

# Optimising Management of Stillbirths in Modern Singapore

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## ABSTRACT

**Objective:** To conduct a critical analysis of stillbirths in Kandang Kerbau Hospital with emphasis on epidemiological factors, related causes and investigation strategies.

**Design:** A prospective study.

**Setting:** Kandang Kerbau Hospital.

**Patients:** Case records containing antenatal and post-partum details of all 136 stillbirths were obtained from the medical records office and reviewed by 3 obstetricians. Epidemiological data, antenatal history, intrapartum progress, post-partum investigation, post-mortem findings (where applicable) were reviewed and recorded.

**Results:** The incidence of stillbirths was 4.48/1,000 in 1994. 73.1% of the stillbirths were macerated. Significantly higher stillbirth rates were noted in the Malays and unbooked or late booking cases.

The causes of stillbirths were unexplained in 29.4%. Fetal anomalies constituted 18.4%, followed by asphyxia, abruptio, and cord accidents. Maternal obstetrical problems contributed to the rest.

**Conclusion:** A comprehensive management strategy to reduce stillbirths include community and patient education, early or shared antenatal care, careful prenatal surveillance, optimum investigations as well as a careful audit with adequate bereavement and counselling.

**Keywords:** stillbirth and perinatal mortality, antenatal care, fetal anomalies, perinatal necropsy, intrauterine death

## INTRODUCTION

The death of a fetus is one of the unhappy events in the field of obstetrics. A stillbirth is defined as the birth of a child after 28 weeks of gestation which does not breathe or show any sign of life after delivery from the mother<sup>(1)</sup>. Although stillbirth rate in Kandang Kerbau Hospital has shown a decline albeit hesistant over the recent years, it remains an enigma in many areas including the identification of the precise cause and consensus regarding proper investigation and management strategies. The purpose of this paper is to highlight the social demographic characteristics and risk factors associated with this unfortunate event and review our current management strategies from the perspectives of an obstetrician.

## METHODS AND MATERIALS

A prospective analysis of all cases of stillbirths were reviewed by a panel of three obstetricians from January 1993 to December 1994. The patients' case records, results of investigations and post-mortem records were scrutinised and recorded.

## RESULTS

### Incidence

A total of 136 (0.44%) cases of stillbirths among 30,786 deliveries were identified in the 2-year study period ie. 1 per 226 deliveries or 4.4 per 1,000 deliveries. The annual stillbirth rate in our hospital has shown a slight decline in the past four years in contrast to neonatal death rate (Fig 1).

### Epidemiological characteristics

#### (i) Maternal age

This is shown in Table 1. Mothers above 30 have a higher rate of stillbirth ( $p = 0.05$ ).

#### (ii) Racial characteristics

There was a statistically significant higher rate of stillbirths in the Malay antenatal population compared to the Chinese population ( $p < 0.01$ ) (Table II).

### Stillbirth characteristics

#### 1. Birthweight

49.3% of the stillbirths were more than 1,999 gm and 37.5% between 1,000 - 1,999 gm and 13.2% were less than 1000 gm.

#### 2. Type of stillbirths

About three-quarter of stillbirths were macerated (73.1%).

#### 3. Booking characteristics

More than one quarter (27.2%) were unbooked and only 40% were booked before 24 weeks. This is in stark contrast to the general obstetrical population, where 96.6% of cases were booked and only 3.4% unbooked ( $p < 0.0001$ ).

#### 4. Post-mortem rates

The overall post-mortem (PM) rate was 39.7%. The post-mortem rate for those stillbirths with unknown causes or factors was 17.5%. The post-mortem rate for Malay stillbirths was significantly lower at 4.5% ( $p < 0.0001$ ).

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**Table I - Maternal age**

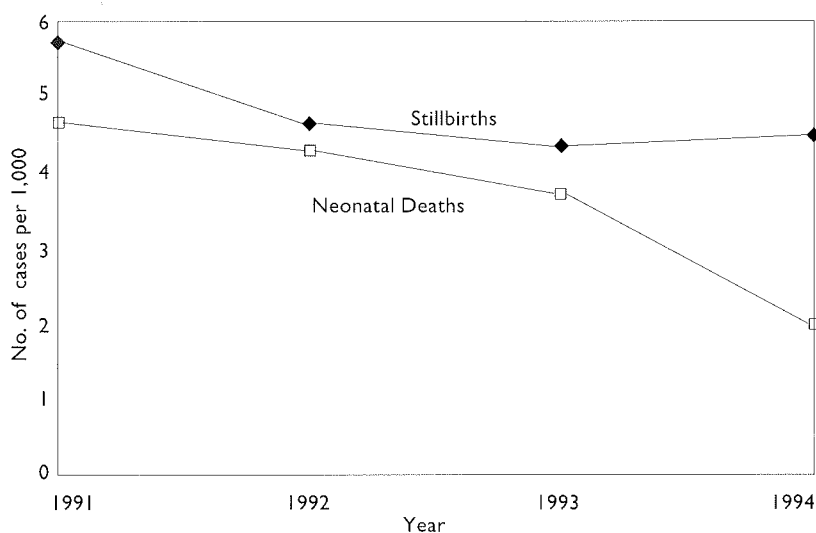
Age In Years	Stillbirth frequency	Stillbirth %	Obstetric population frequency	Obstetric population %
< 30	62	45.6%	16,594	53.9%
≥ 30	74	54.4%	14,192	46.1%
Total	136	100%	30,786	100%

**Table II - Racial characteristics**

Race	Antenatal population %	Stillbirth %	Stillbirth rate (adjusted)
Chinese	50.2%	41.9%	0.38%*
Malay	35.4%	49.3%	0.61%*
Indian	10.0%	7.4%	-
Others	4.4%	1.5%	-

\* p < 0.01

**Fig 1 - Incidence of stillbirths and neonatal deaths**



Neonatal deaths (per 1,000)	4.6	4.2	3.6	2
Stillbirths (per 1,000)	5.69	4.61	4.35	4.48

**Contributing factors in stillbirths**

There were 25 (18.4%) cases of fetal anomalies. Of the 25 cases, 4(16%) cases had maternal age 35 and above. Two of them had chromosomal anomalies. Overall chromosomal anomalies were established in 6 (24%) of the 25 cases. Of the 25 cases, 12 (48%) were booked late or unbooked which made prenatal diagnosis and termination difficult.

**DISCUSSION**

The study of perinatal mortality encompasses both stillbirth rate and neonatal death rate. While neonatal death rate in Kandang Kerbau Hospital, Singapore has steadily declined from 0.46% in 1991 to 0.20% in 1994 (p < 0.01), the same cannot be said for the stillbirth rate (Fig 1). As practising clinicians dedicated to improve health standards, this is the area where we must focus upon.

The study of fetal death is plagued by non-conformity of definition and the world wide legal requirements for stillbirth registration remain variable. It may be by gestation age eg. 28, 24 or even 22 weeks, or it may be by birth weight usually 500 gm or 1,000 gm, or exceptionally by length (eg. 25 cm crown to heel)<sup>(1)</sup>. At one extreme, countries like Japan, register all fetal deaths occurring after 13 weeks gestation<sup>(2)</sup>. In Singapore, fetal deaths after 28 weeks are registered as stillbirths<sup>(3)</sup>.

The higher stillbirth rate among the Malays (0.60%) compared to the Chinese (0.38%) is a cause for concern. Ethnic group differences in stillbirth rates have existed in the study of perinatal mortality all over the world. In the USA, perinatal mortality rates among the black population are greater than among whites; in Australia, the aborigines have a higher mortality rate than the white settlers; in Israel, the Arabs have a higher mortality than the Jews. In the United Kingdom, immigrants from India, Bangladesh have the highest rates<sup>(4-6)</sup>. In Malaysia, the stillbirth rate was significantly higher amongst Indian mothers compared to the Chinese and Malays<sup>(7)</sup>. Although such difference may be associated with consanguinous marriages, it is more likely that the high frequency of unbooked cases or late booking and consequentially the decreased utilisation of prenatal diagnosis has contributed significantly to this difference.

The stillbirth rate of women more than 30 years old was found to be significantly greater than those less than 30 years old. Although there is generally a U-shaped variation with the risk of perinatal death, the difference in pattern of stillbirth rate increasing with maternal age is more pronounced<sup>(4)</sup>. Many authors have showed that this relationship between advanced maternal age and stillbirths was mainly associated with antepartum fetal deaths and was explained by the increased rates of hypertension, bleeding and infections in older mothers. However, a recent study on a large unselected obstetrical population in Canada<sup>(8)</sup> over a 30-year period which controlled for the above confounding variables, confirmed that women 35 years or older continued to have a significantly higher rate of fetal death than their younger counterparts (odds ratio for women 35 to 39 years of age as compared with women < 30 years of age, 1.9; 95% confidence interval, 1.3 to 2.7.)

Suggestive signs of fetal death specifically the women's inability to perceive fetal movements and physician's inability to hear the fetal heart beat are imprecise at best<sup>(9)</sup>. Diagnosis of all 136 stillbirths in our series was confirmed by real time ultrasound. Failure to detect heart wall motion and valvular

**Table III - Contributing factors in stillbirths**

Contributing factors	Number	%
Unknown	40	29.4
Fetal Anomalies	25	18.4
Abruptio	16	11.8
Cord accidents	15	11.0
Diabetes mellitus	12	8.8
IUGR	8	5.9
Infections	7	5.1
Pre-eclampsia	5	3.7
Twin problems	4	2.9

**Table IV - Breakdown of congenital abnormalities**

Anomalies	Number	%
Multiple	12	48
Anencephaly	4	16
Clinically Down syndrome	2	8
Thanatrophic dwarf	1	4
Hypertrophic cardiomyopathy	1	4
Single umbilical artery	1	4
Barts hydrops	1	4
Severe hydrops	1	4
Renal anomalies	1	4
General dymorphic	1	4

function has become the gold standard for establishing diagnosis with absolute certainty.

Our study showed that 73.1% of stillbirths were macerated. Maceration (Latin *macerare* – to soften by looking) describes the softening effect of soaking on solid tissues and is applied to degenerative changes occurring in a fetus retained in utero after death. The earliest signs of maceration are seen in the skin in the form of skin slipping<sup>(10)</sup> approximately six hours and certainly twelve hours after intrauterine death.

Only relatively infrequently is it possible to identify a specific condition that directly causes death of the fetus. Severe congenital malformations, premature separation of placenta, umbilical cord prolapse are such examples. To further frustrate the obstetrician and patients much of the time, the cause of fetal death cannot be identified by even the most thorough search. However, it is generally felt that there is still a sizable scope for improvements into the stillbirth rates and optimising our management strategies in areas of prenatal diagnosis, antenatal surveillance, community and patient education and better investigative procedures.

Congenital abnormalities attributed to 18.4% of all stillbirths. Although major congenital abnormalities are not seen as frequently in stillbirths as they are in neonatal deaths, they were still found in 13% of stillbirths in a study of 253 macerated stillbirths examined in Oxford by Keeling<sup>(11)</sup>. Stillbirths with congenital malformation have a higher frequency of chromosomal abnormalities (5%-10%). The most common of these include trisomies (21,18,13) and monosomy. This observation was borne out in our series. With this in perspective, it would be logical to assume that stillbirth rate from this cause could be potentially reduced by a protocol of early antenatal diagnosis and termination. To further emphasise the importance of antenatal care, our study revealed that a staggering 27.2% of stillbirths had late bookings compared to only 3.4% in the general obstetric population.

The risks of stillbirths associated with gestational complications were high and around 40% of fetal deaths were attributable to complication such as abruptio placenta, diabetes mellitus, intrauterine growth restriction, pre-eclampsia and infection (Table III). A Finnish study<sup>(12)</sup> reported that 68% of mothers of stillborn infants had medical or obstetrical complications during pregnancy.

As it is obvious that good diabetic control in the areas of enhanced screening (OGTT, HBAIC), stringent follow-up and maintenance of a normoglycaemic state will definitely be beneficial, it is in the area of microbiological studies that controversies arise. The yield from routine infection investigations (TORCHES) have been poor. This panel of serological tests were performed on 117 (86%) of our patients with stillbirths. Amongst this study group, there were only three cases positive for syphilis and another two showed elevated titres for toxoplasmosis. Cytomegalovirus serology were negative in all patients. In fact, the significance and frequency of infection in cases of intrauterine death has been conflicting and likely to be less frequent in macerated stillbirth, compared to fresh stillbirths and neonatal deaths<sup>(10)</sup>. A negative serology may, however, be useful in exclusion of causes eg. toxoplasmosis. Madan et al<sup>(13)</sup> showed that isolation of genital myoplasmas from fetal tissues, although associated with chorioamnionitis and funisitis, correlated poorly with the incidence of intrauterine death. Hence, it is felt that routine bacteriological and viral cultures are not justified in every case, but should be performed in cases where clinical information and pathological findings are suggestive of infection. These would include not only cases with obvious signs of infection (opacity and neurosis of placental membranes), but also severe intrauterine growth retardation and non-immune hydrops (Table IV). Congenital echovirus infection (echovirus type 33 and 27) might be suspected in the fetus with marked haemorrhagic necrosis, particularly in the peripheral muscles, and viral cultures may be helpful. Other antenatal infections like Parvo19 virus may also need to be considered.

Hypertensive disease as a cause only contributed about 3.7% of the total. This depends very much on the frequency of the disease in a particular population and the era from which it is drawn<sup>(9)</sup>. However, it remains an area where potential improvements can be expected, as the role of low-dose aspirin in preventing pre-eclampsia is explored.

Connective tissue disorders, especially in women with lupus anticoagulant and raised levels of anticardiolipin antibodies, are each independently associated with fetal loss and they should be sought even in apparently healthy mothers, following fetal loss<sup>(14)</sup>. However, it would be more cost-effective to be selective in the usage of anticardiolipin antibodies and anti-lupus anticoagulant, anti-ANA rather than implementing a whole battery of autoimmune tests on all stillbirths.

Although there appears to be advances made in the accuracy of prenatal detection of birth defects, serological and autoimmune tests, necropsy still provides the final diagnosis in many cases and serves as an "ultimate audit". The overall post-mortem rate was 39.7% and only 4.8% in Malay stillbirths. Although religious belief was mainly responsible for this trend, it is prudent to emphasise the clinical importance of an autopsy. In Berger's view<sup>(15)</sup>, "any single autopsy may not have dramatic import for progress in medicine but it may have profound and life-long implications for helping the dead child's family". Indeed, histological examination can help in the assessment of gestational age at the time of death (sudden or associated with prolonged stress), presence of viral infection or maternal diabetes. Even negative findings after carefully performed necropsy are useful in future parental counselling<sup>(16)</sup>. Furthermore, this information obtained can become an essential component of any strategy aiming at the reduction of perinatal mortality. There is a need for obstetricians to raise the profession's and the public's awareness of the prognostic benefits that may accrue from a properly conducted perinatal autopsy.

### CONCLUSION

This comprehensive 2-year analysis of stillbirths has highlighted several aspects of obstetric care in Singapore, where improvements can be made. It has also questioned some of our investigative strategies. The investigative protocol consisting of history, routine infective serology, blood pressure, kidney function and diabetic screening has become ritualised.

It is important to review such "rituals" so that it has not lost its original meaning and introduce new ones which can offer a higher yield in identifying the cause of a stillbirth and its subsequent management.

A million deaths may be a statistic, but a single death by itself is a tragedy. Be it in terms of patient management and counselling or improving the standard of health care in the country, the study of stillbirths cannot be over-emphasised. The obstetrician plays a pivotal role in bringing together pathologist, microbiologist and counsellor as a team to make this difference.

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