

# REPRODUCTION RESEARCH AND HEALTH\*

## PART II — FETAL HEALTH

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### INTRODUCTION

IN the recent decades, in most developed and some developing countries, the frequency of maternal deaths is so low that the fetal death rates, occurring before and immediately after birth, are being regarded as a more satisfactory and sensitive index of the quality and efficiency of the obstetric services of a hospital or country. The technical term, used by obstetricians and health administrators to measure the extent of fetal deaths, occurring in relation to late pregnancy complications and childbirth, is "perinatal mortality". The term perinatal mortality is defined as the total number of "stillbirths" and "newborn deaths occurring in the first week after birth" per 1,000 total births.

The beneficial impact of research on fetal (perinatal) health in the past 25 years can best be exhibited by reviewing the recent advances in the four major areas of perinatal medicine, namely, (1) low birth-weight infants (premature and dysmature infants), (2) intra-uterine fetal hypoxia (oxygen deprivation for the unborn child), (3) fetal birth injuries, and (4) fetal malformations.

### Low Birth-Weight Infants

Fetal wastage (perinatal mortality) from pregnancies resulting in the birth of low birth-

weight infants is still the major cause of perinatal mortality in some developing and all under-developed countries of the world. Factors that have contributed towards improved fetal salvage in the "Low Birth-Weight Infants" in the recent 25 years are multi-factorial and these are now discussed.

The socio-economic enhancement of the community, in general, and the mother, in particular, which involves not only, the eradication of poverty, but also, health education to correct misconceptions prevailing as a result of ignorance, socio-cultural taboos and unhealthy traditional practices in the areas of nutrition and health care of pregnant and puerperal mothers and newborns, has contributed considerably in this area of fetal salvage.

Improvements in the quality and extent of ante-natal and post-natal services (both out-patient and inpatient) that are being provided to both mothers and newborns have influenced fetal salvage significantly in this field.

Advances in the pharmacological management of pre-term labour have recently contributed in a small way, and this has consisted of the inhibition of premature labour by the use of Beta — Sympathomimetic drugs, and thus allowing the pregnancy to progress to a better stage of fetal viability. The use of antibiotics, before and after birth, has helped to prevent fetal demise from fetal infection.

Fetal monitoring in labour with the liberal practice of "assisted" vaginal delivery, in particular the latter, has helped to prevent fetal demise from asphyxia and birth trauma in the intrapartum period.

There is presently the availability of expert newborn paediatric services in most reputable obstetric units of hospitals. In the University Hospital, University of Malaya, Malaysia, there is provision of Special Care Nursery, built

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\*Inaugural Lecture (part) that was delivered on the 2nd  
March 1979 at the Faculty of Medicine, University of  
Malaya, Pantai Valley, Kuala Lumpur, MALAYSIA, under  
the Chairmanship of the Royal Professor Ungku A. Aziz,  
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adjacent to the Labour Ward of the Hospital for the speedy and effective care of the low birth-weight infant, which involves the maintenance of respiration, body temperature and nutrition; the prevention and treatment of infection; and the treatment of jaundice of the newborn.

### **Intra-Uterine Fetal Hypoxia**

In all developed countries and in some developing countries of the world, intra-uterine fetal hypoxia, or in a less technical jargon — “oxygen deprivation for the unborn child”, has emerged as the major cause of fetal wastage in pregnancy (perinatal mortality). The two common groups of causes of intra-uterine fetal hypoxia are placental insufficiency syndrome and prolonged or difficult labours.

- (i) **Placental insufficiency syndrome:** “This is a clinical syndrome in which there is a state of dysfunction of the placenta, from failure of optimal growth or premature degeneration of the placenta, with resultant reduction in the placental reserve state, or a failure of the placental membrane to function as an efficient semi-permeable membrane, to such an extent as to jeopardise the oxygen, nutrient and excretory requisites of the fetus. The end result can manifest itself by retarded intra-uterine fetal growth, fetal cachexia or by a state of intrapartum fetal anoxia, any one of which may predispose to perinatal mortality and morbidity from asphyxia, intracranial haemorrhage and infection” (Sinnathuray, 1964). The common clinical conditions that can predispose to “placental insufficiency” syndrome are postmaturity (prolonged pregnancy syndrome) (Sinnathuray, 1967 and 1972), toxæmia of pregnancy, chronic hypertensive diseases, elderly primigravida and diabetes mellitus (Sinnathuray, 1964).
- (ii) **Prolonged or difficult labour:** In this arena of obstetric practice there have been progressive changes in the concept of “prolonged labour” in the past 30 years — from an earlier concept of a labour which exceeded 48 hours duration, to one that exceeded 36 hours, 24 hours and even, presently, to a shorter duration. The present-day practice of the use of partograms to chart the progress of labour in modern institutional obstetric practice has led to the need for the

active augmentation of sluggish and inefficient labour, at all stages of the process of labour, by the use of oxytocic agents (oxytocin and prostaglandins), epidural anaesthesia and planned assisted vaginal delivery. This practice has ensured that most women attain the delivery of their babies between the physiological labour duration of 6 to 18 hours.

### **Fetal Birth Injuries**

The contributory role of fetal birth injuries to fetal ill-health (perinatal mortality and morbidity) has shown a rapid decline in the past three to four decades, throughout the world. In the developed and most developing countries, presently, fetal birth injuries contribute to a relatively small role towards the total cause of perinatal (fetal) mortality, much less than any one of the other three causes, namely, “low birth-weight infants, intra-uterine fetal hypoxia or fetal malformations.

The two major groups of causes of fetal birth injuries in the past have been (i) prolonged or difficult labours which were due to cephalopelvic disproportion, fetal malpresentations or uterine dysfunction; and (ii) difficult manipulative vaginal deliveries, such as high forceps delivery, difficult breech delivery, or internal version/breech extraction. The major advances that have contributed towards the reduction of fetal birth injuries in the past three or four decades have been multi-factorial, and they are improved health and physique of would-be mothers — a reflection of the socio-economic upliftment of the community (Baird, 1960); the liberal provisions of ante-natal care; the availability of obstetric trained personnel — both doctors and trained nursing staff; proper pre-delivery pelvic capacity assessment (clinical and radiological); hospital delivery for the high risk pregnancies; partograms to evaluate progress of labour; augmented labour for sluggish labour conditions; and the practice of liberal Caesarean section delivery. In this last context, there is need for restraint and the balanced usage of Caesarean sections in modern obstetric practice. Sir Hector McLennan, who was an eminent British obstetrician and President of the Royal College of Obstetricians & Gynaecologists of the United Kingdom in the mid-1960s, summed up the situation most aptly as follows: “Caesarean section has been a boon — let us prevent it

from falling into disrepute and becoming the first resort of the lazy obstetrician, the escape of the timid obstetrician, and the cloak of the incompetent" (McLennan, 1954 and 1959; Caire, 1978 and 1979).

Skilled conduction of vaginal deliveries by the proper training of obstetric personnel: It must be appreciated that the proper conduction of abnormal vaginal deliveries is both an art and a skill. It calls for the proper training, skill and judgement of the accoucher. This can best be illustrated in the context of the skilled conduction of vaginal breech delivery in obstetric practice. In the management of breech labour, there needs to be a proper balance between the "masterly inactivity" in the early phases of labour, and the "masterly activity", of a decisive and precise nature, at the time of conduction of the delivery of the baby's trunk and head. Dr. De Lee (1937, as quoted in *British Obstetric Practice*, p. 649, 2nd Ed. 1959), an eminent American obstetrician who practised in the early part of this century, had summed up the situation in these words: "Let me watch a man conduct a breech case and I will give you his obstetric rating."

### **Fetal Malformations**

The rapid advances in obstetric research and the excellence of obstetric services in most developed countries of the world have currently considerably reduced the perinatal fetal wastage from low birth-weight infants, intra-uterine fetal hypoxia and fetal birth injuries. This has resulted in a relative increase in the contribution of fetal malformations towards the total picture of perinatal fetal wastage in such situations; and it is probably the second major cause of perinatal fetal wastage in most developed countries of the world.

The major causes of fetal malformations can be broadly classified as inherited disorders, which can be sex-chromosome-linked or autosome-linked, inherited as a Mendelian or recessive nature; or environmentally acquired disorders, which can be due to viral infections (German Measles, rubella), bacterial infection (syphilis), parasitic infection (toxoplasmosis), irradiation (x-rays and radioactive materials), and toxic chemicals (cytotoxic drugs, progestogens, thalidomide and certain other chemicals).

The major research advances that have contributed and can contribute towards the reduction of perinatal fetal wastage from fetal malformations are the provision of genetic counselling of parents — based upon the better understanding of human genetics; the health education of public, in general, and parents, in particular; and the health education of medical personnel — undergraduate and continuing medical education. Further advances in this area have been the sequelae of excellent comprehensive modern ante-natal care services providing for the screening for genetically inherited diseases by amniocentesis and fetal cell culture; the screening for neural tube defects of anencephaly and spina bifida by amniocentesis and detection of alpha-feto-proteins; the screening for infective embryopathies, e.g. tests for syphilis, rubella and toxoplasmosis in the blood of pregnant mothers; and the avoidance of exposure of fetus-in-utero to irradiation and noxious chemicals. Definitive reductions in perinatal fetal wastage from infective embryopathies can be achieved by effective immunisation of women in the non-pregnant status against rubella and the early and effective treatment of maternal infections that can afflict the fetus-in-utero, e.g. syphilis, and toxoplasmosis.

Fetoscopy as a sophisticated procedure in fetal medicine is currently emerging as an invaluable investigatory set-up. This has been recently made possible by the present-day technological advances in the areas of fibre optic endoscopic instrumentation and related "cold" light source. With the aid of fetoscopy it is becoming possible, in the early stages of human pregnancy, between the 4th and 6th months (second trimester of pregnancy), to visualise the small fetus for severe external malformations, such as anencephaly, or other fetal monstrosities. More importantly, it is now possible, through fetoscopy, to take micro-samples of fetal blood from the fetal blood vessels that can be visualised on the fetal surface of the placenta. The access to medical scientists of fetal blood, so early in pregnancy, has now made it possible to diagnose lethal or severely disabling fetal conditions by elaborate blood studies for chromosomal, thalassaemic, biochemical and cellular defects. Thus, it is now becoming possible for us to scientifically detect major fetal malformations and fetal thalassaemia major in the early stages of human pregnancy (Walters, personal communication).

Therapeutic abortion service: With the above scientific advances in the reliable early detection of fetal malformations and fetal blood dyscrasias, it is both socio-medically and ethically acceptable, as well as humanely realistic, to offer therapeutic abortion services to mothers in the early stages of their pregnancies, when the investigatory evidences by maternal serology, amniotic fluid studies and fetal blood (by fetoscopy) studies conclusively show that the unborn fetus is afflicted with the major groups of fetal malformations such as German measles fetal afflictions, major fetal chromosomal afflictions, fetal neural tube defects, e.g. anencephaly (fetal monsters without brains) or overt spina bifida, and severe disabling hereditary blood disorders, e.g. fetal thalassaemia major. In all such situations, adequate psycho-social and genetic counselling should be instituted before and after the therapeutic abortion services, so as to alleviate the mental anguishness in the family.

## THE FUTURE

Just as was stated in the previous paper (Sinnathuray, Med. J. Malaysia, 1979) on Maternal Health, the future developments in the field of Fetal Health also promise to be exciting. Advances in the field of social obstetrics and gynaecology, particularly in the context of developing countries, will lead to socio-economic upliftment of the pregnant mothers. This will, in turn, lead to improvements of their general health and nutrition, which will subsequently be reflected in their better fetal growth and in the birth of better babies. The quantity and quality of fetal salvage will be considerably enhanced by the improvements to the quality and extent of the obstetric and neonatal paediatric services made available and utilised.

Fetoscopy seems to hold exciting promises for the future. Recently introduced as a fetal diagnostic tool to visualise the fetus-in-utero and withdraw fetal blood samples for diagnostic purposes, it may become an important avenue through which direct access can be made to the unborn fetus and its fetal circulation, to enable us to institute therapy to the fetus in its early stages of intra-uterine life. Thus, fetoscopy points promisingly towards diagnostic and therapeutic fetal medicine. The currently high prevailing rates of fetal loss from fetal abnormalities will be reduced either by better identification of

the causes of the fetal malformations and by related preventive measures, or by their earlier detection in the pregnant women and by subsequent safe termination of such afflicted pregnancies.

## CONCLUSIONS

In my inaugural address, I have attempted to comprehensively cover the extensive benefits accruing to human health and human welfare from research in human reproduction in this 20th century. The ultimate objectives of research in human reproduction are firstly, to ensure that the society in general, the family as a unit, or the woman as an individual, is assisted in her or its endeavour to successfully have the desired number of children, at the desired pregnancy intervals, and further to ensure that every pregnancy progresses from conception to childbirth, as uneventfully as possible, with the minimal of health hazards to mother and child.

It is, thus, apparent to all of you that those of us, practising in field of obstetrics and gynaecology, are intimately concerned not only with the quantity of life at conception, but also with the quality and quantity of both maternal and fetal life throughout pregnancy, childbirth, and thereafter!

The sum-total message of my inaugural address, entitled Reproduction, Research and Health, is a healthy woman conceiving at the desired times of her reproductive life, and having, on each occasion, a healthy pregnancy status, culminating in a normal childbirth; and the final return to the society of a happy and healthy mother and child.

## SUMMARY

The four major areas of fetal (perinatal) medicine, which have been contributing to excessive fetal (perinatal) wastage in recent years, namely low birth weight (premature and dysmature) infants, intra-uterine fetal hypoxia, fetal birth injuries and fetal malformations, have been presented and discussed. The beneficial impact that research and evolution of modern obstetric practice have had on these four major causes of perinatal (fetal) wastage has been reviewed. The manner in which the future trends towards the betterment of fetal health are likely to develop has been briefly stated.

## ACKNOWLEDGEMENTS

To the Honourable Vic-Chancellor, Royal Professor Ungku A. Aziz, I wish to extend my very sincere gratitude for having graciously presided at the meeting of my inaugural address, and for having introduced me with such laudable and kind remarks about my department and myself to a large audience, consisting of staff and students of the University of Malaya and University Hospital, the members of the medical profession and the public. I also wish to thank the Honourable Vice-Chancellor for giving me the honour and distinction of delivering the first inaugural address in this Medical Faculty, in its current resumed series, after a long lapse of over 12 years.

My very sincere appreciation and thanks to Mrs. Ivy Phang of my department for her excellent secretarial assistance rendered on the preparations of the manuscript of my inaugural address, for the presentation and the subsequent publications.

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