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A case-control study of stillbirths at the Port Moresby General Hospital

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SUMMARY

From September 1995 to May 1997, 315 consecutive stillbirths and 315 randomly selected controls were studied at the Port Moresby General Hospital to determine the causes of the deaths, to describe the sociodemographic and reproductive characteristics of the mothers, and to see if there were any avoidable factors in the stillbirths and where the responsibility for them lay. 249 (79%) of the stillbirths were antepartum and 14% were intrapartum; the timing of death could not be determined in the remaining 21 (7%). 36% of the stillbirths were unexplained. The common identified causes were: syphilis (VDRL and TPHA positive) 10%, intrauterine growth restriction/placental insufficiency 9%, antepartum haemorrhage 9%, malaria 6%, major congenital abnormalities 6%, cord accidents 6%, pregnancy-induced hypertension 5% and acute intrapartum asphyxia 4%. Multiple logistic regression analysis showed a significant association between stillbirth and the following variables: husband's occupation unskilled, age over 35 years, poor antenatal attendance, a past history of stillbirth, syphilis and malaria. An avoidable factor was established in 41% of the cases; in 60% the responsibility for the avoidable factor lay with the patient and her relatives.

Introduction

The stillbirth rate at the Port Moresby General Hospital (PMGH) is high. It has been around 20-24/1000 total births in the past 5 years (1). This compares with 4.7/1000 total deliveries for a teaching hospital in Australia, 7.7/1000 in the USA and 4.4/1000 for a teaching hospital in Hong Kong (2,3). Some sociodemographic and obstetric characteristics have been associated with stillbirth. These include low social class, maternal age at the extremes of reproductive life, ie, less than 18 and more than 35 years, and previous pregnancy wastage. The number of antenatal visits is known to correlate positively with favourable perinatal outcome (4-6) and would be expected to cancel the effect of some of the risk factors. To be able to reduce the stillbirth rate it is important to identify not only the causes and associated risk factors, but also any avoidable factors in these deaths. This was the aim of this survey.

Objectives of the Study

The objectives of the study were to determine:

1. The causes of stillbirths at the PMGH.
2. Any sociodemographic and obstetric history characteristics which might be risk factors for stillbirth.
3. The incidence of avoidable factors in the deaths and the responsibility for these factors.

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Patients and Methods

Study site and study population

The PMGH is the only tertiary referral centre in the National Capital District. It delivers about 9000 women a year. The study population consisted of all singleton babies delivered at the PMGH. The cases were babies who at the time of delivery did not show any sign of life. The controls were selected from the labour ward register. Births are entered in the register in chronological order according to the time of birth. For each case, the control was the first live birth immediately entered after the case. The study was approved by the Medical Faculty Research Committee.

Subject enrolment, study period and sample size

From September 1995 to May 1997, 315 cases and 315 controls were sequentially enrolled.

Definition of terms

A *stillbirth* is a baby at gestation of more than 20 completed weeks or weighing 500 g or more which at the time of complete separation from its mother did not show any sign of life.
An *avoidable factor* is a characteristic or an error of omission or commission, which, had it not been present or happened, might have led to an outcome other than death. The presence of an avoidable factor, and the responsibility for it, was determined at the monthly perinatal audit meetings of the Division of Obstetrics and Gynaecology.
A *parous subject* is a subject who has had a previous delivery.
A *grand multipara* is a patient with 5 or more previous deliveries.
A *nullipara* has not had a delivery before the index birth.
The *pregnancy interval* is obtained by subtracting the gestational age at delivery from the number of months between the penultimate birth and this delivery.
A *booked* patient is a patient who had antenatal care in this pregnancy; an *unbooked* patient did not attend for antenatal care.
A *low birthweight* baby is a baby with a birthweight <2500 g.
Occupation was divided into several categories: professional, eg, accountant; skilled, eg, laboratory technician; semi-skilled, eg, laboratory assistant; unskilled, eg, subsistence farmer.

Data sources, collection and recording

The data sources were a pretested interviewer-administered questionnaire and the patients' antenatal and labour/delivery records. Midwives trained by the investigators used the questionnaire to record sociodemographic and past obstetric history characteristics of the subjects on the labour and postnatal wards. The investigators used a separate data collection form to record information on antenatal, labour and delivery events. The completed questionnaires were checked by the investigators before the patient left the hospital and any inconsistencies and inaccuracies were corrected.

Data analysis

The raw data were transferred to precoded data entry forms and punched into a computer for analysis. Analysis was performed in two parts: first, the whole sample was examined by univariate analysis for the influence of sociodemographic characteristics, past obstetric history and index antenatal period factors on stillbirth; second, labour/delivery variables were examined in a subsample in which the cases were mothers whose babies were still alive at the time of admission in labour. An equal number of controls was randomly selected by computer from the parent control group. Variables which were significant in univariate analysis were entered in a model for multiple logistic regression analysis. The Epi Info version 6 and the SPSS softwares were used for the statistical analyses. Differences with p values <0.05 and odds ratios whose 95% confidence intervals did not include 1 were taken as significant.

Results

Antepartum and intrapartum deaths

Of the 315 stillbirths, 249 (79%) occurred before the onset of labour and 45 (14%) happened during labour; in the remaining 21

(7%) the time of death could not be determined.

Proximate causes of stillbirth

Unexplained stillbirths formed the largest category (36%) (Table 1). Common causes of death were syphilis, based on VDRL (Venereal Diseases Research Laboratory test) and TPHA (*Treponema pallidum* haemagglutination test) positive results, 10%; intrauterine growth restriction (IUGR)/placental insufficiency 9%; antepartum haemorrhage 9%; cord accidents 6%; malaria 6%; and congenital malformations 6%.

Sociodemographic characteristics

Southern Region ethnicity and village residence, rather than urban and urban slum residence, were significantly associated with stillbirth (Table 2). There was no difference in the mean ages of the cases and controls and the proportion aged <18 years was not significantly different in the two groups (3.2% vs 3.3%), but age >35 years had a significant association with stillbirth (7% vs 2%) (Table 2). Mean maternal height was significantly smaller for the cases than for the controls (156.4 vs 158.0 cm), but the proportion <150 cm was not significantly different in the two groups (11% vs 9.5%) (Table 3). The cases and controls did not differ in the mean number of school years completed (6.0 vs 6.6) or in the proportion that had never been to school (13% vs 12%). Whether the partner was currently employed did not make a difference, but unskilled occupation of the partner was significantly associated with stillbirth (79% vs 59%).

Past obstetric history characteristics

Mean parity (1.6 vs 1.4) and nulliparity (39% vs 37%) were not different in the cases and control groups, but grand multiparity was

TABLE 1

PROXIMATE CAUSES OF 315 STILLBIRTHS

Proximate cause		Frequency (% of 315)
Unexplained		112 (35.6)
Preterm	77	
Term	35	
Syphilis (both VDRL and TPHA positive)		30 (9.5)
IUGR/placental insufficiency		28 (8.9)
Antepartum haemorrhage		28 (8.9)
Abruptio placentae	24	
Placenta praevia	4	
Major congenital anomaly		19 (6.0)
Malaria		19 (6.0)
Cord accident		19 (6.0)
Pregnancy-induced hypertension		15 (4.8)
Acute intrapartum asphyxia		13 (4.1)
Chorioamnionitis		10 (3.2)
Diabetes mellitus (pregestational and gestational)		9 (2.9)
Traumatic delivery		6 (1.9)
Others (ruptured uterus, typhoid, PUO, anaemia)		7 (2.2)

IUGR = intrauterine growth restriction
PUO = pyrexia of unknown origin

TABLE 2

SOCIODEMOGRAPHIC CHARACTERISTICS

Panel A: Ethnic region distribution: number (percentage)

Region	Southern	Highlands	Momase	Islands
Cases (N=315)	236 (74.9)	48 (15.2)	20 (6.4)	11 (3.5)
Controls (N=315)	207 (65.7)	67 (21.3)	23 (7.3)	18 (5.7)
Total	443	115	43	29

Panel B: Categorical variables

Cases	Controls	OR (95% CI)	M-H p
Southern Region origin (N=630)			
74.9% (236/315)	65.7% (207/315)	1.56 (1.09-2.23)	<0.02
Age >35 years (N=434*)			
6.8% (15/220)	2.3% (5/214)	3.04 (1.03-10.88)	<0.03
Village residence (N=630)			
29.8% (94/315)	21.9% (69/315)	1.52 (1.04-2.21)	<0.03

Panel C: Continuous variable

	Cases Mean±SD	Controls Mean±SD	K-W H p
Age, years (N=434*)	25.2±5.71	24.5±5.03	>0.5

OR = odds ratio 95% CI = 95% confidence interval of odds ratio
M-H p = Mantel-Haenszel chi squared p value
SD = standard deviation
K-W H p = Kruskal-Wallis H test p value
* Unreliable ages excluded

TABLE 3

SOCIODEMOGRAPHIC CHARACTERISTICS (CONTINUED)

Panel A: Categorical variables

Cases	Controls	OR (95% CI)	M-H p
Husband not currently employed (N=617)			
36.9% (115/312)	31.5% (96/305)	1.27 (0.90-1.80)	>0.1
Husband's occupation is not skilled (N=454)			
78.7% (174/221)	58.8% (137/233)	2.59 (1.68-4.01)	<0.001
Mother never been to school (N=630)			
13.3% (42/315)	12.4% (39/315)	1.09 (0.67-1.78)	>0.5
Maternal height <150 cm (N=586)			
11.0% (31/281)	9.5% (29/305)	1.18 (0.67-2.08)	>0.5

Panel B: Continuous variables

	Cases Mean±SD	Controls Mean±SD	K-W H p
School years completed (N=630)	6.0±3.57	6.6±4.23	>0.2
Maternal height, cm (N=586)	156.4±6.66	158.0±6.49	<0.003

OR = odds ratio 95% CI = 95% confidence interval of odds ratio
M-H p = Mantel-Haenszel chi squared p value
SD = standard deviation
K-W H p = Kruskal-Wallis H test p value

significantly more common among the cases than the controls (9% vs 4%) (Table 4); however, the lower limit of the 95% confidence interval of the odds ratio was just below 1. Among parous subjects, delivery of a stillbirth in the past was strongly associated with stillbirth (13% vs 4.5%) in the index pregnancy. A past neonatal death or induced or spontaneous abortion did not make a difference. The mean pregnancy interval was not significantly different in the two groups (34.3±30.89 vs 29.2±20.57 months); and the proportion with interval <24 months was not different in the two groups (49% vs 48%).

Antenatal care and other events in this pregnancy

The mean number of antenatal visits by the cases was significantly less than that of the controls (4.5 vs 5.9) (Table 5). However, the cases delivered at significantly lower gestational ages than the controls (35.0 vs 39.1 weeks) (Table 5) and there were significantly more preterm deliveries among the cases (53% vs 14%) (Table 4). To remove the influence of the period available to the patient to attend for antenatal care on the number of antenatal visits actually made, the analysis was confined to subjects who booked at <27 weeks and delivered at term. The number of antenatal visits in the two groups did not show any difference (7.3 vs 7.6) (Table 5). Antepartum haemorrhage (6% vs 3%) (Table 4), last haemoglobin level <8.0 g/dl (10% vs 3%) (Table 5), syphilis (14% vs 3%) (Table 5) and malaria (15% vs 4%) (Table 5) were significantly associated with stillbirth, but pregnancy-induced hypertension - 14% (38/268) vs 11% (33/310) - was not. A last haemoglobin <8.0 g/dl was more frequent among the cases, but the mean last haemoglobin was not significantly different in the two groups (10.5±2.12 vs 11.2±6.70 g/dl). The cases had a significantly lower mean birthweight and a larger proportion of low birthweight infants than the controls (63% vs 9%) (Table 4). First antenatal maternal weight and maternal weight gain had no association with stillbirth.

TABLE 4

CHARACTERISTICS OF PAST OBSTETRIC HISTORY AND ANTENATAL CARE IN INDEX PREGNANCY

Panel A: Categorical variables

Cases	Controls	OR (95% CI)	M-H p
Mother para >5, ie, grand multipara (N=630)			
8.6% (27/315)	4.4% (14/315)	2.02 (0.99-4.13)	<0.05
Mother has history of a past stillbirth, para 0 excluded (N=391)			
12.6% (24/191)	4.5% (9/200)	3.05 (1.31-7.30)	<0.005
Antepartum haemorrhage (N=630)			
6.3% (20/315)	2.5% (8/315)	2.60 (1.07-6.54)	<0.05
Preterm birth (N=404*)			
53.3% (89/167)	13.5% (32/237)	7.31 (4.40-12.18)	<0.001
Low birthweight (N=620)			
62.8% (196/312)	8.8% (27/308)	17.58 (10.90-28.54)	<0.001

Panel B: Continuous variables

	Cases Mean±SD	Controls Mean±SD	K-W H p
Parity (N=630)	1.6±1.88	1.4±1.51	>0.5
Birthweight, g (N=620)	1977.0±1024.84	3102.7±495.18	<0.001

OR = odds ratio 95% CI = 95% confidence interval of odds ratio
M-H p = Mantel-Haenszel chi squared p value
SD = standard deviation
K-W H p = Kruskal-Wallis H test p value
* Unreliable dates excluded

TABLE 5

ANTENATAL CARE IN INDEX PREGNANCY

Panel A: Categorical variables

Cases	Controls	OR (95% CI)	M-H p
Syphilis in index pregnancy, subjects who did not have VDRL test excluded (N=508)			
14.4% (32/222)	2.8% (8/286)	5.18 (2.31-11.97)	<0.001
Malaria in index pregnancy (N=629)			
14.6% (46/314)	4.4% (14/315)	3.69 (1.92-7.21)	<0.001
Last haemoglobin in pregnancy <8.0 g/dl (N=238*)			
9.5% (8/84)	2.6% (4/154)	3.95 (1.01-18.38)	<0.05†

Panel B: Continuous variables

	Cases Mean±SD	Controls Mean±SD	K-W H p
Number of antenatal visits (N=630)	4.5±2.80	5.9±2.86	<0.001
Number of antenatal visits (N=143**)	7.3±3.16	7.6±2.28	>0.5
Delivery gestational age, weeks (N=404‡)	35.0±4.81	39.1±1.99	<0.001
Antenatal weight gain, kg (N=143**)	6.0±4.44	7.8±5.72	>0.05

OR = odds ratio 95% CI = 95% confidence interval of odds ratio
M-H p = Mantel-Haenszel chi squared p value
SD = standard deviation
K-W H p = Kruskal-Wallis H test p value

* Only subjects with first haemoglobin at <27 weeks and last haemoglobin at >33 weeks included
† Fisher exact 2-tailed test p value
** Only subjects with the following characteristics included: reliable dates, first antenatal visit at <27 weeks, delivery at >36 weeks
‡ Unreliable dates excluded

Analysis of subsample of fresh stillbirths and randomly selected controls

To investigate the influence of labour and delivery factors, a subsample was used. The cases comprised the 45 mothers whose babies were alive at the time of admission in labour, ie, antepartum intrauterine deaths were excluded. The computer was used to randomly select 45 subjects from the 315 controls for comparison with the fresh stillbirths group. The following labour or delivery factors did not have any association with stillbirth: labour induction, abdominal level of the head, crossing of the action line, the number of times the fetal heart rate was checked, caput succedaneum, moulding and sex of the baby. The numbers, however, might have been too small to show any effect. Although the mean cervical dilatation at admission in labour was not significantly different in the two groups, dilatation <4 cm was associated with stillbirth; however, the lower limit of the 95% confidence interval of the odds ratio was just below 1 (Table 6). The following variables were significantly associated with stillbirth in univariate analysis: fetal distress (Table 6), thick meconium staining of the amniotic fluid (Table 7), augmentation of labour, no artificial rupture of membranes, delivery during the day shift (ie, from 8 am to 8 pm), major congenital anomaly and preterm delivery - 42% (19/45) vs 13% (6/45), p<0.005. The cases were significantly lighter than the controls (2492.8±1153.10 vs 3209.5±420.34) and had a higher proportion of low birthweight infants - 40% (18/45) vs 5% (2/42), p<0.0005.

Multiple logistic regression analysis on the whole sample

The variables which in univariate analyses were significantly associated with stillbirth were included in a model for multiple logistic

TABLE 6

LABOUR AND DELIVERY FACTORS AMONG SUBJECTS WITH BABIES STILL ALIVE AT TIME OF ADMISSION IN LABOUR

Panel A: Categorical variables

Cases	Controls	OR (95% CI)	M-H p
Induction of labour (N=89)			
13.3% (6/45)	2.3% (1/44)	6.62 (0.74-311.21*)	>0.05
Abdominal level of head 2/3-5/5 (N=81)			
30.8% (12/39)	16.7% (7/42)	2.22 (0.69-7.32*)	>0.1
Action line crossed (N=80)			
25.0% (9/36)	11.4% (5/44)	2.60 (0.68-10.90*)	>0.1
Cervical dilatation at admission in labour <4 cm (N=87)			
55.8% (24/43)	34.1% (15/44)	2.44 (0.94-6.39)	<0.05
Fetal distress (N=79)			
54.1% (20/37)	4.8% (2/42)	23.53 (4.67-219.90)	<0.001

Panel B: Continuous variables

	Cases Mean±SD	Controls Mean±SD	K-W H p
Cervical dilatation (N=87)	3.9±2.85	4.7±2.85	>0.05
Number of times FHR checked (N=84)	4.7±4.24	5.6±5.11	>0.1

OR = odds ratio 95% CI = 95% confidence interval of odds ratio
M-H p = Mantel-Haenszel chi squared p value
SD = standard deviation
K-W H p = Kruskal-Wallis H test p value
FHR = fetal heart rate
* Exact confidence limits of odds ratio

TABLE 7

LABOUR AND DELIVERY FACTORS (CONTINUED)

Panel A: Categorical variables

Cases	Controls	OR (95% CI)	M-H p
Thick meconium staining of the amniotic fluid (N=84)			
39.0% (16/41)	7.0% (3/43)	8.53 (2.08-49.02)	<0.001
Augmentation of labour with syntocinon infusion (N=86)			
40.5% (17/42)	9.1% (4/44)	6.80 (1.88-30.31)	<0.001
Artificial rupture of membranes not performed in labour (N=88)			
51.1% (23/45)	20.9% (9/43)	3.95 (1.40-11.42)	<0.005
Delivery during day shift, ie, from 8 am to 8 pm (N=90)			
73.3% (33/45)	44.4% (20/45)	3.44 (1.29-9.29)	<0.01
Major congenital anomaly (N=90)			
17.8% (8/45)	0.0% (0/45)	-	<0.005

OR = odds ratio
95% CI = 95% confidence interval of odds ratio
M-H p = Mantel-Haenszel chi squared p value

regression analysis (Table 8, Panel A). The significant variables were: age >35 years, unskilled occupation of husband, past stillbirth, antepartum haemorrhage, syphilis, malaria, last haemoglobin level <8.0 g/dl, Southern Region ethnicity, grand multiparity and village residence. All the variables remained significant, except for Southern Region ethnicity, village residence and grand multiparity.

Multiple logistic regression analysis on the subsample

In the multiple logistic regression analysis the following remained significant: fetal distress, thick meconium staining of liquor, artificial rupture of membranes not performed in labour, day shift delivery, major congenital anomaly and low birthweight (Table 8, Panel B).

Avoidable factors and responsibility

There was an avoidable factor in 41% of the stillbirths. The responsibility for the stillbirth was apportioned as follows: patient and relatives 60%, the antenatal clinic and its staff 16%, labour ward staff 19%.

Discussion

In this study, the most common maternal disease accounting for stillbirth was syphilis. The prevalence of positive syphilis serology in our practice is 3% (1). 19% (122/630) of patients had no syphilis serology results at the time of labour. This is close to the figure recorded in our annual statistics. The contribution of this factor could be higher if information had been available for the total sample. Syphilis is readily treatable and we agree with Tongia et al. that its detection could

TABLE 8

MULTIPLE LOGISTIC REGRESSION ANALYSIS OF VARIABLES WHICH IN UNIVARIATE ANALYSIS WERE SIGNIFICANTLY ASSOCIATED WITH STILLBIRTH

Variable removed	Log likelihood	-2 Log LR	df	Significance of Log LR
Panel A: Whole sample (N=630)				
Maternal age >35 years	-356.164	12.653	2	0.0018
Husband unskilled	-356.250	12.825	2	0.0016
Past stillbirth	-353.646	7.616	2	0.0222
Antepartum haemorrhage	-364.814	29.952	2	0.0000
Syphilis	-374.309	48.942	2	0.0000
Malaria	-357.689	15.703	2	0.0004
Last haemoglobin <8.0 g/dl	-360.191	20.706	2	0.0000
Panel B: Subsample of mothers with live babies when admitted to labour ward (N=90)				
Acute fetal distress	-28.619	11.427	2	0.0033
Thick meconium staining	-29.011	12.212	2	0.0022
ARM not performed in labour	-28.056	10.300	2	0.0058
Day shift delivery	-25.130	4.448	1	0.0349
Congenital anomaly	-29.856	13.901	1	0.0002
Low birthweight	-26.959	8.107	2	0.1074

df = degrees of freedom
LR = likelihood ratio
ARM = artificial rupture of membranes

reduce the stillbirths in our community (7). That the serology status of nearly 20% of our patients was not known at the time of labour, and that patients who might have had the disease could not therefore have been treated antenatally, is indeed worrying. Hospitals in other parts of the country where sexually transmitted disease rates are much higher than in our hospital are even worse off than the PMGH in serological testing for syphilis. We hope that in the not too distant future it will be possible to test for this condition in all booked antenatal patients.

In areas of unstable transmission, malaria can cause maternal death, abortion, stillbirth, premature delivery and low birthweight. In areas of high endemicity, with stable malaria and intensive transmission, the association of malaria and abortion or stillbirth is not so strong (8). A significant proportion of our patients are from areas of the country where malaria transmission is unstable. These patients are at the greatest risk because they have little if any immunity against malaria. Moreover, pregnancy causes a reduction in the maternal immunity against malaria especially for the primigravida. In the absence of malaria chemoprophylaxis, the consequences of malaria can be devastating. In our clinic, patients are given chloroquine as chemoprophylaxis against malaria, and to ensure compliance the first dose of the drug is administered at the clinic. Occasionally some patients escape our net. The problem is more difficult for nonattenders and for those who attend some of the urban clinics where chemoprophylaxis is not pursued with the same vigour.

Occasionally, there is a shortage of antimalarial drugs. We hope that with the confirmation of malaria as a major cause of stillbirths, authorities will make sure that malaria chemoprophylaxis is always available. The prevalence of chloroquine- resistant malaria has been estimated at about 40% in our community. Currently the recommended malaria prophylaxis during pregnancy is still chloroquine. The problem with other effective drugs is the theoretically associated embryopathy with some of them. It has been recommended that in the presence of high chloroquine resistance an artemesinin derivative should be used, except in the first trimester when quinine is preferable (8).

In agreement with findings from other workers, the category of unexplained term and preterm stillbirths form a big group (7,9-11). Whilst some workers believe that it would be difficult to do much about this category of patients (11), others contend that the search for gestational diabetes (10) and intensive antenatal fetal assessment (9) could help to reduce deaths in this category of stillbirths. In our practice, lack of adequate facilities and the sheer cost of such measures will make any attempts to reduce deaths from this group a daunting task. Moreover, we are unable to perform postmortem examinations on our stillbirths. The ultimate cause of death in this category will therefore remain unresolved.

Antepartum haemorrhage, especially abruptio placentae, may strike so suddenly that it would be difficult to do much about it. On the other hand, improved labour ward practices such as cardiotocography and intensive monitoring of babies can help reduce deaths from cord accidents and other acute asphyxia situations.

This study showed Southern Region origin and village residence to be risk factors for stillbirth in univariate analysis but not in the logistic regression analysis. We have previously shown that Southern Region origin is associated with low birthweight and that low birthweight infants are more likely to die in utero or at birth (12,13). The explanation may not be entirely genetic. Socioeconomic status, nutritional status, general health and in some cases altitude and climate may partly account for these differences. The urban-rural divide has been observed in previous studies as well (11,14).

Multiple logistic regression analysis showed that poor attendance at antenatal clinic and a husband with a low-skilled occupation were significantly associated with stillbirth. These two variables are related to the social class of the patients and would confirm many earlier findings in showing that socioeconomic and education factors play a part in predicting

behaviour of patients during pregnancy and therefore perinatal death (14,15).

Whilst the association of low socioeconomic status with stillbirth does not imply causation, we should recognize that late booking or nonattendance and other variables act as marker variables for one or more underlying risk factors. It will be profitable to educate our patients, their husbands and medical personnel on the ways that social disadvantage and deprivation continue to affect perinatal health (16).

Extremes of maternal age, particularly advanced maternal age, have been shown to be associated with adverse perinatal health (11,17-19). All these studies have found increased risk of stillbirth in the older age group even though in one study this association was due in the main to the influence of hypertension (19). In our study, multiple logistic regression analysis showed that advanced age was associated with a higher risk of stillbirth. Even though the preponderance of studies show adverse outcome with advanced age, one study reported from New York City showed that there was no difference in the perinatal outcome for women over age 35. However, patients with diabetes, hypertension, heart disease, obesity, previous myomectomy, severe anaemia and previous caesarean section were not accepted at the hospital (20). The evidence appears strong that stillbirth rate increases significantly with maternal age. We can prevent pregnancies in this age group by offering family planning advice to these patients and their partners, especially those who also have many children already. For those who start childbearing late in life, intense monitoring may help to avoid the additional risk.

Past history of stillbirth was found on logistic regression analysis to be associated with stillbirth. We believe that this phenomenon, like the socioeconomic factor, may be a proxy for inherent biological problems such as diabetes, chromosomal abnormalities, and syphilis and other maternal infections. In the presence of such a history, all efforts should be made to try and find out what could have caused the previous stillbirth so as to minimize its impact in the index pregnancy.

Of the labour ward factors, congenital anomaly, low birthweight, meconium staining, fetal heart abnormalities (fetal distress) and delivery during the day shift were found to be associated with stillbirth. All but the last variable are well known causes of fetal demise. Kiely and associates concluded that there was a decrease in intrapartum death rates in births most closely attended to in labour. Fetal deaths that occur during labour as opposed to those that occur antepartum constitute a perinatal outcome that is especially sensitive to level of obstetric care (21). The finding that significantly more intrapartum deaths occur during the day shift for the nursing staff rather than in the night (8 pm - 8 am) was a surprise, since staffing numbers are usually lower during night hours.

In our hospital the high standards that have been reached in the western world cannot be readily achieved. The reasons are many:

1. There is a chronic shortage of nursing staff in the labour ward so there is no question of personalizing care.

2. There is an acute shortage of medical staff even though we have stationed one middle-level doctor in the labour ward to try and improve the care. But with the constant attrition of our numbers we are not always able to maintain this arrangement.

3. We have only one electronic fetal monitor in the labour ward and it is not always in working order. When it requires maintenance we have to do without.

In conclusion, we have drawn attention to many problems which are associated with stillbirth in our practice. Some of these are preventable. Others are not. We note that in 60% of cases the responsibility for an avoidable factor lay with the patient and her relatives. It seems to us that the solution does not lie in any one quarter only. To make a difference, health workers, community workers, administrators, educators, and patients and their relatives need to work together.

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