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Assessment of risk factors for stillbirth among pregnant women in Jamaica

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Summary

A case – control study was conducted to assess the risk factors of stillbirth among pregnant women in Jamaica. A total of 314 women participated (160 with stillborn babies and 154 with live-born babies). A questionnaire designed to collect information on sociodemographic characteristics, antenatal care, medical and sexually transmitted disease (STD) history, method of delivery and infant birth and health status was administered to each woman. Medical records were reviewed to verify medical history. Six variables were found to be significant predictors of stillbirth by multivariate logistic regression. Low birth weight (OR = 4.3, CI = 2.4 – 7.7), complications during pregnancy or delivery (OR = .19, CI = 0.09 – 0.41), method of delivery (caesarean section; OR = 7.2, CI = 1.6 – 33.2), number of living children (OR = 0.54, CI = 0.40 – 0.73), number of antenatal visits (less than three; OR = 2.0, CI = 1.3 – 3.1), and presence of unfavourable and /or adverse fetal outcome (OR = 4.0, CI = 1.8 – 9.2) were found to be associated with stillbirth. These findings have important implications in establishing policies for prenatal care in Jamaica.

Introduction

One of the most widely accepted of indicators of the quality of obstetric and neonatal care of a country is its perinatal mortality rate. Perinatal mortality is defined as the number of stillbirths and neonatal deaths occurring in the first week of life in the population. Like many developing countries, Jamaica has more than three times the rate of perinatal mortality than developed countries (Greenwood *et al.*, 1994a). The rate of perinatal mortality of the country has not decreased since 1963 (Ashley *et al.*, 1994c) and as of 1996 the rate was 31 per 1000 births (Ashley *et al.*, 1994b).

In 1986, the Jamaican Ministry of Health launched a major health survey, the Jamaican Perinatal Mortality Study, to identify the factors associated with perinatal deaths (Ashley *et al.*, 1994c). The survey found that 29% of all perinatal deaths were due to antepartum fetal

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deaths, that is, macerated stillbirths occurring before the onset of labour. Forty-four per cent of the perinatal mortality was attributed to intrapartum asphyxia and included fresh stillbirths, macerated stillbirths, with evidence of death occurring during labour, and live-born babies that died after the first day and had clinical evidence of asphyxia. The stillbirth rate was registered as 5.9 per 1000 births in 1984 in Jamaica. However, due to significant under-registration of both infant births and deaths, the publication of stillbirth statistics by the Registrar General's Department was discontinued in 1984 (Ashley *et al.*, 1994c).

In Jamaica, the conditions that predispose women to experience perinatal mortality are anaemia, high blood pressure and infectious diseases, including STDs (Ashley *et al.*, 1994b). Fifty-one per cent of mothers with perinatal deaths had a decreased haemoglobin level (under 11 g/dl) (Ashley *et al.*, 1994b). This relationship between decreased haemoglobin levels and perinatal deaths is a reflection of prenatal care in Jamaica, because women who receive prenatal care and who have low haemoglobin levels are given iron supplements. Haemoglobin testing is conducted at each clinic visit. Therefore, women who had no prenatal care were less likely to have taken iron supplements (Ashley *et al.*, 1994a). Women in Jamaica who did not take iron supplements experienced 78% more stillbirths than women who took iron supplement (Ashley *et al.*, 1994a). High blood pressure was also found to be strongly associated with perinatal deaths, and 11% of the women who had stillbirths in Jamaica had elevated diastolic blood pressure (⩾ 100 mmHg) compared to only 3% of those with live births (Ashley *et al.*, 1994b).

Women who had a history of syphilis were found to be twice as likely to have had stillbirths compared to those who tested negative (Ashley *et al.*, 1994b). A study conducted shortly after HIV-1 was observed in the Caribbean reported no additional threat to the fetus as a result of infection with this virus, or with HTLV-1 which is endemic in Jamaica (Johnstone *et al.*, 1988). However, Taha *et al.* (1995) reported that the mortality rate of children born to HIV seropositive mothers was substantially higher than for children born to seronegative mothers. Also, the study showed that the incidence of prematurity and intrauterine growth retardation (IUGR) was higher among infants of HIV seropositive mothers compared to infants of seronegative mothers (Taha *et al.*, 1995).

Several other sociodemographic variables such as age, marital status and rural vs. urban residence have been identified as factors that predispose women to experience perinatal deaths in Jamaica (Mostafa *et al.*, 1991; Golding *et al.*, 1994). Women with the highest risk of having perinatal deaths tended to be young, unmarried and to reside in rural areas (Mostafa *et al.*, 1991; Golding *et al.*, 1994). In addition, women with no existing children were also found to have the highest incidence of stillbirth and the incidence seemed to decrease with an increase in the number of children in the household (Mostafa *et al.*, 1991; Golding *et al.*, 1994). The 1986 Perinatal Mortality survey also found that women who were not living with a steady partner were at greater risk of having perinatal death, particularly antepartum fetal deaths (Ashley *et al.*, 1994c). An independent association was detected between maternal education and antepartum fetal death. Moreover, if the major wage earner of the household had a managerial or professional job, a significant reduced risk for perinatal deaths was observed (Golding *et al.*, 1994).

Studies of perinatal mortality in most developed countries have shown a strong association between perinatal deaths and obstetric histories of the mothers (Greenwood *et al.*, 1994b). A study conducted in Ireland found that mothers who had previous miscarriages had twice the risk of perinatal mortality compared to mothers who had not (Cahalane *et al.*, 1965). An increase in the trend in perinatal deaths among women who had prior miscarriage was also observed in the United States (Niswander and Gordon, 1994).

Although several factors have been found to be associated with perinatal deaths in Jamaica, no study had been conducted to assess comprehensively the risk factors for stillbirth among pregnant women. Over the 10-year period, 1985 – 1995, the total number of cases of stillbirths based on hospital records remained high, fluctuating from 800 to 1100 per year, and the cause of stillbirths was reported mainly as unknown. Therefore, this study was conducted to identify maternal, social and demographic factors related to stillbirth among pregnant women in Jamaica.

Methods

Study design and study population

This was a case – control study in which women who experienced stillbirths (cases) were matched with other women in the same hospital who delivered live babies (controls). In Jamaica, stillbirth is defined as a fetus ⩾ 24 weeks that upon expulsion shows no sign of life; that is, no heartbeat or no breathing. The women were recruited at four major urban hospitals, two in the Southeastern and two in the Northwestern regions of Jamaica, from January 1996 to April 1997.

These hospitals are well equipped and serve over 50% of the prenatal population on the island. One of the hospitals, Victoria Jubilee in Kingston, is a specialty hospital for maternal deliveries and handles 13 000 deliveries per year. The other, Cornwall Regional Hospital in Montego Bay, serves a population of 200 000 or more. The maternity section of this hospital handles approximately 5000 deliveries per year. The other two hospitals are polyclinic centres that specialise in obstetric, surgical and paediatric care and internal medicine. They are located in the parishes of Westmoreland (the Savanna-la-mar Hospital) and St Catherine (the Spanish Town Hospital). The Savanna-la-mar Hospital attends to approximately 3000 deliveries per year and the Spanish Town hospital attends to 7000 – 8000 deliveries per year.

Written consent was obtained from each case and matched control prior to their participation in the study. The women were matched for age (± 10 years in age difference) and date of delivery (within 24 hours). Three hundred and thirty-two women (167 mothers of stillborn infants and 165 mothers of live-born infants) were recruited. Of these, 160 case and 154 control mothers completed the study. Seven cases and 11 women in the control group were dropped from the analysis due to refusal to complete the questionnaire or give a blood sample for the purpose of the study.

Data collection

A questionnaire designed to collect information on sociodemographic characteristics, antenatal care, method of delivery, history of STDs including HIV/AIDS, mother's medical

history and infant birth and health information was administered to each mother by a research coordinator. The presence of high blood pressure, which is a component of the mother's medical history, was verified through medical records and physician's reports. In this study we used results from blood tests (haemoglobin and blood chemistry) conducted during pregnancy to assess antenatal care received by the women, as blood tests are part of antenatal care in Jamaica.

Statistical analysis

χ^2 or Fisher's exact tests were used to evaluate the univariate association of demographic, maternal and prenatal variables with stillbirth. The Mantel – Haenszel χ^2 statistic was used to determine if a trend was present in the proportion of stillbirths over ordered levels of different variables. Multivariate logistic regression was used to evaluate the simultaneous effect of different independent variables on stillbirth. The variables initially included in the model were birth weights of infants, high blood pressure (HBP) during present pregnancy, blood test performed during present pregnancy, distance of residence from the hospitals, hospitalisation for pregnancy-related reasons, gestational age, medical problems and number of months pregnant. Additional variables included in the model were number of people sleeping in the same bed, previous testing for STD, receipt of information on STDs and its prevention, method of delivery, number of children alive, delivery complications, infant abnormalities, number of antenatal care visits, type of birth and presence or absence of any gross abnormalities. A backward selection procedure was performed to determine the significant predictors of stillbirth. Odds ratios and the corresponding 95% confidence intervals were calculated for the significant prognostic variables in the final model.

Results

Demographic characteristics of cases and controls

Almost half the mothers in both groups were less than 25 years of age (47% in cases, 48% in controls; Table I). Most of the women had some secondary education (74% of cases, 80% of controls) and were involved in a stable relationship, that is, married or common law relationship (55% of cases, 53% of controls) with the father of their child. The majority of women who had stillborn babies (90%) or live births (95%) lived within 5 miles of the hospital/clinic and reported that they had visited an antenatal care clinic during their pregnancy (96% for cases, 97% for controls). There was no significant difference between the sexes of the infants born alive and those stillborn. Case and control mothers gave birth to similar proportions of male and female babies. There were six sets of twins and one set of triplets in the stillbirth group, and two sets of twins and no triplets in the live-born group. No significant difference ($P > 0.05$) in the distribution of the variables reported in Table I was observed between cases and controls.

Univariate analysis of risk factors for stillbirth

Based on univariate analysis, there was a significant association between the distance that the women lived away from the hospital and having stillborn babies ($P = < 0.0001$, Table II). Thirty-two per cent of the mothers with stillborn babies lived more than 10 miles from the hospital, compared to 14% of the mothers who had live-born babies. Table II also shows that

among the cases, 28% reported having no living children, whereas only 9% of the controls reported no living children ($P = 0.0001$). Among women with stillborn babies, 30% had high blood pressure (HBP) during their most recent pregnancy compared with 17% of mothers with live-born babies ($P = 0.004$).

Table II shows that 22% of the cases and 12% of controls were hospitalised during the current pregnancy before delivery for pregnancy related reasons ($P = 0.009$). The most frequently reported reasons for hospitalisation were bleeding, high blood pressure and infections. In addition, 93% of controls remembered having blood tests, such as tests for iron, haemoglobin and other routine tests (other than STDs) performed during their current pregnancy compared to 79% of cases (Table II). A significant relationship was observed between stillbirth and blood tests performed during the present pregnancy ($P = 0.0004$). A blood test performed during pregnancy was used as a proxy to assess antenatal care received by the women, because blood tests are performed routinely as a part of antenatal care in Jamaica. Although most of the women had visited the clinic or hospital while they were pregnant, mothers with stillbirths were found to attend less frequently than mothers who had live-born babies (Table II). Forty-three per cent of cases reported that they had visited an antenatal clinic (ANC) only 0 – 3 times compared to 19% of controls. The frequency of visits in the ANC was significantly related to stillbirth in this study ($P < 0.001$).

Only 69% of the mothers with stillborn babies reported having received information on STDs and their prevention compared to 86% of the control mothers ($P = 0.001$). With regard to the duration of time since the mothers had received information on STDs, 45% of mothers of live-born babies reported that they had received information on STD in less than 1 year, compared to 31% of mothers with stillborn babies ($P = 0.01$).

Table III shows that 96% of controls had normal vaginal delivery compared with 84% of cases ($P = 0.0005$). Fifty-two per cent of mothers with stillborn babies had complications during their delivery in contrast to 13% of mothers with live babies ($P < 0.001$). The most commonly reported complications during delivery were breech, abruption of the placenta, pre-eclampsia, ruptured membranes and bleeding. Some of these complications are indications for a caesarean section. Among mothers with live-born babies, 86% delivered at 9 months of pregnancy compared to only 38% of mothers with stillborn babies ($P < 0.0001$).

Gestational age of infants at the time of delivery, birth weight and observed abnormalities were also compared for the two groups. Table III shows that 78% of stillbirths were delivered at less than 37 weeks' gestation compared to 53% of live-born infants ($P < 0.0001$). Forty-seven per cent of the stillborn babies had unfavourable and/or adverse fetal outcomes identified compared to 12% of the live-born babies ($P < 0.0001$). The most common unfavourable and/or adverse fetal outcomes reported by physicians were the umbilical cord wrapped around the neck, severe fetal distress in labour and skin peeling (maceration), and collapsed bone. Fifty-four per cent of stillborn babies had low birth weight ($\leqslant 2500$ g), and 19% had very low birth weight (< 1499 g). Conversely, 13% of live-born babies had low birth weight and only 4% had very low birth weight.

Multivariate logistic regression analysis

Six variables were found to be significant predictors of stillbirth using multivariate logistic regression. Stillborn infants were 4.3 times more likely to have lower birth weights compared to live-born infants (OR = 4.3, CI = 2.4 – 7.7; Table IV). Complication during pregnancy or delivery was also found to be a significant predictor for stillbirth. The risk for stillbirth decreased by 81% among women with no complications at the time of delivery (OR = 0.19, CI = 0.09 – 041). Another factor found to be a predictor of stillbirth was the method of delivery. Women who delivered their babies by caesarean section were 7.2 times more likely to have stillborn babies compared to women who gave birth naturally (CI = 1.6 – 33.2). Further, the results show that a woman's risk for stillbirth decreased by 46% as the number of living children before the current pregnancy increased (OR = 0.54 CI = 0.40 – 0.73). Women who visited the ANC less than three times during their pregnancy were twice as likely to have stillborn babies compared to women who visited the ANC more than three times (OR = 2.0, CI = 1.3 – 3.1). Unfavourable and/or adverse infant outcomes were four times more likely to be observed among stillborn babies compared to live-born babies (OR = 4.0, CI = 1.8 – 9.2).

Discussion

The results of this study provide information on significant predictors of stillbirth in Jamaica. Low birth weight (LBW) was an independent risk factor for stillbirth. Babies born with LBW were more likely to be stillborn, and a greater proportion of very LBW babies were stillborn. The strong association found between stillbirth and LBW is consistent with the studies conducted in Kenya and Latin America (Morrison and Olsen, 1985; Were 1994). In this study, we are uncertain of whether stillbirth was a consequence of LBW, therefore further studies on the effect of birth weight on stillbirth is needed. However, these results highlight the significance of diagnosing intrauterine growth retardation (IUGR) and the possibility of lowering the rate of stillbirth as a number of epidemiological studies have shown that LBW contributes to perinatal mortality (Gadow *et al.*, 1991).

Similar to this study, complications or illness during pregnancy were also found to be associated with high risk for stillbirth in Brazil (Ferraz and Gray, 1990). A much larger percentage of women with stillbirths in this study had been admitted to a hospital for pregnancy-related reasons before delivery in comparison to mothers with live-born babies. Around 20% of fetal deaths were attributable to complications such as abruption of the placenta, pre-eclampsia, prelabour ruptured membranes and bleeding. Studies conducted in Finland and Zambia (Watts and Harris, 1982; Hovatta *et al.* 1983) have also shown that greater than 50% of women with stillborn babies had medical complications during pregnancy. It appears that complication during pregnancy is a significant predictor of stillbirth in different countries. Therefore, timely and adequate antenatal care can ameliorate potential risks for stillbirth (Ferraz and Gray, 1990).

Almost all deliveries in this study were normal spontaneous vaginal deliveries. None the less, emergency caesarean sections were performed on mothers with pregnancy-related complications and most caesarean sections were performed on mothers who had stillbirths compared to mothers of live-born infants. However, the use of caesarean section was likely

to be the consequence of complications leading to stillbirth rather than caesarean section being a risk factor for stillbirth.

With regard to the association between the number of living children delivered by a woman and risk for stillbirth, an increased risk for stillbirth was detected for women with no living children, and an increase in the number of living children lowered this risk. Golding *et al.* (1994) reported a similar observation between the risk for perinatal death and the number of children in the household. The indication of lower risk for women with greater number of children is interesting. We believe that having more children provides women with more experience in dealing with pregnancies.

The number of stillbirths was higher among women who visited the antenatal clinic less frequently. Lack of antenatal care during pregnancy may prevent early detection of problems leading to stillbirth. The multivariate analysis also showed an association between stillbirth and unfavourable and/or adverse fetal outcomes. Stillborn babies had more documented unfavourable fetal features compared to live-born babies. However, the possibility of bias cannot be ruled out because midwives, physicians and other healthcare professionals are more likely to report unfavourable fetal complications when the outcome of pregnancy is stillbirth (Kumar and Singhi, 1992). It is very difficult to identify a specific condition such as umbilical cord prolapse, cord around neck and premature separation of placenta, that directly caused the death of a fetus in areas of the world where advanced technology is scarce. Women may find it difficult to perceive fetal movements coupled with imprecision in the physician's inability to hear the fetal heart beat (Yeong *et al.*, 1997). However, there is always scope for decreasing the rate of stillbirth if the available techniques in prenatal diagnosis, patient education and antenatal surveillance are optimised. Although numerous studies have shown a strong relationship between anaemia and stillbirth, our study failed to establish such a relationship. This may be attributed partly to the small sample size of this study, and failure to obtain haemoglobin data for all of the women.

In conclusion, this study identified several factors predictive of stillbirths. However, identification of women at high risk for stillbirth cannot be viewed as beneficial if this is not coupled with recommendations and institution of policies and procedures that address the risks identified. In Jamaica, Types I and II health centres that serve smaller populations are located in rural communities. Encouraging women to make use of these centres to seek antenatal care will help in the early detection of conditions that may lead to pregnancy complications and so decrease stillbirths. Health officials should also examine the utility of these centres and determine their contribution to antenatal services. In addition, women with no living children should be considered as a high-risk group for adverse pregnancy outcomes and should be given proper education on pregnancy. Antenatal surveillance should be implemented, especially among women with a previous record of stillbirth and miscarriage. Proper monitoring of the next pregnancy of these women should be a part of the antenatal care programme. Simple measurement of the fundal height of the uterus by means of a simple malleable ruler may help to detect IUGR (Belizan *et al.*, 1978) and proper action can be taken to decrease LBW. More emphasis should be placed not only on early detection of problems but also on quality of care and adequate management of complications and should result in a decrease in the incidence of stillbirths in Jamaica.

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Table I.

Demographic characteristics of cases and controls

Variables	*Controls* N *(%)*	*Cases* N *(%)*	P *value*
Age of mothers (in years)			
⩽ 25	80 (48)	75 (47)	0.07
> 25– <35	74 (45)	63 (39)	
⩾ 35	11 (7)	23 (14)	
Educational level			
No formal/primary	23 (14)	36 (22)	0.11
Secondary/technical	129 (80)	119 (74)	
Tertiary/university	9 (6)	5 (3)	
Marital Status			
Married	16 (10)	20 (12)	0.89
Common law	70 (43)	69 (43)	
Visiting relationship	68 (42)	65 (41)	
Other	7 (4)	6 (4)	
Distance from hospital/clinic (miles)			
0 – 5	148 (95)	138 (90)	0.08
> 5	8 (5)	16 (10)	
Received antenatal care			
Yes	159 (97)	155 (96)	0.57
No	5 (3)	7 (4)	
Sex of infant			
Male	99 (60)	83 (55)	0.30
Female	65 (40)	69 (45)	

Table II.

Univariate analysis of demographic and health history factors related to stillbirth

Variables	***Controls* N *(%)***	***Cases* N *(%)***	**P *value***
Distance from hospital (miles)			
0 – 10	141 (86)	107 (68)	< 0.0001
> 10	23 (14)	51 (32)	
Number of living children			
None	14 (9)	45 (28)	< 0.0001
1	40 (25)	52 (32)	
2	41 (26)	37 (23)	
3	33 (21)	16 (10)	
4	20 (13)	5 (3)	
5	8 (5)	3 (2)	
6	3 (2)	2 (1)	
HBP during pregnancy			
Yes	27 (17)	48 (30)	0.004
No	135 (83)	110 (70)	
Hospitalisation during pregnancy			
Yes	19 (12)	36 (22)	0.009
No	144 (88)	124 (78)	
Blood tests performed during pregnancy			
Yes	150 (93)	126 (79)	0.0004
No	12 (7)	34 (21)	
Number of antenatal visits			
0 – 3	31 (19)	66 (43)	< 0.0001
4 – 6	71 (44)	53 (35)	
7 – 9	36 (22)	29 (19)	
⩾ 10	22 (14)	5 (3)	
Received information on STDs and prevention			
Yes	136 (86)	107 (69)	0.0007
No	23 (14)	47 (30)	

Variables	*Controls* N *(%)*	*Cases* N *(%)*	P *value*
Duration of time since STD information was received			
6 months	40 (25)	21 (14)	0.01
7 months – 1 year	33 (20)	26 (17)	
> 1 year	66 (41)	69 (45)	

HBP = high blood pressure; STD = sexually transmitted diseases.

Table III.

Univariate analysis of delivery and infant factors related to stillbirth

Variables	*Controls* N *(%)*	*Cases* N *(%)*	P *value*
Method of delivery			
Normal spontaneous vaginal delivery	157 (96)	133 (84)	0.0005
Caesarean section	7 (4)	25 (16)	
Complications during delivery			
Yes	22 (13)	78 (52)	< 0.0001
No	141 (87)	72 (48)	
Gestational age at birth (weeks)			
⩽ 28	7 (4)	43 (28)	< 0.0001
29 – 36	79 (49)	77 (50)	
⩾ 37	74 (46)	34 (22)	
Unfavourable/adverse fetal outcomes			
Yes	19 (12)	71 (47)	< 0.0001
No	141 (88)	81 (53)	
Birth weight of infant (g)			
< 1499	4 (4)	22 (19)	< 0.0001
⩾ 1500 – 1999	2 (1)	21 (18)	
⩾ 2000 – 2500	12 (8)	20 (17)	
⩾ 2501 – 3499	94 (59)	35 (30)	
⩾ 3500	45 (28)	19 (16)	

Table IV.

Predictors of stillbirths among pregnant women in Jamaica

Variable	*Risk indicator*	*OR*	*95% CI*	P *value*
Birth weight (g)	< 2501	4.3	2.4 – 7.7	< 0.0001
Complications during pregnancy or delivery	Yes	0.19	0.09 – 0.41	< 0.001
Method of delivery	Caesarean section	7.2	1.6 – 33.2	0.01
Number of living children	None	0.54	0.40 – 0.73	< 0.0001
Number of antenatal visits	Less than 3	2.0	1.3 – 3.1	0.0008
Unfavourable/adverse fetal outcomes	Yes	4.0	1.8 – 9.2	0.0008

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