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Risk Factors Associated with Stillbirths in Public-Hospitals in Peshawar, Pakistan

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Abstract

Stillbirth is considered one of the most important maternal and pregnancy health and healthcare indicators. This study investigates the association of stillbirth with a wide range of factors related to geo-demographics, maternal health and pregnancy history in public hospitals at Peshawar, Pakistan. Data on geo-demographics, maternal health indicators, pregnancy history and outcome scores for new-born babies and their families (n=1039) were collected prospectively in a cross-sectional survey of four public hospitals in Peshawar. Crude and adjusted odds ratios were used to investigate the factors associated with stillbirth. The stillbirth rate was found to be 78.5 per 1000 births. The factors independently associated with stillbirth were maternal age (≥35years), paternal illiteracy, consanguinity, maternal height (<1.55 cm), congenital malformation and caesarean delivery. However, three factors (paternal education, congenital malformations and caesarean delivery) were highly associated with stillbirth ($p<0.0001$). In addition to congenial malformation and caesarean delivery, this study highlights the importance of paternal education regarding stillbirth rate in this area. The effect of paternal illiteracy on stillbirth might be due to its strong association with low family social-status, deprived area of residence, and maternal health conditions.

Keywords: Stillbirth rate, paternal education, congenital malformation and mode of delivery.

Introduction

Stillbirth is one of the most important maternal and pregnancy outcome health indicator (McClure, Goldenbuerg & Bann., 2007) and access to quality and adequate antenatal and delivery care (Say, Donner, Gulmezoglu, Talijaard & Piaggio 2006). Worldwide stillbirths have been estimated to be 3.2 to 4 million per year (Stanton, Lawn, Rahman, Wilczynska-Ketende & Hill, 2006, McClure, et al., 2006). Recent estimates show that stillbirth rate is nearly 24 per 1000 deliveries worldwide, 32 per 1000 deliveries in Sub-Saharan Africa and South Asia compared to 5.3 per 1000 deliveries in the developed countries (Stanton, et al., 2006).

A review of literature on stillbirth found that the rate of stillbirths is less than 1% in the developed and 3% in the developing countries (Say, et al., 2006). Of the total stillbirths, 99% were estimated in developing countries with four Asian countries (China, India, Pakistan and Bangladesh) sharing more than half (51%) of the total number of stillbirths (Stanton, et al., 2006). It is the highest in Pakistan at 41.4 per 1000 deliveries compared to recent estimates for the neighbouring countries India (29.5) and Bangladesh (37.8), respectively (Stanton, et al., 2006). Similarly, a study of five low income countries found that stillbirth rate was highest in Pakistan compared to Democratic Republic of Congo, Guatemala, Zambia and India (McClure, et al., 2007).

Studies in the U.K. (Ahmad, 1994; Parsons, Duley & Alberman 1990) found that stillbirth and neonatal mortality was nearly double in mothers born in Pakistan compared to those born in the U.K. This would suggest that the risk of having a stillbirth is higher for mothers born in Pakistan irrespective of whether they currently live in Pakistan, or have moved to a more developed country (Stanton, et al., 2006; McClure, et al., 2007; Parsons, et al., 1990).

Studies showed that the main demographic factors associated with stillbirth were teenage mothers (Hollander, 2006; Brian, Bateman & Lynn 2006), advanced maternal age, greater than 34 years (Hollander, 2006; Fretts, 2005; Brian, et al., 2006; Ferraz & Gray, 1990), maternal and paternal illiteracy (Fikree & Gray, 1996), maternal education, rural communities (Cripe, Pung, Nguyen & Williams 2007), low socioeconomic status (Fretts, 2005; Fikree & Gray, 1996; Ferraz & Gray, 1990), consanguinity (Stoltenberg, Magnus, Lie, Daltveit & Irgens, 1998 & 1999) and maternal race/ethnic group (Parsons, et al., 1990; Ferraz & Gray, 1990).

Other factors found to be associated with stillbirth were hypertension, diabetes, anaemia and maternal weight, medical and obstetrical complications and antepartum haemorrhage (Ferraz & Gray, 1990), vaginal bleeding (Jehan, et al., 2006) and previous adverse pregnancy history (Getahun, et al., 2007; Korejo, et al., 2007; Ferraz & Gray, 1990). In addition, congenital malformation (Jehan, et al., 2006; Ferraz & Gray 1990) and inadequate prenatal care were also reported to be some of the causes of stillbirths (Ferraz & Gray, 1990; Cripe, et al., 2007). Studies also showed that foetal abnormality, congenital infection, maternal medical conditions and pre-eclampsia were also some of the causes of stillbirths (Pasupathy & Smith, 2005).

Whilst Pakistan has a high rate of stillbirths, the local influential factors are still largely unknown. The present study therefore seeks to explore the specific determinants of stillbirth in Peshawar, Pakistan.

Material and Method

Data were collected in a cross-sectional prospective survey on maternal and paternal geo-demographic factors, maternal health and pregnancy history and neonatal outcome from all public hospitals (Hayatabad Medical Complex, Khyber Teaching Hospital, Lady Reading Hospital, and Government Maternity Hospital) in Peshawar during August to November 2003 through volunteer clinicians on duty. The data comprise questionnaire responses collected from 1,039 single birth mothers delivered during the study period.

The clinicians interviewed women for this study in local languages at admission, and in the delivery room in the case of emergency. The responses were recorded on a pre-designed questionnaire validated by health professionals during a pilot study in the same hospitals. The Research Ethics Committee of Liverpool John Moores University, UK (reference number 02141) approved this study in 2003.

For the purpose of this study, a stillbirth is defined as the "delivery of an infant whose gestational age was at least 28 weeks or whose birth weight was at least 1000g, but who showed no signs of life and whose Apgar score was zero" (Tannirandorn & Jatuparisuth, 2004). Gestational age was calculated from the first day of the last menstrual period reported by the mother and categorised such that any delivery from 24 and <37 weeks were termed as preterm birth (Smith, Pell & Dobbie, 2003).

In this paper, pregnancy registration was taken as proxy for pre-natal care (Table 1 and 2). Five other factors were collected as continuous measures, which were later banded into categorical measures according to the previous literature. These measures include maternal age (Khan & Jamal, 2003), gestational age (Lone, Qureshi & Emanuel, 2004; Khan & Jamal, 2003), height (Fikree & Berendes, 1994) and the gap between this and the previous pregnancy (Grant & Bittles, 1997). However, the threshold for maternal pregnancy weight during analysis was decided to be 57 kg for this study, as this value had the highest significance for adverse pregnancy outcomes (LBW) at univariate level (Badshah, Mason, McKelvie, Payne & Lisboa, 2008).

Table 1

Characteristics of mothers (geo-demographic-factors) delivered and their new-born at the four Public-hospitals in Peshawar between August-November 2003, and their univariate associations with birth-status.

Maternal characteristics	Total	Stillbirths n(%)	Live-birth n(%)	OR[95% C.I]
Area of residence				
Tribal	245(24.3)	27(11)	218(89)	1.7[1.02, 2.70]**
Settled	764(75.7)	53(6.9)	711(93.1)	
Nationality				
Afghan refugees	117(11.5)	14(12)	103(88)	1.7[0.90, 3.17]*
Pakistani	901(88.5)	66(7.3)	835(92.7)	
Consanguinity				
Yes	608(60.0)	55(9)	553(91)	1.6[0.96, 2.60]*
No	406(40.0)	24(5.9)	382(94.1)	
Maternal age at delivery				
<20 years	76(7.5)	7(9.2)	69(90.8)	1.7[0.70, 3.90]
≥35 years	139(16.6)	29(17.2)	140(82.8)	3.4[2.07, 5.70]**,
20-34 years	771(75.9)	44(5.7)	727(94.3)	
Fresh water availability				
No	370(36.6)	41(11.1)	329(88.9)	2.0[1.30, 3.13]**,
Yes	640(63.4)	38(5.9)	602(94.1)	
Family income				
<5000 rupees	694(69.0)	64(9.2)	630(90.8)	2.2[1.20, 3.92]**
≥5000 rupees	312(31.0)	14(4.9)	298(95.5)	
Maternal education				
No	706(69.7)	67(9.5)	639(90.5)	2.4[1.30, 4.40]**,
Yes	307(30.3)	13(4.2)	294(95.8)	
Paternal education				
No	384(37.9)	47(12.2)	337(87.8)	2.6[1.60, 4.20]**,
Yes	628(62.1)	32(5.1)	596(94.9)	

*** p<0.01, **p<0.05 and * p<0.10

There were two levels of data analysis, univariate (crude odds ratios) and multivariate (multivariate logistic regression) to identify the significant main factors associated with stillbirth. Multivariate logistic regression (Allison, 1999; Kleinbaum, 1994) was applied to assess the independent effects of factors on stillbirth, using uncorrelated groups of factors (Pearson's, Spearman's correlation with thresholds of 0.6), using SPSS (Field, 2003). Chi-square test was used for the significance of the factors in univariate models and Wald's test for multivariate models (Machado and Hill, 2003).

Results

The results are for data from 1039 birth episodes, prospectively sampled in the four public hospitals in Peshawar. The overall stillbirth rate was found to be 78.5 per 1000 deliveries (gestational age ≥28 weeks). The crude odds of stillbirth were highly significant for four geo-demographic factors; maternal age ≥35 years (OR=3.4, $p<0.01$), non-fresh water sources (OR=2.0, $p<0.01$), maternal illiteracy (OR = 2.4, $p<0.01$) and paternal illiteracy (OR= 2.6, $p<0.01$). In maternal health and pregnancy history, the factors associated with stillbirth at univariate level were found to be maternal height <155cm (OR=2.0, $p<0.01$), weight <57kg at delivery (OR=1.9, $p<0.01$), pregnancy registration in the hospital (OR=2.2, $p<0.01$), anaemia (OR=2.7, $p<0.01$), any other health condition (OR=3.0, $p<0.01$), previous history of abortion/miscarriages (OR=2.3, $p<0.01$), previous history of preterm delivery (OR=3.5, $p<0.01$), parity ≥5 (OR=2.0, $p<0.01$), congenital malformation (OR=23.0, $p<0.01$) and mode of delivery (OR=2.4, $p<0.01$) (Table 2).

The adjusted odds of stillbirth showed that only three geo-demographic factors (i.e. maternal age, consanguinity and paternal education), and three maternal health and pregnancy history factors (i.e. maternal height, congenital malformation and mode of delivery) were independently associated with a stillbirth, using probability of entry and removal 0.01 for the model (Table 3). However, using probability of entry and removal as 0.001 for the model, only three factors — paternal education, congenital malformation of the baby and mode of delivery — were found to be independently associated with stillbirth (Table 4). Of the three significant factors, congenital abnormality had the highest odds (OR=21.1, $p<0.0001$), compared to paternal illiteracy and caesarean delivery (OR=2.99, 2.64, $p<0.0001$), respectively (Table 4).

Discussion

The motivation behind this study was to collect data on stillbirths and to investigate the factors associated with it. This will help to identify areas for future research and to formulate policies for future interventions in order to minimise the high rate of stillbirth in this region.

This study represents only 9% (urban=18%, rural=6%) of the total births delivered in Khyber Pukhtunkhwa province, because the majority (91%) of the deliveries take place at home, or in private hospital/clinics etc. (Federal Bureau of Statistics, 2002). It was not possible to collect data from home births or private hospitals within the remit of this study because of a number of limitations, e.g. time and resources. This study therefore had to recruit women prospectively from the four public hospitals in Peshawar. The present study also uses information of the newborn after birth (live birth or stillbirth), so we do not know, whether the baby died during birth process or dead baby was delivered. However, the results of this study might be generalised for babies delivered in public hospitals in Peshawar only, although could give some indication of areas for further study of stillbirths occurring during home births and within private hospitals in this area.

Considering the reliability of data, it was found that some factors i.e. maternal and paternal education, non-fresh water areas, family income, consanguinity, diabetes, hypertension, anaemia and abortions are comparable with other reports for population or population-based studies (Badshah, et al., 2008). However our study found a higher proportion of women from Tribal areas and a lower proportion of teenage mothers compared to other figures and studies in the region (24% versus 15% of Tribal mothers, and 7.5% versus 19.6% of teenage mothers (Grant & Bittles, 1997). The high proportion of mothers from tribal areas might be due to lack of healthcare facilities in the tribal areas and subsequent referral of high risk mothers (Bartlett, et al., 2002), whereas low participation of teenage mothers in this hospital based study might be due to lack of health awareness.

The present study found that the stillbirth rate in Peshawar (78.5 per 1000 deliveries) is nearly twice the national stillbirth rate for Pakistan, nearly three times higher than a similar study in Karachi Pakistan (Jehan, et al., 2006), and more than 15 times higher than figures from developed countries (Stanton, et al., 2006). However, the main risk factors associated with stillbirth were

advanced maternal age, consanguinity, maternal low height, caesarean delivery, congenital malformation and no paternal education.

The association of maternal age >34 years with stillbirth is consistent with other such studies in United States, United Kingdom and Brazil (Hollander, 2006; Fretts, 2005;, Brian, et al., 2006; Joy, et al., 2000 and Ferraz & Gray, 1990). Consanguinity reported to be one of the important factors for newborn health in Peshawar (Badshah, et al., 2008) and 11 cities of Punjab province of Pakistan (Bittles, Grants & Shami,, 1993); was also associated with stillbirth in the present study and consistent with other studies Norway (Stoltenberg, et al., 1998 and 1999) and Karnataka India (Kulkarni & Kurian, 1990). Similarly the adverse effect of short maternal height on stillbirth was consistent with other studies in Sweden (Stephansson, Bickman, Johansson & Clattinqius, 2000), Jamaica (Greenwood, Golding, McCaw-Binns, Keeling & Ashley 1994), and India (Desai, Hazra & Trivedi, 1989).

We found that Caesarean delivery was at higher risk for stillbirth, and this was also seen in a study of the 5 poor countries that "The low rates of physician attendance, hospital delivery, and caesarean section deliveries suggest that stillbirth rates could be reduced by access to higher quality institutional deliveries" (McClure, et al., 2007). The effect of congenital malformation on stillbirth in our study is also consistent with Jehan, et al., (2006) study in Karachi, Ferraz & Gray (1990) study in Brazil, and Pasupathy & Smith (2005) study in UK.

The effect of paternal illiteracy in our study was also consistent with Fikree & Gray (1996) study in Karachi and a population based study in Norway (Arntzen, Maqnus & Bakketeiq, 1993). However, after further analysis of the data, the effect of paternal illiteracy on stillbirth was found to be due to independent association of paternal illiteracy with a number of other important factors, i.e. (i) non-registered pregnancy (OR=1.6, $p<0.01$), (ii) deprived area of residence and low income families, respectively (OR=1.7, 3.6, $p<0.01$), (iii) maternal illiteracy (OR=3.44, $p<0.01$), (iv) low pregnancy weight at delivery (OR=1.6, $p<0.05$) and (v) mothers at high risk of diabetes (OR=5.5, $p<0.01$). The effect of non-registered pregnancy, deprived area, low family income, maternal illiteracy is evident from the literature (Cripe, et al., 2007; Fretts, 2005; Fikree & Gray, 1996; Ferraz & Gray, 1990).

Figure 1 shows that the proportion of stillbirths (for non-congenital malformation babies delivered through caesarean delivery) was significantly high for illiterate

fathers (17%) compared to 6% for literate fathers (OR=3.2, p<0.01). The effect of paternal illiteracy compared to paternal literacy even in the case of spontaneous and non-congenital malformation babies was also established. This finding further strengthens the evidence and effect of paternal illiteracy on stillbirth.

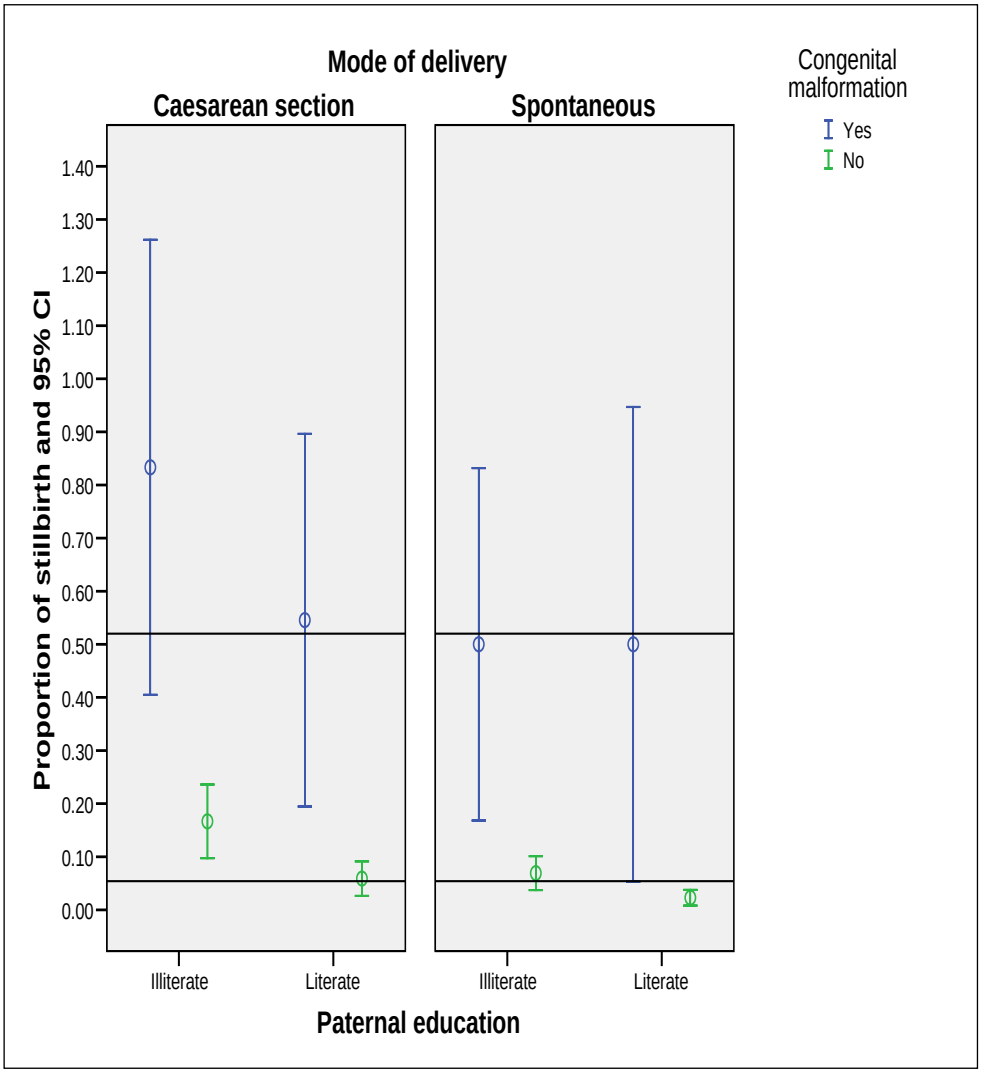

Figure 1: The proportion of stillbirth for paternal illiteracy controlling for mode of delivery and congenital malformation.

Conclusion

The stillbirth rate in Peshawar hospitals is very high compared to the rest of Pakistan. This study highlights the importance of paternal literacy, which was found to be associated with a number of geo-demographic factors and health conditions. However, the root causes of congenital malformation and effect of caesarean delivery on stillbirth need further investigation to identify the main factors of stillbirth in this region. Further studies are recommended to explore, the expertise of the clinicians controlling for other important factors associated with stillbirth

These findings are specific to public hospitals in NWFP-Pakistan. Further studies on stillbirth in private hospitals and clinics, along with studies of home delivery, are also needed in order to extend the scope of this work on stillbirth in this area of Pakistan.

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Table 2

Characteristics of mothers (maternal health and pregnancy history) delivered and their newborn at the four Public-hospitals in Peshawar between August-November 2003, and their univariate associations with birth-status.

Maternal characteristics	Total n(%)	Stillbirths n(%)	Live-birth n(%)	OR[95% C.I]
Maternal height				
<155cm	311(31.0)	36(11.6)	275(88.4)	2.0[1.20, 3.14]***
≥155cm	691(69.0)	43(6.2)	648(93.8)	
Pregnancy weight				
<57kg	246(24.5)	29(11.8)	217(88.2)	1.9 [1.20, 3.10]***
≥57kg	759(75.5)	50(6.6)	709(93.4)	
Pregnancy registration				
No	543(54.0)	56(10.3)	487(89.7)	2.2 [1.30, 3.60]***
Yes	463(46.0)	23(5)	440(95)	
Gestational age				
<37 weeks	220(21.9)	24(10.9)	196(89.1)	1.7 [1.00, 2.70]*
≥37 weeks	783(78.1)	54(6.9)	729(93.1)	
Maternal diabetes				
Yes	26(2.6)	5(19.2)	21(80.8)	2.9 [1.10, 7.90]**
No	972(97.4)	74(7.6)	898(92.4)	
Maternal hypertension				
Yes	184(18.5)	23(12.5)	161(87.5)	1.9 [1.20, 3.20]**
No	812(81.5)	56(6.9)	756(93.1)	
History of anaemia				
Yes	385(38.8)	48(12.5)	337(87.5)	2.7 [1.70, 4.30]***
No	608(61.2)	31(5.1)	577(94.9)	
[1]Any other health condition				
Yes	59(6.1)	11(18.6)	48(81.4)	3.0 [1.50, 6.10]***
No	916(93.9)	65(7.1)	851(92.9)	
Abortion/miscarriage				
Yes	173(17.4)	24(13.9)	149(86.1)	2.3 [1.40, 3.75]***
No	55(82.6)	55(6.7)	768(93.3)	
History of preterm				
Yes	120(11.9)	23(19.2)	97(80.8)	3.5[2.10, 5.99]***
No	888(88.1)	56(6.3)	832(93.7)	
Parity				
One	293(28.8)	13(4.4)	280(95.6)	0.6 [0.33, 1.24]
≥5	298(29.3)	38(12.8)	260(87.2)	2.0[1.20, 3.33]***
2-4	426(41.9)	29(6.8)	397(93.2)	
Congenital malformation				
Yes	39(3.9)	23(59)	16(41)	23[11.5, 46.0]***
No	970(96.1)	57(5.9)	913(94.1)	
Mode of delivery				
Caesarean	340(33.7)	42(12.4)	298(87.6)	2.4 [1.50, 3.82]***
Non Caesarean	669(66.3)	37(5.5)	632(94.5)	

*** p<0.01, **p<0.05 and * p<0.10

[1] other than diabetes, hypertension and anaemia.

Table 3

Factors independently associated with stillborn babies at four Public-hospitals in Peshawar between August-November 2003, using multivariable logistic regression method* for all factors in Table 1 & 2.

Factors	*adjusted odd-ratios*	*95% CI*	*p-value*
Maternal age (20-34 years, as ref. category			
<20 years	1.30	[0.50, 3.34]	0.605
≥35 years	2.90	[1.61, 5.20]	0.0001
Consanguinity (No, as ref. category)			
Yes	2.23	[1.23,4.10]	0.008
Paternal education (literate, as ref. category)			
Illiterate	2.86	[1.66,4.92]	0.0001
Maternal height (≥155cm as ref. category)			
<155cm	2.50	[1.31,3.85]	0.003
Mode of delivery (Spontaneous, as ref. category)			
Caesarean	2.48	[1.50,4.24]	0.001
Congenital malformation (No, as ref. category)			
Yes	24.50	[11.35,2.88]	0.0001

** using probability of entry and removal 0.01 for the model*

Table 4

Factors independently associated with stillborn babies at four Public-hospitals in Peshawar between August-November 2003, using multivariable logistic regression method** for all factors in Table 2.

Factors	***adjusted odd-ratios***	***95% CI***	***p-value***
Paternal education: illiterate			
(literate, as ref. category)	2.99	[1.77, 5.05]	0.0001
Congenital malformation: yes			
(No, as ref. category)	21.10	[10.10,44.20]	0.0001
Mode of delivery Caesarean			
(Spontaneous, as ref. category)	2.64	[1.58, 4.43]	0.0001

** using probability of entry and removal 0.001 for the model.