are unfavourable. Inverse temperature elevations are of especially bad insignificance.

Absence of fever, it must be remembered, at times may mean lack of resistance as shown by other symptoms. Continued rapidity of pulse, not due to other causes, is of unfavourable significance. Cyanosis when acute and accompanied by dyspnoea, or following upon hæmoptysis, is unfavourable as an acute extension of the disease or the onset of miliary tuberculosis is most likely. Hæmoptysis may be either accidental and of little import or it may be a symptom of progressing disease. When not accompanied by fever, dyspnoea, cyanosis, or tachycardia, providing the loss of blood is not severe, prognosis may be but slightly altered.

Symptoms, as a rule, afford an index of the activity of the lesion while physical signs and the *x*-ray show the location, extent, intensity and character. Usually the apical lesion is more favourable than one situated in the centre

or at the base. An extensive lesion is less favourable than one of small area and the greater the intensity (infiltration, consolidation, etc.) usually the less favourable the prognosis. At times the *x*-ray gives an idea of the activity of the lesion when physical signs do not, and of course the prognosis should vary with progression or retrogression of the lesion. When *x*-rays taken at intervals of three months show no change the prognosis should be favourably influenced, since apparently the disease is at least not progressing, but on the other hand may be quiescent or possibly "healed".

A gradual lessening in amount and a change from purulent to mucoid sputum is of favourable significance. At times the amount may be increased and the character change from purulent to mucoid just preceding a lessening or cessation of sputum. Sudden diminution in the amount may be due to localized congestion within the lung, pneumonic or miliary processes, and when accompanied by unfavourable symptoms should make the prognosis unfavorable. So, too, a growing increase in quantity and a change from mucoid to purulent is of unfavourable significance. The presence of tubercle bacilli in the sputum makes the prognosis less favourable than when absent. Their periodic or permanent disappearance allows a more favourable prognosis. Tuberculous complications, of course, make the prognosis less favourable and in proportion to the severity and location of the complication. Early laryngitis, when properly treated, responds readily to treatment. Pleurisy with effusion at times is of favourable significance, especially in limited disease. In early cases pneumothorax may occur without symptoms or damage. But in advanced cases pneumothorax is a very serious complication. Enteritis, it is now believed, may be recovered from temporarily if not permanently. However, when occurring in advanced cases and when the symptoms are marked, the prognosis should be very guarded. Tuberculous empyema is a serious complication. Tuberculous meningitis, while nearly always fatal, has at times been recovered from, so, too, has Addison's disease.

To arrive at a satisfactory prognosis then we must consider the numerous factors which favourably or unfavourably influence the disease in each individual case. In part (not, however, in the order of their importance) these may be said to consist of the following: age, sex, environment, personality, onset, loss and gain

in weight, digestion and assimilation, elevation of temperature, fast pulse, cyanosis and dyspnoea, hæmoptysis, extent, intensity and location of the lesion, tubercle bacilli, complications, ability to receive and accessibility of proper treatment.

An idea of what may be expected in a general way in patients receiving education and treatment may be gotten from the accompanying tables formulated from the records of the Trudeau Sanatorium. Tables 1, 2, 3 are from an analysis of three hundred cases all of which had x-ray evidence of parenchymatous disease.

TABLE No. 1

CHANGE OF RÂLES ADMISSION AND DISCHARGE IN 300 PARENCHYMATOUS CASES

RALES	DEVELOPED	3%
"	DISAPPEARED	11%
"	None	14%
"	STATIONARY	18%
"	INCREASED	27%
"	DECREASED	27%

Table 1 shows the frequency with which râles were present or absent, developed or disappeared, increased or diminished in area during residence at the Sanatorium which receives almost exclusively only minimal or incipient and moderately advanced cases for periods of from three to six months. From the table it may be seen that when râles are present upon entrance the most frequent occurrence is their increase or diminution. The next likely occurrence is that they will neither increase nor diminish. In only a relatively small percentage did râles occur when not previously present or disappear when found upon admission.

TABLE No. 2

CHANGE IN X-RAY—ADMISSION AND DISCHARGE IN 300 PARENCHYMATOUS X-RAY CASES

X-RAY	INCREASED	14%
"	STATIONARY	17%
"	DIMINISHED	69%

Table 2 shows the changes during treatment as seen in the x-ray plates. Here over two-thirds of the cases are seen to have improved. Those cases in which the x-ray showed no change were probably quiescent or arrested cases upon entrance.

Table No. 3 shows the discharge condition of these 300 cases. Nearly three-fourths have shown definite improvement and freedom from symptoms of activity.

TABLE No. 3

DISCHARGE CONDITION OF 300 X-RAY PARENCHYMATOUS CASES

UNIMPROVED	11%
IMPROVED	14%
APP. ARRESTED	
QUIESCENT	74%

During treatment of three to six months' duration of this class of cases it may be said, as a general rule, that only a small percentage of cases will lose their râles and approximately one-half will show an increase or diminution of their extent. The x-ray will show an extension of the lesion in about one-seventh of the cases while at discharge nearly three-quarters will be free from symptoms of activity for at least the two previous months.

TABLE No. 4

RÂLES—ADMISSION AND DISCHARGE CHANGE—ALIVE 5-11 YEARS—POST DISCHARGE 979 CASES (Dr. F. B. Trudeau)

INCREASED	68%
DECREASED	83%
STATIONARY	89%

Table No. 4 has been arranged from the figures of F. B. Trudeau (*Amer. Rev. Tuberc.* Sept., 1920, iv. 7). This table shows the percentages of those living from five to eleven years after discharge in nine hundred and seventy-nine cases whose râles during treatment remained stationary, increased or decreased in area. It will be seen that the greatest number of deaths occurred in the "râles increased" group and that, if anything, the "râles stationary" group has a prognosis equal to, or perhaps better than, the "râles diminished" group.

TABLE No. 5

APPROXIMATE PER CENT. DEAD 10 YEARS AFTER DISCHARGE

INCIPIENT	21%
MODERATELY ADVANCED	54%
ALL CASES	33 to 45%
APP. ARRESTED	
QUIESCENT	2.8%
UNIMPROVED	52%

Proportion :- Incip. 1 Mod. Adv. 2 or 3.
App. Ar. 1 Qui. 1 Unimp. 1 1/2 or 2.

Table No. 5 shows the approximate mortality ten years after discharge among incipient and moderately advanced cases and those having been discharged as "active" (improved-unimproved) and "inactive" (apparently arrested and quiescent). The moderately advanced case,

after ten years has from two to three times the mortality of the incipient and, the "active" case one and one half to two and one-half times the mortality of the "inactive" case.

TABLE NO. 6.

Approx. Ages. DEAD 20 YEARS AFTER DISCHARGE - 816 CASES.
 11-19 = 11%; 21-40 = 22%.
 20-30 = 61%; 41-62 = 6%.

INCIPIENT	58%
MODERATELY ADVANCED	55%
ALL CASES	52-55%
APP. ARRESTED	59%
OBSCURE	
INACTIVE	
UNIMPROVED	83%

Table No. 6 shows the mortality as in Table No. 5, after twenty years. Here it is also seen that the incipient and inactive cases have a better prognosis than the moderately advanced and active cases. And as in Table No. 5 the incipient cases and the "inactive" cases behave similarly, so, also the moderately advanced and "active" cases.

TABLE NO. 7

CAUSE OF DEATH, TUBERCULOSIS IN 174 CASES 20 YEARS AFTER DISCHARGE

INACTIVE	82%
ALL CASES	90%
ACTIVE	47%

Table No. 7 gives the percentages of deaths (in those discharged twenty years) from tuberculosis in one hundred and seventy-four instances in which these facts were known. From this table it is seen that while the prognosis as to death from tuberculosis is still in favour of the "inactive" cases the difference is relatively small (15 per cent.) and that the majority of the one hundred and seventy-four cases (90 per cent) have died of pulmonary tuberculosis. The small number dealt with here is, of course, unfortunate. Of eight hundred and sixteen cases whose status twenty years after discharge was known, six hundred and sixty-three were dead and of these the cause of death was known in only one hundred and seventy-four. In 1400 more recent cases discharged ten to nineteen years, the cause of death was known in 93 per cent. Tuberculosis was the cause in 89 per cent.

Table No. 8 shows the general mortality and mortality from tuberculosis in the incipient, moderately advanced and far advanced cases sixteen to nineteen years after discharge from the Sanatorium. The cases are subdivided into four groups according to the presence or absence of tubercle bacilli or a history of hæmoptysis of a

teaspoonful or more. From the table it is seen that those cases in which tubercle bacilli were not found and in which no hæmoptysis occurred (Group 1) and those in which hæmoptysis occurred but in which tubercle bacilli were not found (Group II.) behaved similarly. And those cases in which tubercle bacilli were found whether hæmoptysis occurred or not behaved similarly

TABLE NO. 8

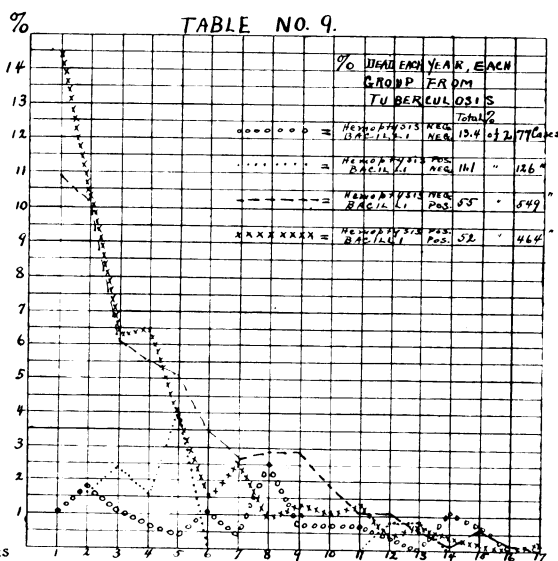
DEATHS FROM ALL CAUSES AND FROM TUBERCULOSIS IN 1,000 CASES 16 TO 19 YEARS AFTER DISCHARGE HEMOPTYSIS, NEG., BACILLI, NEG., GROUP I.

ALL CAUSES	INCIPIENT	15%
	MODERATELY ADVANCED	30%
TUBERCULOSIS	INCIPIENT	9%
	MODERATELY ADVANCED	25%
HEMOPTYSIS POS. } GROUP II BACILLI NEG. }		
ALL CAUSES	INCIPIENT	18%
	MODERATELY ADVANCED	26%
TUBERCULOSIS	INCIPIENT	11%
	MODERATELY ADVANCED	13%

HEMOPTYSIS NEG. } GROUP III BACILLI POS. }		
ALL CAUSES	INCIPIENT	35%
	MODERATELY ADVANCED	64%
	FAR ADVANCED	89%
TUBERCULOSIS	INCIPIENT	28%
	MODERATELY ADVANCED	60%
	FAR ADVANCED	87%

HEMOPTYSIS POS. } GROUP IV BACILLI POS. }		
ALL CAUSES	INCIPIENT	33%
	MODERATELY ADVANCED	60%
	FAR ADVANCED	92%
TUBERCULOSIS	INCIPIENT	28%
	MODERATELY ADVANCED	56%
	FAR ADVANCED	88%

(Groups III. and IV.). Groups III. and IV. show a decidedly unfavourable prognosis compared to Groups I. and II. So the occurrence of tubercle bacilli in the sputum must be looked



upon as of unfavourable significance. It must not be inferred from this, however, that the occurrence of tubercle bacilli means an active lesion. It does mean, however that an "open" lesion is more dangerous than a closed one. Again the advantage of the incipient over the moderately advanced and of the moderately advanced over the far advanced case is readily seen.

Table No. 9 shows the percentages in each of the groups of Table 8 dying from tuberculosis in each year after discharge. The greater numbers of such deaths and their early occurrence is readily seen in the bacilli positive groups. Not only is the ultimate prognosis less favourable in the bacilli positive groups but prognosis as to duration of life is much less favourable than in the bacilli negative groups.

From all of the tables, which deal almost entirely with incipient and moderately advanced cases after three to six months' treatment, may be summarized the following:

1. Râles when present at the onset of treatment will, after three to six months' treatment, tend to either increase or diminish in over half of the cases. Only comparatively infrequently do they disappear or appear when previously absent. A fair number (about one in five or six) show no change in the area of râles heard.

2. The *x*-ray will show no improvement in about one of seven cases and approximately two-thirds will show definite improvement.

3. Nearly three-quarters of the cases will show freedom of symptoms of activity.

4. After five to eleven years those in whom the râles increased in area while under treatment showed the highest mortality. When râles remained stationary during treatment prognosis was not unfavourably influenced.

5. Incipient or minimal cases have a better immediate and ultimate prognosis than the moderately advanced; moderately advanced a better prognosis than far advanced cases.

6. Regardless of extent of lesion the cases becoming inactive under treatment have a much better prognosis than those which retain symptoms of activity.

7. After the lapse of twenty years the cause of death was pulmonary tuberculosis in most of the traced cases. Those cases, which were inactive after treatment have a better prognosis than those having symptoms of activity.

8. Tubercle bacilli when present in the sputum make the prognosis much less favorable than when absent. This refers to longevity general mortality and mortality from tuberculosis, and holds true for the incipient and moderately advanced cases.

TO THE MEDICAL PROFESSION OF CANADA:

If you are requiring an assistant or planning a holiday this summer, or a few weeks off to brush up, or possibly a honeymoon, the services of a recent graduate, or a senior student in medicine, might be desired. The student body of the province of Ontario is being canvassed with reference to summer work.

Should you consider utilizing one of the men available, please forward full particulars to the Secretary of the Ontario Medical Association, at 127 Oakwood Avenue, Toronto, making note of the following:

This year's graduate, or senior student;
When required;
For how long;
Assistant or *locum tenens*;
Must he be able to drive car;
Remuneration;

and any other information which will facilitate the confluence of supply and demand.

A large number of senior students will be available on June 1st.