

# IMPLICATIONS OF THE SPECIALITY OF OBSTETRICS AND GYNAECOLOGY

## 3. Foetal And Neo-Natal Mortality

BY

J. JHIRAD, M.D., F.R.C.O.G.

The aim of maternity work is a healthy mother and a normal full-term infant. Such is the natural expectation, since the state of maternity is a normal physiological process, but even nature allows of a certain wastage in its planning, and hence there is likely to be an irreducible minimum of foetal loss.

Foetal and neo-natal mortality form part of the wider subject of infant and child mortality. It was in the early years of this century that the high mortality amongst children attracted attention, which resulted in extensive Child Welfare Services. Infant mortality includes deaths within the first year of life and has been reckoned against 1,000 live births. Certain centres have started reckoning the incidence against 1,000 total births, including still-births, registration of which has considerably improved in recent years. The rate of infant mortality is considered a sensitive index of environmental factors, for a number of infants are liable to succumb, particularly, to gastro-intestinal and respiratory affections.

In Great Britain, the infant mortal-

ity has been reduced from 154 per 1,000 live births in 1900 to 29.6 per 1,000 in 1951. It is thus less than one-fourth of what it was nearly 50 years ago. Indian figures are unreliable, in the absence of proper registration of births and deaths even in large cities. However, we may take the figures for what they are worth. In 1930, it was estimated that there were 181 infant deaths per 1,000 live births, in 1940 160 per 1,000 and in 1951 124.4 per 1,000. Thus there is hardly an appreciable decrease, indicating the enormity of the problem yet to be tackled in our country.

For us obstetricians, the problem of foetal and neo-natal mortality is of immediate concern, as the incidence of these depends largely on obstetric work. Total foetal salvage should include the consideration of the incidence and prevention of abortions, which are estimated as forming 20% of total births. Yerushalmy, in 1945 worked out that of every 1,225 conceptions 1,000 survive to one year, 150 end in abortions (15%), 30 end in still-births, 45 are accounted for by neo-natal and infant deaths.

In Great Britain the still-births rate was 41 per 1,000 in the years 1931-35 and it was brought down to 28 per 1,000 in 1944-45. The neo-

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natal death rate was reduced from 28.3 per 1,000 live births in 1939 to 19.7 per 1,000 live births in 1948. Mudaliar quotes figures of infant mortality and neo-natal mortality rates for several provinces in India (1924-25) which show a 40-50% incidence of neo-natal mortality as against total infant mortality. Greenhill gives the following figures for the United States,

	1925	1944
Total Infant Mortality	71.7%	66.8% (39.8 Infants 27.0 Still-Births)
Neo-Natal Mortality	52.7%	62.1%
Infants less than one day	20.9%	28.8%

The increase in the rate of neo-natal mortality is only apparent, as the total infant mortality has gone down, but the neo-natal death rate has not declined proportionately. Nixon gives a graphic illustration by working out the following facts:

Decline in mortality under one day .. ..	0.44%
Decline in mortality from 1 day to 1 week ..	0.63%
Decline in mortality from 1 week to 1 month ..	2.40%
Decline in mortality from 1 to 12 months ..	4.47%

He states that deaths during the first week of life form 40% of infant deaths. It will be noticed that the decline in mortality is least marked in the first week, after which there is a remarkably rapid fall. Cruickshank, in 1930, worked out that 70.6% of neo-natal deaths occurred in the first week.

Recent advances in midwifery aim at measures to reduce this high foetal and neo-natal mortality without jeopardising maternal life. The significance of the problem is best realised by a study of the available statistical data. A good number of investigations on the subject have been carried out in Great Britain, United States and other countries, but very few enquiries, and these based most-

ly on statistical data, have been carried out in India. Sir A. Lakshmanaswami Mudaliar gave a very comprehensive study of "The Causes of Ante-Natal, Natal and Neo-Natal Mortality of Infants" being the first Elizabeth Mathai Lectures at the University of Madras in 1928. Christine Thomson investigated "Still-Births and Neo-Natal Deaths" at various Centres in India and published her findings in 1929. A few statistical enquiries have been made at Calcutta and Delhi. The latest enquiry was by Das Gupta into "The Bearing of Premature and Immature Births on Infant Mortality" in 1946-47. Thus there is much scope for detailed study of this subject in our country. A study of the available data show that many a cause reflects through still-birth to neo-natal death. Ante-natal and intranatal causes are applicable to still-births, and for neo-natal deaths ante-natal, intra-natal and post-natal causes come into play, many a cause being common to still-births and neo-natal death.

The term "still-birth" is variously understood. In Great Britain it includes dead-births from 28 weeks onwards, the foetus having shown no signs of life either by breathing or even by the beating of the heart. Other countries have applied the term to those cases where respirations had not set in, even if the heart beats were present. It is, therefore, difficult to give comparative figures. Whatever figures I quote will be in the form of illustration to emphasise the basic problem.

Eardley Holland was one of the first to make a detailed study of this subject. He brought out a comprehensive report, based on carefully carried out dissections and histological examinations of the various viscera. It was through his studies that the incidence and significance of tentorial tears and of intracranial haemorrhages was emphasised. He, in collaboration with Lane-Claypon, followed this up by a wider study. Both these reports show that the management of pregnancy and labour left much to be desired. It was noticed that pre-existing conditions of mother and foetus (ante-natal causes) e.g. general maternal diseases, specific parental diseases as syphilis and lead poisoning, specific maternal conditions (toxaemia etc.), malformations of the foetus and placental insufficiencies, accounted for 36.8% of still-births and 33.3% of neo-natal deaths, these latter through premature and immature births. Hazards of birth (intra-natal causes) as difficult labour, abnormal presentations, inertia, prolapse of cord, antepartum haemorrhages etc. accounted for over 50% of still-births and 32.9% of neo-natal deaths manifested

as intracranial haemorrhage, asphyxia, atelectasis etc. 25.8 of neo-natal deaths were of post-natal origin, mostly infections. Dougal Baird, working particularly on "Socio-economic Influences on Still-Births and Neo-Natal Deaths" in 1945, found 62% accountable to pre-existing conditions of mother or foetus, and 38% due to hazards of labour, almost a reversal of the percentages of Holland and Claypon's series, showing a definite improvement in the management of labour. He found that there were three times more still-births and four times more neo-natal deaths in the lower social group. His investigations also showed that neo-natal deaths were ten times higher in the premature. Macafee gives 53% mortality due to premature and immature births. Das Gupta, in his enquiry in Bombay, noticed an incidence of 86% mortality amongst the prematures and immatures. Potter and Adair worked out that 32% mortality occurred during ante-natal period, 21% during labour and 47% in the post-natal period. Potter has, along with co-workers, done extensive work on the subject, and brought out valuable data on the pathological findings. Statistics taken from a hospital in Bombay show obstetric causes accountable for 58% still-births and 9.6% neo-natal deaths.

To turn to more detailed studies, Holland, through his careful dissections, found tentorial tears in 81 out of 167 fresh foetuses i.e. 48% and cerebral haemorrhage in all but 6 of those with tears. The incidence was high in breech deliveries (even normal breech) and of course, in difficult forceps deliveries. The incidence

of syphilis in the combined investigation was 7%. Mudaliar reviewed statistics from the leading hospitals in Madras in 1928, and found a very high percentage of prematures. In his series diarrhoea accounted for

intra-natal factors, and a challenge to our speciality. Potter and Adair (1943) investigated 559 neo-natal deaths and 614 still-births (autopsy in 81%) and tabulated the aetiology as under:—

Causes of Death	Ante-Partum Death	Intra-partum Deaths	Neo-Natal Deaths	Total
<b>Anoxia, including Pl. Pr.,</b>				
prol. cd., etc. ..	34.2%	45.0%	18.0%	28.7%
Birth Injury ..		13.7%	21.3%	13.0%
Major Malformations ..	7.8%	14.9%	11.3%	11.1%

25% of neo-natal deaths and birth injuries were responsible for 16.4%. Bundesen et al give a comparison of diagnoses in cases with and without autopsies, which is very illustrative. They stated that pneumonia could often be diagnosed only by histological section. Cruickshank carried out 800 autopsies in the neo-natals. He found that 67.5% were due to asphyxia, atelectasis, prematurity and birth injuries, these latter accounting for 32.1%; post-natal infections were responsible for 29.75% pneumonia forming 24.6% of these. Cruickshank found less than 1% accountable to syphilis. His investigation showed that 70.6% of total neo-natal deaths occurred in the first week. This high incidence during the first week is a distinct indication of the influence of ante-natal and

Holland has aptly summarised the causation of still-births as,

1. Those the causes of which can be discovered during the ante-natal period and prevented by ante-natal treatment e.g. syphilis, toxæmia;
2. Those the causes of which can be discovered in the ante-natal period, but which depend for their prevention on intra-natal management e.g. disproportion;
3. Those which are accidental discoveries e.g. prolapse of cord, P.O.P., A.P.H.
4. Those which are not discoverable, as placental insufficiency, malformations.

He worked out that 50% of foetal deaths were preventable, 20% by ante-natal methods, 12% depended

	No Autopsy (608 Cases)	Autopsy (398 Cases)
Cerebral haemorrhage	12.7%	25.6%
Pneumonia ..	2.8%	9.5%
Asphyxia ..	7.4%	3.3%
Atelectasis ..	14.7%	9.3% (no other pathological lesion)

on combined ante-natal and intra-natal management and 20% depended on intra-natal management.

The above studies show the common causative factors for still-births and neo-natal deaths, and confirm Cruickshank's dictum that "many a neo-natal death is a delayed still-birth". The value of a proper and detailed autopsy, combined with histological examination of certain viscera, is obvious, for arriving at the right diagnosis.

We shall now consider a few specific problems. The most outstanding one is *prematurity*. This is seen to take a very high toll. We must be clear as to the definition of prematurity. The international standard laid down a weight of 5½ lbs. and under for prematurity and immaturity. All the Western figures are worked out on this basis. For the East, the limit of standard weight will have to be reckoned nearer 4½ lbs. for we have noticed that in a large number of hospital class of patients 5½ lbs. has been the average full-term weight. Das Gupta took the maximum weight for prematures and immatures to be 4 lbs. 15 ozs. thus implying that he has taken all those under 5 lbs. in his survey. Sandifer, in his analysis of 1,000 prematures at Queen Charlotte's Hospital, London, in 1944, made out that 50% of total still-births were associated with prematurity and 50% of neo-natal deaths were among the prematures, whereas the incidence of premature births was about 8% that of total births. The incidence was noticed to be four times higher in emergency cases, thus showing the beneficial ef-

fects of proper ante-natal care. It must, however, be remembered that emergency admissions at most institutions are selected abnormal or difficult labours. Allen and Macafee, investigating neo-natal mortality, found an incidence of 53% of premature and immature births. The death rate in their series was mature 1.5 to immature and premature 24. Das Gupta, during his enquiry, taking only institutional figures (which accounted for 75% of total births) found an incidence of 17.6% of premature and immature births. According to him, 81% of neo-natal deaths were among the premature and immature. Christine Thomson, in 1929-30 reported an incidence of 17.5% of prematures in Calcutta. She worked out that 59.2% in Calcutta, 64.4% in Madras, and 64.5% in Bombay of still-births and neo-natal deaths were in prematures. Samuel Z. Levine in his illuminating address on the "Handicaps of Prematurity" said that "In the United States the eighth leading cause of death through life span is prematurity". In his series, premature birth accounts for 5% of the total births, but these were responsible for 50% of neo-natal deaths. He gave a detailed study of each of the handicaps of the premature infant, a perusal of which makes one realise how vulnerable the premature is. Autopsy studies, made by Bundesen et al, on 243 neo-natal deaths in the premature, bring out the following:—

Cerebral haemorrhage	23.0%
Pneumonia	.. 7.8%
Asphyxia	.. 3.7%
Atelectasis	.. 12.3%
No lesions	.. 33.3%

It is significant that in spite of a detailed autopsy, 33.3% of prematures showed no lesions. Sandifer puts this figure at 37.2%. His survey also shows that the still-birth rate among prematures is 25.2% and the survival rate 60.4%. The death rate amongst prematures in the United Kingdom, as reported in 1948, has been reduced to 15%. This is an achievement after much thought and organisation. The problem, however, of prematurity is pressing. It accounts for over 50% of deaths in the neo-natal period and about an equal percentage of still-births. The common causes of prematurity are toxæmia, ante-partum hæmorrhages, multiple pregnancy, hydramnios, foetal malformations, syphilis, anaemia and other general affections. It is noticed that 30-40% of premature births have no assignable cause. These have probably a socio-economic basis. Poor nutrition is seen to be a very important factor. Experiments by the Peoples' League of Health in England, in the Rhonda Valley and at Toronto, all confirm the value of nutrition. In these experiments the incidence of prematures and still-births was definitely reduced on better nutrition. The war years in England required stringent rationing for the population, but special provision, in the way of extra milk and vitamins, was made for the expectant and nursing mothers and for children, and it was noticed that the rate of prematurity and of still-births had dropped. Nixon quotes the experience after the siege of Leningrad (1942). The incidence of prematures rose from 6.5% to 41.2%, and that of neo-natal deaths to 90 per 1,000 for full-term and 308 per 1,000 for

prematures.

The first line of defence is prevention of premature births by proper ante-natal care, which includes investigation of serological factors and treatment as indicated, salutary environment, prevention of infectious diseases and proper nutrition. Premature births put extra hazards, as intracranial lesions are proportionately commoner in these, even with a normal delivery, and other handicaps, particularly respiratory, are liable to bring about either a still-birth or an early death. Those who survive the process of birth will require special care and very careful nursing. The association of a paediatrician in the care of the premature should be welcomed, in view of the numerous handicaps of prematurity. Levine lists these as 11 major handicaps. The common problems are associated with respiratory distress, faulty control of body temperature, diminished alimentary tolerance, defective hæmopoiesis and deficient ante-natal storage of vitamins, minerals and immune substances. These will surely need specialist's supervision and watchfulness. It is not sufficiently realised that nursing care of different types of cases should also be a speciality. There is a distinct need for specialisation in training for the care of the new-born and particularly for nursing the premature. These infants require very careful handling and patient feeding.

#### *Special Obstetric Causes*

The common ones are eclamptic toxæmia and ante-partum hæmorrhages. These are responsible for a good proportion of prematures and still-births. Statistics from an insti-

tution in Bombay give the incidence as under:—

	Pre-matures	Still-Births	
		Full-Term	Pre-mature
Toxaemia	12.4%	9.5%	12.5%
A.P.H.	9.7%	17.5%	25.0%

N.B. Percentages worked against total premature births, and full-term and premature still-births respectively.

Worked as percentage distribution of toxaemia amongst full-term and premature still-births, the incidence is noticed to be 2:3 at an earlier period and 1:3 in recent years. The incidence of ante-partum haemorrhages, worked out on similar basis, gives almost double the number of still-births under prematures, 3.5 : 6.5 in the earlier period and 3:7 in recent years.

It will be noticed from the figures quoted in the above table that whereas toxaemia gives an almost equal percentage of premature live and still-births, ante-partum haemorrhage gives a percentage almost three times higher under still-births as compared to live births, and ante-partum haemorrhages give twice as many prematures, live and still-births, as full-term still-births.

*Toxaemia* will affect foetal life mostly in the ante-natal and the intra-natal periods, the residue of deaths in the immediate post-natal period being a reflection of the birth, either because of prematurity with its handicaps, or due to anoxaemia. Incidence of premature births, live and still-births, is very high in toxaemia, partly because of the varying intensity of the toxaemia and partly due to elective induction of premature

labour in cases of persistent toxaemia, not responding to treatment, or for rapidly advancing symptoms. Intra-uterine death of the foetus is proportionately common, and is noticed in cases of toxaemia of nephritic origin where multiple placental infarcts are frequent. The majority of cases of typical eclamptic toxaemia, although responsible for a smaller percentage of intrauterine deaths, are liable to give a number of premature births, premature still-births or full-term still-births, a few full-terms born alive succumbing to anoxia, the result of the maternal toxaemia, effects of anaesthesia if used, intracranial lesions consequent on artificial delivery or occasionally to the effects of the toxaemia itself. I have recollections of a case of typical eclamptic convulsions in an infant born to an eclamptic. Post-mortem showed typical changes in the liver and kidneys.

Toxaemia is a disease of theories no doubt, but we know from our experience that many a case can be detected early and the toxaemia nipped in the bud by prompt treatment. We do know that hygienic living, attention to the excretory functions and proper dietary will go a long way towards prophylaxis of toxaemia. A proper balance of minerals has to be maintained in the system. For this purpose a liberal supply of vitamins is essential. It is only a small percentage of toxaemias which prove refractory or are of a fulminant nature, jeopardising the life of both mother and foetus.

The management of *ante-partum haemorrhages*, as we have already seen, has undergone a revolutionary change, resulting in better prospects for the mother, and higher percent-

age of salvage of the foetus. Cases of *placenta praevia* have been carried to term at some centres (Macafee at Belfast) and both mother and infant have been given a good chance of survival by adequately planned treatment. There will, however, be an irreducible minimum of foetal loss in this condition. The common causes of foetal loss are prematurity, intrauterine death due to repeated haemorrhages (the placenta in these cases of implantation in the lower segment is usually thin and the foetus may suffer from anoxaemia), and death during birth, the result of the method adopted. Vaginal delivery is particularly hazardous for the foetus, as the placental site is necessarily compressed during the passage of the foetus. Delivery by the vaginal passage gave a comparatively better result if the vertex presented, and in the days before caesarean section was popularised for this complication, cases were treated by the introduction of the de Ribes' bag in preference to podalic version, which latter gave a foetal mortality of 60% as against 40% after the use of the bag. De Ribes' bag is now seldom used, as caesarean section shows better maternal and foetal results. The treatment has to be carefully planned to suit individual cases. Macafee reported a foetal loss of 23.5% after adequate planning. It must, however, be remembered that this complication is definitely detrimental to the life of the foetus and undue risk should not be placed on the mother's life, only to try to save a potential life. There is a higher incidence of foetal malformations in cases of *placenta praevia*; tendency to cord prolapse is also increased, because of the

apparent lengthening of the cord as the result of the low insertion of the placenta.

*Abruptio placentae* is an even more difficult problem. Its aetiology is connected with an obscure toxæmia, perhaps also with nephritic toxæmia and thus its prevention would depend largely on the prevention of development of toxæmia. Once ante-partum haemorrhage sets in, the life of both mother and foetus are under strain. In a large majority of cases the foetal loss is disproportionately high, much higher than in cases of *placenta praevia*. *Abruptio placentae* is a grave complication and all efforts are directed to saving the mother's life, for the foetus will have already suffered from the effects of massive separation of the placenta.

The rest of the obstetric causes fall under the category of *difficult or obstructed labour*. It is obvious that the majority of the cases will be full-term. This has been worked out at 43% of still-births under full-term and 6.5% of premature still-births at an institution in Bombay. The percentage distribution of the cause gives 86% under full-term still-births. Neo-natal deaths due to these causes give an incidence between 12-13% at two leading institutions in Bombay. Cases of disproportion, malpresentations, inertia, or accidents, as rupture of the uterus, are liable to give tentorial tears, intracranial haemorrhage, asphyxia or atelectasis in the foetus. To this category may be added prolapse of the cord and strangulation by a tight cord which, however, form a small percentage as compared to the major heading of difficult labour. Most of these causes are preventable by proper ante-natal



and well chosen intra-natal methods. To quote Holland again "Ante-Natal work is the strategy and intra-natal work the tactics of obstetrics". Indications for the management of these cases have been already given in previous lectures, but a few points pertaining to management in relation to foetal results will not be out of place.

We may first consider *breech deliveries*. The usual practice is to do external cephalic version during ante-natal period, but a certain proportion cannot be turned or because of certain anticipated complications are deemed best to be left alone. Delivery of a breech is fairly easy if uterine contractions are effective; even an extended breech may be expected to end in a live baby under these conditions but, apart from inertia, a case of breech presentation is often complicated by minor degrees of pelvic disproportion, placenta praevia, uterine or ovarian tumours, multiple pregnancy and foetal deformity. There is a greater tendency to prolapse of the cord. All these complications will naturally put a greater hazard on the life of the foetus. Even excluding these, there is a comparatively greater risk to the foetus in a breech delivery. Holland found that a large proportion of these, even those with an easy delivery, had intracranial lesions, particularly tentorial tears, and he explained the mechanics of causation of these tears in the after-coming head. The publication of his report made for more care and patience in the management of a breech delivery and better salvage of the foetus. Undue haste in the delivery of the after-coming head should be particularly avoided.

A premature infant is more vulnerable to tentorial tears and intracranial haemorrhage.

Indications for *forceps delivery* have to be considered very carefully and even then a thorough examination under anaesthesia should be carried out to see if the ideal conditions are fulfilled, and if the occiput has rotated. Omission to recognise the position of the head and deliberate application of the forceps at a level higher than ideal, work for enhanced foetal and neo-natal mortality. Munro Kerr has shown very graphically how the percentage mortality goes up with forceps applied at higher levels. It is actually four times high in the case of high forceps as compared to cases delivered by low forceps. Holland has shown that of 81 cases of tentorial tears 44 were in vertex presentations, 25 of these being cases delivered by the forceps. Forceps delivery has been advocated as a prophylactic measure in certain maternal complications, but the implication is that of low forceps. Forceps at a higher level in a case of either eclampsia or heart disease (to take only two instances) would mean a longer anaesthesia and a greater strain on the mother, not to speak of the adverse effects on the foetus. Forceps can be a life saving procedure but, unwisely used, will prove disastrous, particularly to the foetus.

*Ecbolics*, used indiscriminately to stimulate uterine contractions and hasten delivery, can also work havoc. Over-zealous guarding of the perineum may also make for foetal distress. Episiotomy may be necessary even for the delivery of a premature infant, who is more prone to intracranial lesions.

*Caesarean section* is not free from risks to the foetus. The best anaesthesia from the point of view of the foetus is local, but this may not be practical in all cases. General anaesthesia often means affection of the foetus which may be born apnoeic. It has been shown of late that infants born after caesarean section are more prone to resorption atelectasis and to the development of pulmonary hyaline membrane, and premature infants are more susceptible to these affections. Byrom Williams gave a graphic description of this condition in introducing discussion on "Neo-natal Deaths following Caesarean Section" at a meeting of the North of England Obstetric & Gynaecological Society in April 1950. Taylor and Ward, writing on "Intrinsic Foetal Mortality of Caesarean Section" found mortality of prematures very high. They felt that the factor of weight over-shadowed all other considerations as anaesthesia and pre-natal care. Intracranial lesions have also been noticed after caesarean section, done even without a preceding trial. Potter and Adair (1939 & 1940) found by post-mortem studies that intracranial haemorrhage occurred in the following percentages in different types of delivery:—

Natural cephalic delivery	6.4%
Caesarean Section	10.8%
Version and Extraction	12.5%
Low Forceps	24.5%
High Forceps	69.1%

Analgesics and anaesthetics are absorbed through the placental circulation and have to be given guardedly.

*Prolapse of the cord* is a complication which affects foetal life. A

number of these cases can be anticipated in the early intra-natal period and, as I have already explained, every case admitted with pains and a floating head, apart from the possibility of disproportion, has the potentiality of prolapse of the cord. The cord may be either already presenting in the bag or is liable to be swept down if the bag ruptures with a gush while the head is still floating. I have often anticipated this by a timely examination and replacement of the presenting cord or prevention of prolapse of the cord by careful rupture of the membranes to allow the waters to escape slowly and allow the head to get into the brim.

Much of the responsibility for reducing mortality under this general head of difficult labour devolves on the obstetrician. Reduction in the incidence of breech deliveries and of other abnormal presentations requiring version, proper application of forceps and above all desisting from undue force in dragging a head past resistance, will go a long way towards reducing foetal and neo-natal mortality under this head.

An infant born with asphyxia or atelectasis has often an intracranial lesion to account for this. Intracranial lesions are manifested at birth usually by apnoea and pallor—the so-called white asphyxia. Even if revived, the infant remains dazed and groans most of the time. If it survives this period, convulsions are liable to set in. Some of these cases have been saved by careful management, exhibition of respiratory and cardiac stimulants, sedatives and vitamin K, and by keeping them continuously in an oxygen tent. But the child has to be followed up for

some years to see if it grows up as a normal individual.

Other causes of prematurity and of still-births, full-term and premature, are multiple pregnancy, hydramnios, malformations, syphilis, anaemia and general diseases, of which fevers form a high percentage. All these conditions play a minor part in the aetiology. The Rh factor has received increasing attention of late. This is responsible for a proportion of still-births and neo-natal deaths. It must be remembered, however, that the problem of Rh incompatibility arises only after two to three births. It is thus unlike the usual course of syphilis, where a typical history is of premature still-births rising to near term in repeated pregnancies. In this connection I would like to affirm that abortions in the early months are not a typical feature of either syphilis or Rh incompatibility. Two other conditions are also responsible for repeated prematures and still-births, and these are diabetes and chronic nephritis. Chronic nephritis and hypertension often cause repeated still-births at about the same period in each pregnancy, or even tend to bring on termination of pregnancy at an earlier period in subsequent pregnancies, thus differing from the effects of syphilis. The adverse effects of diabetes are being controlled by timely exhibition of insulin therapy and of hormones. Follicular hormone has been found effective. We have not acquired sufficient knowledge of certain foetal and placental states which affect foetal life. Malformations are difficult to explain. In certain countries, where rubella is prevalent, it has been noticed that the incidence of

malformations is high among women who have had rubella in the early months of gestation. Rubella is not a common disease in India, but allied virus infections do occur in our country and these may have a similar effect. This subject needs investigation. Other causes of neo-natal mortality fall under post-natal conditions, of which respiratory, gastrointestinal and other infections take a heavy toll.

A certain number of infants, particularly premature ones, have been known to develop resorption atelectasis and pulmonary hyaline membrane. This latter is said to be brought about by inhalation of liquor amnii. The incidence has been worked out at 30% of total necropsies on live-born infants. The incidence is very high amongst the premature. However, the incidence cannot be considered too high considering that most infants at birth are known to have inhaled varying quantities of liquor amnii. The development of hyaline membrane does not seem to have any relation to the type of labour, except that a high proportion has been noticed in infants born after caesarean section, barring those born under local anaesthesia. The probable explanation is that the anoxia resulting from the anaesthesia predisposes to the condition. It has been known to occur even after a normal labour. The infant may cry well at birth and appear quite healthy, but, within a few hours, signs of respiratory embarrassment are manifest with retraction of the epigastrium and the lower intercostal spaces. Blood-stained frothy sputum is brought up in quantities. Some of these cases may be confused

with what has been termed congenital pneumonia. Only a small percentage of these cases are said to recover, if prompt drainage of the upper air passages is carried out. This subject is being extensively studied with a view to prophylaxis.

A good number of infants at birth swallow or inhale liquor amnii and try to bring it up the next few hours. A precaution which is most helpful is to keep the infant's head on the side so that any vomit will go over the side and there would be less chances of inhaling the same. Sudden and unexpected attacks of cyanosis are often the result of such regurgitation. Autopsy studies, as already stated, show a higher incidence of pneumonia in the new-born than is diagnosed clinically. In a number of cases only histological sections have confirmed the diagnosis. Pneumonia is accountable for 7.8% of deaths in the premature and 9.5% in the full-term, as per these autopsy studies. Greenhill gives an incidence of 5.8%. Cruickshank worked out an incidence of 7% and refers to two types, the atelectatic and the septic. It is possible that a number of the atelectatic cases are associated with the development of the hyaline membrane. The common organisms involved in the infection of the new-born are the staphylococci, but occasional cases of pneumococcal infection are noticed.

The next common infection is of the gastro-intestinal tract. This is commonly noticed in institutional cases, and is probably due to proximity of the cases in a large ward, with insufficient nursing staff. To prevent cross-infection of the respiratory and the gastro-intestinal

tracts, some institutions in the west have glass partitions between each bed. This may not be practicable in our country but immediate segregation of suspected cases of diarrhoea and other infections, to be nursed by a separate staff, should go a long way towards minimising the spread of infection as also deaths under this head. It should be remembered that new-born infants have a tendency to hypo-acidity. Cruickshank quotes Hess as suggesting the following types of cases due to gastro-intestinal disturbances:—

1. Functional insufficiencies of the gastro-intestinal tract dependent on lack of development;
2. Underfeeding in healthy breast-fed infants in the first few months;
3. Secondary digestive and nutritional disturbances accompanying systemic infections (parenteral);
4. Infections of the gastro-intestinal tract (enteral).

General *septicaemia* and *pyaemia* and above all neo-natal tetanus should hardly be known in good obstetric practice. These are usually the legacies of practice of untrained dais. *Jaundice* forms an important cause of neo-natal mortality. A number of cases of physiological jaundice, which is harmless and passes off within a few days, are commonly noticed, but the ones that are serious and liable to prove fatal are due to certain well recognised entities, as familial or icterus gravis neonatorum, erythroblastosis or Rh incompatibility, acholuric icterus due to atresia of the bile ducts, syphilitic peri-

cholangitis, toxic as part of mother's toxæmia, and septic due to infection from the umbilicus or from the alimentary tract. This is a formidable list and will require care in diagnosis, and prompt and well-planned treatment. Rh incompatibility is manifested, in those infants born alive, by either profound and progressive anaemia or deepening jaundice. The most effective treatment at present is by blood-transfusion, preferably replacement transfusion, a number of cases having thus been salvaged. This is a special study and requires very careful technique. Blood transfusion officers would need to take up this study so as to give help through the Flying Squads to out of the way cases. An important investigation suggested during the ante-natal period, in addition to routine Wassermann or Kahn's test, is the Rh factor of every pregnant woman, so that Rh negative mothers could be kept under special supervision, and their titre for anti-bodies and blocking bodies taken periodically. Fortunately the incidence of Rh negative individuals is small in our country except in a few communities.

*Syphilis* accounts for a certain percentage of premature and still-births and a smaller number of neo-natals. Mudaliar terms it "the captain of the hosts of death of the foetus" and quotes figures giving an incidence of 40% of prematures and 24% of foetal deaths at the Johns Hopkins Hospital. This was in 1920. Holland and Claypon in 1926, gave an incidence of 7%, whereas Cruickshank in 1930, found less than 1% as due to syphilis. Diagnosis of syphilis has to be based not necessarily on positive Wassermann reaction, as many false posi-

tives have been noticed during pregnancy, but on histological examination of the organs. With the present tendency to early diagnosis and treatment, the incidence of syphilis is probably low. The introduction of treatment by special penicillin preparations has helped much in this direction.

*Haemorrhagic disease* is said to be due to deficiency of vitamin K. The commonest manifestation is melaena, but haemorrhages from other mucus and serous membranes are also known. A certain number of intracranial haemorrhages are also probably of this origin. Prompt injection of mother's blood intramuscularly has been found useful. It is possible that the mother's blood contains the required vitamin K as also a sufficiency of calcium. A prophylaxis suggested is the exhibition of vitamin K to the mother in the last fortnight of pregnancy as also early in labour, and administration of vitamin K to the infant soon after birth.

*Sclerema Neonatorum* is a condition rarely seen in our warm country, except in the premature and immature in whom the circulation is poor. The best preventive is a uniform temperature and proper humidity for the infant.

To turn to certain general observations, Yerushalmy (1945) mentions the following factors as influencing premature births and neo-natal mortality:

1. There is 25% higher mortality in male infants;
2. Very young and elderly women run a higher risk for themselves as also for their infants;

3. Age of the father has, perhaps, the same effect as above.
4. Incidence of premature births and neo-natal deaths is increased if interval between pregnancies is either too short or too long;
5. He refers to a familial tendency and certain genetic factors.

Mudaliar in 1928, reviewing 64,000 cases of confinement, drew almost identical conclusions. Dougal Baird, writing on the "Influence of Social and Economic Factors on Still-Births and Neo-Natal Deaths" in 1945, showed that the incidence was higher in the lower classes, three times the number of still-births and more than four times the number of neo-natal deaths, as compared to higher social groups. He felt that the state of nutrition of the expectant mother played an important part. This has also been brought out in the experiments carried out at various centres, already referred to and from the observations on the effects of the siege of Leningrad mentioned earlier in the lecture. According to Baird, the highest incidence of prematures and of neo-natal deaths was in first parity and the least in the second para. The least incidence was in women under 25. His investigations showed that neo-natal deaths were ten times higher in the premature. He also stated that 30% of still-births in full-term and 50% among the premature had no assignable cause.

The following data may be drawn from the above facts:—

1. Prematurity forms a major cause in still-births and neo-natal deaths. A premature

baby, being already a problem of rearing is, moreover, most vulnerable to hazards of labour and highly susceptible to post-natal infections;

2. Problem of salvage of the premature. Rate of mortality and, therefore, the survival rate can be improved by specialist nursing and efficient paediatric service;
3. Neo-natal mortality is very high as a total, but particularly so during the first week (70.5%), chief causes of the latter being, prematurity, injuries at birth and malformations, suggesting influence of ante-natal conditions and intra-natal factors;
4. Influence of social, economic and dietetic factors. Baird refers to the striking fall in the rate of prematurity and of still-births during the war periods when special supplements were given to expectant mothers;
5. Autopsy studies show an unusually high incidence of pneumonia in the full-term and in the premature. The development of hyaline membrane in the pulmonary alveoli is intimately connected with this;
6. Not a very high incidence of syphilis was found in detailed studies of still-births and neo-natal deaths;
7. Influence of the Rh factor has been shown.

Certain preventive measures may be formulated by the study of the data given. Greenhill in 1947, made the following suggestions:—

1. Proper ante-natal care;
2. Prevention of, and proper management of, premature births;
3. Prevention of birth injuries (suggests vitamin K as a prophylactic);
4. Prevention of, and early treatment of, syphilis and other infection;
5. Prevention of toxæmias;
6. Avoidance of, and prompt treatment of, erythroblastosis.

In view of the special problems presented in our country, I would like to summarise suggestions for remedial measures as under:—

1. General public health measures to reduce the incidence of infectious diseases, which play a prominent part in bringing about premature and still-births;
2. Other stringent measures to reduce incidence of prematurity—better standards of living, better nutrition. Large doses of vitamin E (75-125 mgms.) have been shown to prevent premature births;
3. Improving social and economic status;
4. Diet supplements;
5. Early diagnosis and adequate treatment of systemic diseases;
6. Efficient ante-natal care, including guidance of patient in her own care and prevention of toxæmia by proper hygienic and dietetic measures, at the same time being alert to the earliest signs and symptoms of toxæmia;
7. Specialist advice for ante-natal complications;
8. Carefully planned intra-natal

measures to reduce incidence due to hazards of labour. It is necessary to plan so that only cases expected to run a normal course, as second to fourth parity, are booked at smaller maternity homes and by general practitioners, and the rest booked for confinement at larger maternity centres where expert attendance is easily available.

9. Proper nursing and paediatric service for the new-born, for salvaging the prematures. These require the right temperature and humidity. As the new-born, and particularly the premature, is most susceptible to infections, proper precautions by the use of masks and avoidance of contacts are necessary. Feeding details have to be carefully worked out.
10. The problem presented by Rh incompatibility must be borne in mind and studied carefully;
11. Contraception for selected cases. Baird has shown that oft-repeated pregnancies resulted in increased frequency of prematures.

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