

Pulmonary Tuberculosis and Pregnancy

BY

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THE literature on this subject is bulky, and the views expressed widely divergent. In the main, 3 aspects of the problem are dealt with: (1) Is pregnancy a danger to a woman suffering from phthisis; does it tend to aggravate active disease or to reactivate quiescent disease in the lung? (2) To what extent may tuberculous women be permitted to bear children? (3) Is phthisis an indication for artificial interruption of pregnancy? This approach is inadequate, for it leaves out of consideration many important questions which arise in the management of these cases. However, even within this restricted field of study, much of the literature has served rather to obscure the problem than to illuminate it. The conclusions of the numerous workers are often contradictory, and this is not remarkable, for in many cases the basis on which these conclusions are founded is inadequate. Much of the literature, in short, is of no scientific value, for the material studied is incapable of supplying the answers to the questions posed. This has not deterred many writers from reaching emphatic conclusions and holding them with great tenacity. The confusing nature of much of the literature may explain, though it can hardly excuse, the remarkable neglect of this important problem in textbooks of general medicine. Even special textbooks on tuberculosis give very little space to the complication of pregnancy, which is adequately covered only in books on obstetrics. In the special literature, too, we find that many of the most ex-

haustive, objective and generally valuable studies of the subject have been made by obstetricians rather than by physicians. This is difficult to understand, for the combination of phthisis and pregnancy is frequent, and it calls for the exercise of the sort of judgment which physicians are apt to claim as their special province. Perhaps it is because they are unfamiliar with the speculative theorizing so prevalent in the literature of tuberculosis, that obstetricians have taken a more objective view of the problem. At all events, among the numerous papers on the subject a certain number are distinguished by a more scientific approach and these enable us to reach certain conclusions.

A traditional belief, existing from ancient times and expressed in the Hippocratic writings, credited pregnancy with a beneficial effect on phthisis, and this belief appears to have been general, both amongst the profession and the laity, until about 1850. During the latter half of the 19th century a number of writers expressed the view that pregnancy is harmful. This view replaced the earlier belief and gained increasing adherence until recent years, while many authorities drew the natural (though ill-substantiated) conclusion that if pregnancy be harmful to a tuberculous woman, artificial abortion must be the most satisfactory treatment. During the past 30 years the doctrinal pendulum has swung back and now occupies a more neutral position. The balance of opinion, however, still holds that pregnancy is harmful to the

tuberculous, although there is nowadays a healthy tendency to avoid sweeping generalization and to give each case individual consideration.

LITERATURE.

In 1931, Robinson¹ published the results of a questionnaire addressed to a large number of different authorities, mostly in Britain, but including some in other countries. He reported that opinion was about 5 to 1 in favour of the view that pregnancy has a harmful effect upon phthisis, though many of these authorities gave little evidence in support of this view. This attitude was also evident in a discussion between physicians and obstetricians at the annual meeting of the British Medical Association in 1936.² A majority of our specialists in tuberculosis appear to regard pregnancy as a harmful "complication" in phthisis, and in active cases not a few of them advocate artificial abortion, provided the pregnancy has not advanced beyond 3 or 4 months. Some, indeed, seem to be more emphatic in their views than the available evidence warrants.

An attempt to analyse the general literature produces a feeling of confusion rather than enlightenment and only a few representative publications can be mentioned here. (Jameson³ has written an admirable review of the literature.)

First, as to the alleged harmful effect of pregnancy on phthisis, perhaps the most frequently quoted writer is Rist,⁴ who, in a study of more than 170 cases of pregnancy associated with phthisis, found that more than 80 per cent were worse after the pregnancy and more than 50 per cent were dead within 2 years of it. These figures are alarming, but they are open to 2 objections. Firstly, inadequate consideration is given to the nature, severity and extent of the tuberculous disease, and secondly there is no control material of cases of equal severity

uncomplicated by pregnancy. Figures supporting the same view have been published by many authors, including Sergent and Moricard,⁵ Trembley,⁶ Hutchinson,⁷ Bernard,⁸ and Norris and Murphy.⁹ It is noteworthy that those writers who produce the most alarming figures are nearly all open to the same criticism as Rist. In papers including a control study, though in a number of cases an unfavourable effect of pregnancy is claimed, its degree is seen to be very much less than that asserted by Rist. One of the best studies of this type was published in 1925 by Forssner of Stockholm.¹⁰ He found that in the less advanced cases of phthisis there was very little difference in the after histories of those women who had undergone pregnancy, as compared with those of a control series. In the more advanced cases of phthisis, however, there appeared to be a somewhat less favourable outcome in the women who had undergone pregnancy, though its degree was less than had been described by other writers. Forssner's results are summarized in Table I, taken from his paper.

A paper by Cohen¹¹ analyses the results in 100 tuberculous women who underwent pregnancy and labour, with the conclusion that "pregnancy and labour *per se* rarely exert any harmful effect on the progress of pulmonary tuberculosis."

A number of other writers have made comparative studies of the after histories of tuberculous patients, some undergoing pregnancy and some not, and have reached the conclusion that no significant difference can be shown between them. Among these are: Barnes and Barnes,¹² Hill,¹³ Brindeau *et al.*,¹⁴ Glaser,¹⁵ and Schultze-Rhonhof and Hansen.¹⁶ To sum up, the bulk of the evidence indicates that in minimal or quiescent cases of phthisis pregnancy exerts no harmful effect, but in cases of more active disease pregnancy may be harmful in a proportion of cases, though it is certain that

this harmful effect has been much exaggerated by many writers.

INFLUENCE OF PREGNANCY ON PHTHISIS.

In what way may pregnancy exert a harmful effect on phthisis? Many theories have been advanced, some of them rather academic. Chemical factors, e.g. depletion of calcium or rise in cholesterol content

fact of pregnancy which is responsible for the relative "anergy." Most stress has been laid on mechanical factors: the enlargement of the uterus and the consequent progressive rise of the diaphragm during pregnancy. The increasing restriction of movement of the diaphragm was formerly held to be the harmful factor, but more recently this theory was seen to be in conflict with the theory of collapse therapy and it

TABLE I.

Comparison of after-history of women suffering from phthisis during a two-year period after pregnancy with that of similar patients in whom there was no gestation which could have influenced the development of the disease (after Forssiner).

Observation period	Stage (Turban)		Aggravated Per cent	Dead Per cent
One year: (Pregnant: 203 cases) (Non-pregnant: 396 cases)	I	Pregnant	28	1
		Non-pregnant	23	2
	II	Pregnant	33	6
		Non-pregnant	21	6
	III	Pregnant	19	46
		Non-pregnant	20	37
Two years: (Pregnant: 185 cases) (Non-pregnant 359 cases)	I	Pregnant	28	12
		Non-pregnant	27	14
	II	Pregnant	35	17
		Non-pregnant	30	14
	III	Pregnant	4	70
		Non-pregnant	10	63

of the blood, have been invoked, though the latter has been held to be protective rather than harmful. Some authors, e.g. Bar,¹⁷ have pointed to the decline in tuberculin sensitivity which is observed in some cases of phthisis during pregnancy and have claimed that these are the cases in whom danger of aggravation of the lung disease exists. Bar went so far as to advocate therapeutic abortion in cases in whom the tuberculin reaction is absent or feeble, though it would seem that it might be the severity of the lung disease rather than the

has accordingly been modified. It is now held that the elevation of the diaphragm during pregnancy is a favourable factor, but that the sudden descent during labour is harmful. This is held to explain improvement of the lung disease during pregnancy, which is sometimes observed, followed by rapid deterioration after delivery. It is true that some cases of phthisis undergo exacerbation during or shortly after the puerperium. The observation of a case of this type is sometimes responsible for emphatic views on the danger of pregnancy

to the tuberculous, though a more general view of the evidence might produce less extreme views. A factor of great importance which has been ignored by many writers is the influence of social and environmental conditions. It is hardly necessary to invoke highly theoretical conceptions of biochemical, endocrine, or even mechanical changes to explain a deterioration in the lung disease of a recently delivered woman when we consider the drastic changes in her life which the advent of an infant brings. The strain of lactation, the physical exertion of caring for a baby and washing its clothing, disturbed sleep, the added difficulties of housework, shopping and caring for the rest of the family, to say nothing of the financial burden represented by the new child, seem more than enough to account for an exacerbation of the lung disease. All these adverse factors apply in inverse proportion to the family income. In this, as in all other aspects of tuberculosis, the social factor is important, but it is often little heeded in academic controversy. It may well be that the widely different conclusions reached by different authors as to the effects of pregnancy on phthisis are largely due to neglect of the social factor, which can vitiate the most carefully chosen cases.

THERAPEUTIC ABORTION IN PHTHISIS.

This subject appears to provoke as much heated polemic as any other in the whole field of medicine, but a brief study of the available evidence leaves little doubt as to the correct attitude. As concluded above, a certain number of cases of phthisis deteriorate after pregnancy, though this proportion is not large and may well be explained largely by social factors. However, the possibility of exacerbation of the lung disease is regarded by many as adequate grounds for advocating abortion

as a method of treatment. If this is to have any scientific justification, evidence must be sought showing that in general the harmful effects are avoided if the pregnancy be interrupted. A study of the literature will soon convince any impartial person that no such evidence exists. There are relatively few studies in which an adequate series of tuberculous women in whom pregnancy has been artificially interrupted is compared with a series of cases of equal severity undergoing full time pregnancy and labour. Such studies as do exist have failed to show that an artificially interrupted pregnancy has in general any less unfavourable effect on the course of the lung disease than a full time pregnancy. Some few authors, for example, Czazkes¹⁸ have claimed a more favourable outcome in aborted cases. Pissavy and Lejard,¹⁹ in a criticism of Czazkes' paper, have pointed out that his conclusions were open to question, since he does not give details of the severity of the cases considered, and that even if the most favourable possible interpretation were accepted it would mean that to secure a $3\frac{1}{2}$ -year survival in 17 women it would be necessary to sacrifice 100 pregnancies. This means the certainty of unnecessarily sacrificing about 80 infants, and since it is impossible to decide in any particular case whether the outcome will be favourable or otherwise it is not easy to justify sacrifice of the infant. Barnes and Barnes¹² found that the outcome in a series of women in whom pregnancy had been artificially interrupted was less favourable than in those in whom it had proceeded to term, and this result has also been obtained by a number of other workers.

Even those who advocate therapeutic abortion are agreed that it must be completed within 3 to 4 months of conception. Since relatively few cases come under observation so early, and since the benefit

in any particular case is problematical, we must conclude that abortion is justified only in a small number of cases where special circumstances exist. It can play little part in the solution of the difficult problems which arise in the treatment of pregnant tuberculous women.

As regards the child, it is clear from many studies that the infant of a tuberculous mother has almost as good a chance of being normal at birth as that of a healthy woman. Congenital tuberculosis is extremely rare, and provided the child can be protected from the risk of infection by its mother after birth its chances of survival and normal development are very good.

THE EXTENT OF THE PROBLEM.

Pulmonary tuberculosis stands first among all causes of death in women of child-bearing age. In England and Wales, in 1936, respiratory tuberculosis accounted for 25 per cent of all deaths in females of the age group 15-44 years. This is 3 times as many as deaths due to puerperal causes of all kinds.

It is difficult to assess the incidence of phthisis in association with pregnancy, for as yet there is little information available on this point. Browne²⁰ stated that 82 cases of phthisis had been encountered among a total of 16,000 pregnancies observed at University College Hospital from 1928 to 1937 (incidence 0.51 per cent). Brindeau *et al.*¹⁴ reported a total of 254 cases among 32,667 pregnant women admitted to the Tarnier Clinic during a 10-year period (incidence 0.77 per cent). Bridgeman and Norwood²¹ reported 134 cases in 14,000 parturient records from the Johns Hopkins Hospital, Baltimore (incidence 0.96 per cent). None of these authors states the proportion of cases of active disease, and as their diagnostic standards may vary these figures are

probably not strictly comparable. It is evident that the clinical examination made as part of the routine antenatal supervision at most maternity hospitals will reveal only a proportion of all cases of phthisis, and that if cases are not to be missed some form of radiological examination is essential. An investigation of this problem was begun at Paddington Hospital in 1943, and from that year a screen examination of the chest has been included as part of the routine for all women attending the antenatal department, as soon as possible after the first attendance.²² In every case where screen examination shows possible pulmonary disease a full-size film is taken. From January 1943 to April 1946 a total of 4,430 women have been screened and the results are summarized in Table II.

Only one other survey of this type has been traced in the literature, that of Eisele *et al.*,²³ who carried out screen examination of the chest under rather similar conditions in a series of 10,968 women attending the antenatal department in a Chicago hospital during the years 1934-41. Table III summarizes the findings in all the above-mentioned series, together with those in a series of 59,951 W.A.A.F. recruits examined by miniature radiography (Trail *et al.*²⁴), and some figures showing the number of new cases of phthisis discovered in women aged 15-45 years in 1937 in the County of London.

For various reasons it would be unwise to compare these figures too closely, as they may be influenced by unknown factors. Nevertheless, if we compare the results of the Paddington screening survey with those obtained by rather similar methods in Chicago, we see that we have to reckon with an incidence of probably more than 0.5 per cent of cases sufficiently severe to need immediate admission to hospital. Nearly 60,000 births occur annually in the

County of London, and approximately 10 times that number in England and Wales, and if these figures are capable of general application it becomes evident that a hospital problem of great magnitude is at present being avoided only by our failure to diagnose more than a small proportion of the existing cases. Only radiological methods are adequate for the discovery of the unsuspected cases, and the need for

indicated in Table III, an incidence of 0.5 per cent of severe active cases would mean a total of over 280 cases annually in the County of London alone, whereas at present the number of pregnant tuberculous women admitted to hospital from the L.C.C. area is probably not much more than 50 annually. The problem of providing sufficient beds for treatment of the cases discovered is a corollary of all mass

TABLE II.
Screening Survey at Paddington Hospital.

Total number of pregnant women screened ...	4430	
Total number of patients radiographed ...	249	(5.70 per cent)
Cases of pulmonary tuberculosis:		
Active, requiring immediate admission ...	27	(0.61 per cent)
Possibly active ...	11	(0.25 per cent)
Probably inactive ...	30	(0.67 per cent)
Total cases of tuberculosis ...	68	(1.53 per cent)
(Excluding calcified lesions)		
Calcification shadows ...	39	
(Only large or multiple ones filmed)		
Non-tuberculous conditions, various ...	27	
Azygos vein lobe ...	10	(0.22 per cent)
Increased vascular shadows ...	34	

routine radiological examination of the chest in pregnant women appears to be at least as pressing as in those other groups of the population to which it is now being applied. Of the methods available miniature radiography would probably be the most satisfactory but there are at present certain difficulties in applying it. Until these are overcome screen examination could largely meet the need, and it has the advantage of being already available at most hospitals. Experience at Paddington Hospital has shown that it can be quite easily introduced, and that the co-operation of the mothers is very good.

MANAGEMENT OF PREGNANCY IN TUBERCULOUS WOMEN.

Diagnosis of the many unsuspected cases is only the beginning of the problem. As

radiological surveys, and in the case of pregnant women special difficulties arise, for skilled obstetric care must be available as well as skilled treatment for the lung disease. At present, in many parts of the country, arrangements for the care and treatment of pregnant women suffering from phthisis are inadequate even for the manifest cases, and pregnant women experience even more difficulty than others in obtaining prompt treatment. None the less, provisions for treatment can be made only when the full extent of the problem is revealed, and the wider use of radiological methods is urgently required. In addition to its advantages for the patients, it would create an admirable material for research into the effects of pregnancy upon phthisis, for the cases discovered would be unselected. Existing studies are mostly

based upon cases revealing themselves by symptoms, and a brief experience of radiological survey methods will soon convince anyone that these are an unrepresentative selection.

patients under treatment. The long period of in-patient treatment and separation from the child make many women reluctant to accept treatment at all. A determined effort must be made to mitigate the diffi-

TABLE III.
Incidence of Pulmonary Tuberculosis in Pregnancy.

Author etc.	Method of survey	Total women	Cases of phthisis	Per cent of total	Active phthisis per cent
Browne U.C.H. 1928-37	Clinical	16,000	82	0.50	?
Bridgeman Johns Hopkins Baltimore	Clinical	14,000	134	0.96	?
Brindeau Tarnier Hospital 10 years	Clinical	32,667	254	0.77	?
Eisele, <i>et al.</i> Chicago 1934-41	Screening	10,968	110	1.38	0.67
Jacobs Paddington 1943-46	Screening	4,430	68	1.53	0.61
<i>General Incidence in Women of Child-bearing Age</i>					
Trail, <i>et al.</i> W.A.A.F. 1941-44	Miniature radiography	59,951		0.94	0.36
L.C.C., 1937 Females 15-45 years	New cases phthisis diagnosed	1,071,000	2217	0.21	?
County of London, 1937, total births				56,875	
Cases of phthisis (assuming a rate of 0.50 per cent)				282	

Even with the provision of more beds in institutions suitable for the handling of pregnancy as well as the treatment of phthisis, in many cases social factors add greatly to the difficulties of bringing

culties arising in the home when the mother has to enter hospital. One form of help would be the provision, without financial burden, of domestic help in the home, as well as the necessary financial help to meet

the expenses which tuberculosis imposes and which bear so hardly on all but the wealthiest homes.

We are now in a position to lay down certain principles governing the management of a pregnant woman suffering from phthisis :

(1) *Therapeutic Abortion.*

This is of little help. There are a certain number of cases in which it is indicated, perhaps mainly on social grounds. It can be considered only in the first 3-4 months of pregnancy.

(2) *Treatment of the Lung Disease.*

Pregnancy is an added indication for the promptest application of all possible methods of treatment, especially effective collapse therapy, on the usual indications. This will help to guard the lung against the possible ill-effects of labour. Treatment must be continued after labour, its duration being governed by the usual considerations.

(3) *Obstetric Care.*

Skilled obstetric care must be provided, preferably in the same institution where the lung disease is to be treated.

(4) *Care of the Infant.*

The child usually has to be separated from the mother at birth. If no suitable relative is available to care for it, the child has to be admitted to an institution, either an ordinary residential nursery or a special "preventorium" of the type successfully developed in some Continental countries.

(5) *Help in the Patient's Home.*

Domestic help and financial assistance in the home must be provided where necessary, as well as the usual valuable supervision by health visitors.

How can these principles best be followed in practice? During recent years considerable attention has been devoted to

the problem by some of the larger health authorities. In the L.C.C. area, most cases are admitted to Grove Park tuberculosis hospital and are transferred for obstetric care to the nearby Lewisham General Hospital, where a special department has been established for them in the maternity block. After delivery the patients are retransferred to Grove Park Hospital and in some cases subsequently to country sanatoria. The Essex County Council has organized a special obstetric unit for tuberculous women at Black Notley Sanatorium, so that they may remain in the same institution throughout their treatment. The infants are usually admitted to ordinary residential nurseries.

In the areas of the larger health authorities, such arrangements as these have hitherto proved adequate to deal with the relatively small numbers of cases discovered at the antenatal clinics and tuberculosis dispensaries. If radiological methods were generally applied in antenatal departments, however, it would become necessary greatly to extend these facilities. It is doubtful whether the situation could be met by an attempt to organize maternity units in sanatoria, for these are often situated far from hospital centres and the problem of providing them with specialist obstetric staff would be very great. Moreover, the difficulty of inducing pregnant women to go into hospital is increased if beds be offered in institutions far from their homes. The best answer to this problem would seem to lie in making use of the large general hospitals, which have both specialist medical staff and specialist obstetric staff available, and are situated within easy reach of most patient's homes. The cases could then be promptly admitted to hospital and receive all necessary treatment, being retained in the general hospital until well after the puerperium. Finally, when the tuberculous disease is satisfactorily controlled, they

could be transferred to country institutions for the more ambulant stages of their treatment. Throughout the more critical period of treatment, and during labour and puerperium, the patient would then be under the care of specialist medical and obstetric staff, and would also be within easy reach of her relatives. While the patient is in hospital the provision of domestic help in the home can help to set her mind at rest and make her more ready to accept treatment. After she returns home it is no less essential to spare her excessive domestic drudgery.

In conclusion, the importance of the social factor must again be emphasized. The home difficulties are not easy to overcome, but unless we can do this our best efforts in the dispensary, the hospital and the sanatorium are likely to be wasted.

SUMMARY.

1. Current views of the effect of pregnancy upon pulmonary tuberculosis and the indications for therapeutic abortion are briefly discussed.

2. Figures are given showing the incidence of pulmonary tuberculosis in a series of 4,430 pregnant women, as revealed by screen examination.

3. The problems encountered in the management of pregnancy in tuberculous women are discussed and some principles for their solution enunciated.

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