Association between obstetric complications & previous pregnancy outcomes with current pregnancy outcomes in Uttar Pradesh, India

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Background & objectives: **A substantial proportion of pregnant women in India are at the risk of serious obstetric complications and reliable information on obstetric morbidity is scanty, particularly in socio-economically disadvantaged society. We studied the association between the obstetric complications in women in their current pregnancy and adverse pregnancy outcomes in previous pregnancies in Uttar Pradesh, India.**

Methods: **Data from District Level Household Survey (2007-2008) were used for empirical assessment. Bivariate, trivariate and Cox proportional hazard regression model analyses were applied to examine the effect of obstetric complications and previous pregnancy outcome on current pregnancy outcome among currently married women (age group 15-49 yr) in Uttar Pradesh, India.**

Results: **The results of this study showed that the obstetric complications in the current pregnancy and adverse pregnancy outcomes in previous pregnancies were associated with the outcome of the current pregnancy. Cox proportional hazard regression model estimates revealed that the hazard ratio of having stillbirths were significantly higher among women with any obstetric complications compared to women with no obstetric complications. The adverse pregnancy outcome in a previous pregnancy was the largest risk factor for likelihood of developing similar type of adverse pregnancy outcome in the current pregnancy.**

Interpretation & conclusions: **The findings provided key insights for health policy interventions in terms of prevention of obstetric complications to avoid the adverse pregnancy outcome in women.**

Key words Association - current pregnancy outcome - obstetric complications - previous pregnancy outcome

There has been a significant decrease in the maternal mortality ratios (MMR) in developed countries during the twentieth century. However, developing countries still suffer from a large number of maternal deaths, and very often, pregnancy could be a risky event in a woman's life in these countries. Fifty per cent of the global maternal deaths occurred in the sub-Saharan Africa region alone, followed by South Asia, which contributed around 35 per cent; further, sub-Saharan Africa and South Asia together account for 86 per cent of global maternal deaths[1-5]. Globally, approximately 80 per cent of maternal deaths and 98 per cent of stillbirths have been due to direct obstetric complications, primarily haemorrhage,

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sepsis, complications of abortion, preeclampsia and eclampsia, and prolonged/obstructed labour[6-9]. A substantial proportion of pregnant women in India have been at the risk of serious obstetric complications and most of them had been suffering from multiple complications[10-12].

Uttar Pradesh, a highly populous State in India with more than 170 million people continues to have the highest reported maternal mortality ratio in India[13]. According to Bhat[14], the risk of death due to complications of pregnancy was highest in undivided Uttar Pradesh during the period 1982-1986 as well as during 1987-1996. Estimates based mostly on the sample registration system suggest that the maternal mortality in undivided Uttar Pradesh was the highest in the country in the year 1997 and was well above the national average[14]. Uttar Pradesh continued to be the State with higher maternal deaths; this indicates well above the national average of MMR of 407 per 100,000 live births[15]. Uttar Pradesh has also been the home for the highest number of women suffering from obstetric complications[16].

Obstetric complications in the low-income settings have serious consequences both socially and medically[17,18]. Obstetric complications have been used as a predictor of maternal deaths and other pregnancy outcomes. Threatened miscarriage, defined as vaginal bleeding before 24 wk of gestation, is a common complication affecting about 20 per cent of the pregnancies in India[19]. Pregnancy-related illnesses and complications during pregnancy and delivery are known to have a significant impact on the foetus, leading to poor pregnancy outcomes[11,19,20].

In India, reliable information on obstetric morbidity is scanty, particularly in socio-economically disadvantaged settings like in Uttar Pradesh, the effects of obstetric complications on the pregnancy outcomes have not been studied. Therefore, this study was an effort to find out the association between obstetric complications in the current pregnancy and the adverse pregnancy outcomes in previous pregnancies in women in Uttar Pradesh, India.

Material & Methods

The District Level Household Survey data (DLHS-3, 2007-2008)[21] were used to explore the effect of obstetric complications on pregnancy outcome. A multi-stage stratified systematic sampling design was adopted for DLHS-3. In each district, 50 Primary Sampling Units (PSUs) which were census villages for rural areas and wards for urban areas, were selected in the first stage by systematic Probability Proportional to Size (PPS) sampling. The Census of India 2001 was the sampling frame for DLHS-3.

Out of the sample of 7,20,320 households, 6,43,944 ever married women were interviewed and of these, 21,50,48 women were currently married in age group of 15-49 yr. In Uttar Pradesh, 82,194 currently married women were included as respondents. The study was restricted to only those women who had their last delivery after January 1, 2004. Hence, the final sample size of this study was 40,874 women.

Variables for the analysis: The following variables were considered in the analysis:

Outcome variables - Although maternal mortality has been widely considered as the key indicator of pregnancy outcome, maternal health, and human development, in the absence of accurate data on maternal deaths, the information on other pregnancy outcomes were used, such as stillbirth, or late foetal deaths, spontaneous abortions and induced abortions, which have also been considered reliable indicators of maternal health status[6].

Predictor variables - Obstetric complications (refer to disruptions and disorders of pregnancy, labour and delivery, and the early neonatal period) such as swelling of hands, feet and face; excessive fatigue, convulsions, not from fever; excessive bleeding; vaginal discharge; pregnancy problem of weak or non moving foetus were used as predictor variables.

Other covariates: Cox proportional hazard models were used for important socio-economic characteristics which are associated with pregnancy outcomes: age of women, place of residence, caste, religion, education level of women, occupation of women, household economic status (wealth index).

Statistical analysis: All analyses were done using Stata 10.1 (Stata crop LP, USA) and followed two part analyses strategies: in the first part, bivariate and trivariate analyses were carried out. In the second part, the hazard ratios of stillbirths and spontaneous abortions were estimated by using Cox proportional hazard model[22,23] for those who suffered and those who did not suffer with obstetric complications. Further, in this model, the related socio-economic and demographic determinants were controlled to estimate the net effect of obstetric complications on the selected adverse pregnancy outcomes.

Results

Prevalence of stillbirth by obstetric complication status: This study revealed that within the same socio-economic category, women who were suffering with any obstetric complications have faced greater adverse pregnancy outcomes compared to those who have not suffered with any obstetric complications. Table I presents the prevalence of stillbirths by the status of obstetric complications. For instance, among women in

the age group 25-29 yr, stillbirths (per 1000 pregnancies) were five times more in women with any pregnancy complication compared to women with no pregnancy complications. Similarly, within the urban women, stillbirths for women with any obstetric complications (14 per 1000 pregnancies) were reasonably high compared with those women who had no obstetric complications (only 9.52 per 1000 pregnancies). Women belonging to Schedule Caste/Schedule Tribes

Predictors	Stillbirths (per 1000 pregnancies)			N⁺
	No pregnancy complication	Any pregnancy complication	*P* values	
Age (yr)				
15-19	10.28	14.83	0.001	28031
20-24	7.30	15.84		6374
25-29	5.85	23.53		428
30-34	0.00	0.00		23
35 and above	0.00	0.00		4
Place of residence				
Rural	10.04	15.41	0.001	34585
Urban	9.52	13.98		6289
Caste				
General	6.15	12.99	0.001	8244
Schedule caste/Schedule tribe	9.59	15.71		23200
Other backward class	11.46	15.70		9324
Religion				
Hindu	8.77	14.44	0.001	32857
Muslim	15.97	18.19		7817
Christians	0.00	0.00		17
Others	0.00	19.61		183
Education				
No education	11.37	15.75	0.001	25372
Primary education	15.24	17.59		1748
Above primary education	6.72	13.97		13754
Wealth index				
Poor	17.33	17.33	0.001	23187
Non Poor	13.69	13.69		17687
Antenatal check up (ANC)				
No ANCs	10.10	15.70	0.001	24558
Any ANCs	14.60	14.32		13654

Table I. Prevalence of stillbirths (per 1000 pregnancies) by obstetric complication status in Uttar Pradesh, India, 2007-2008

⁺unweighted sample of pregnancies among currently married women in age group 15-49 yr

(SC/ST) with any obstetric complications showed more stillbirths than other groups (Table I). The prevalence of stillbirth for women with any antenatal check-ups (ANCs) did not vary by pregnancy complication status.

The results presented in Table II showed that among women of the same socio-economic status, a greater number of those who had an adverse pregnancy outcome previously had an adverse pregnancy outcome of their current pregnancy. Further, women who had experienced stillbirths previously also had stillbirth in their current pregnancy. Similarly, women who had experienced induced abortion and spontaneous abortions experienced similar pregnancy outcomes for their current pregnancy. For instance, among urban women, a greater proportion (9%) of those who experienced stillbirth previously had also experienced stillbirths in their current pregnancy. Among women belonged to rich household economic status, who had experienced induced abortion previously, 40 per cent of them had also experienced induced abortion in their current pregnancy.

Hazard ratio (HR) estimates of adverse pregnancy outcome by obstetric complications and previous pregnancy outcome: The Cox proportional hazard model estimations in Table III were confound with the results of trivariate analysis. Among the same socio-economic and demographic characteristics, the hazard ratio of having stillbirth was greater among women who suffered with any pregnancy complication (HR = 1.11, *P*<0.01) compared to those who were not suffered (HR = 1). Similarly, prevalence of stillbirths was eight times more (HR = 8.11, *P*<0.01) for women who had stillbirths in the last pregnancy than women who had live births (HR = 1.00). The hazard ratio of having a stillbirth was also greater if a woman had a spontaneous abortion as a previous pregnancy outcome. The results indicated strong, positive association of stillbirths with obstetric complications and previous adverse pregnancy outcomes.

Table IV revealed that previous pregnancy outcomes had serious implications on spontaneous abortions in women in Uttar Pradesh. The previous pregnancy outcome such as spontaneous abortions and stillbirths showed strong and positive association with the current pregnancy outcome as spontaneous abortions. The hazard ratio of having a spontaneous abortion was six times (HR = 5.7, *P*<0.01) more among the women who had a spontaneous abortion in a previous pregnancy outcome than those who had a live birth as a previous

pregnancy outcome (HR = 1.00). Similarly, prevalence of spontaneous abortions among women who had previous pregnancy outcome as stillbirths was also about twice (HR = 1.48, *P*<0.01) than their counter groups. Overall, Cox regression estimates suggest that the adverse pregnancy outcomes in previous pregnancies greatly determine the adverse pregnancy outcome of the current pregnancies compared to other background characteristics and spontaneous abortions as a current pregnancy.

Discussion

Studies conducted in India on the risk factors of maternal mortality and stillbirths[10,11,19] have not considered previous pregnancy outcomes as a risk factor for adverse pregnancy outcomes in the current pregnancy. The assessment of previous pregnancy history is very critical to avoid adverse pregnancy outcome in the current pregnancy. The key findings of this study were as follows: First, in Uttar Pradesh, a majority of women had experienced obstetric complications during pregnancy. The women in the younger age group and lower socio-economic status had experienced more number of stillbirths, induced abortions and spontaneous abortions compared to those with other age and high socio-economic status. Second, the results also demonstrated that among women with similar socio-economic status, obstetric complications emerged as the greater risk factors for adverse pregnancy outcomes. Third, after controlling for related socio-economic and demographic characteristics, the adverse pregnancy outcome in a previous pregnancy was the largest risk factor for the likelihood of getting similar type of adverse pregnancy outcomes in the current pregnancy. Though, some of the previous studies[10,11,19] documented obstetric complications as a risk factor of pregnancy outcome, but this study evidently supported it from the findings based on a large scale data. Moreover, this study documents the previous pregnancy outcome as a critical predictor of adverse pregnancy outcome in the current pregnancy.

The findings of this study provided certain important insights for health policy interventions in terms of prevention of obstetric complications to avoid adverse pregnancy outcomes. The knowledge of obstetric complications, adverse pregnancy outcomes, causes, and prevention feasibility are the key inputs to be given to women in India. Since, the same women face adverse pregnancy outcomes repeatedly, the targeted health policy intervention for women who had the pregnancy complication in their first pregnancy should

Table II. Percentage distribution of current pregnancy outcomes by previous pregnancy outcomes among socio-economic groups of India, 2007-2008

Predictors	Previous outcome of pregnancy	Current outcome of pregnancy				N	Predictors	Previous outcome of pregnancy	Current outcome of pregnancy				N
		Live birth	Stillbirth	Induced abortion	Spontaneous abortion				Live birth	Stillbirth	Induced abortion	Spontaneous abortion	
Age at living with husband (yr)							Wealth index							
15-19	Live birth	90.87	1.19	2.76	5.17	40689	poor	Live birth	92.53	1.46	1.64	4.36	14030
	Stillbirth	86.40	7.20	0.80	5.60	1003		Stillbirth	81.69	11.00	1.06	6.78	373
	Induced abortion	54.74	1.05	39.47	4.74	665		Induced abortion	56.31	0.00	37.74	5.95	120
	Spontaneous abortion	73.24	1.58	0.72	24.46	2602		Spontaneous abortion	75.62	1.98	0.74	21.66	682
	Total	88.94	1.36	3.24	6.45	44959		Total	90.84	1.75	1.96	5.46	15205
20-24	Live birth	90.57	1.05	3.93	4.45	12734	Rich	Live birth	89.29	0.91	4.17	5.63	11332
	Stillbirth	77.78	11.11	1.85	9.26	309		Stillbirth	88.00	3.72	2.28	6.01	272
	Induced abortion	66.00	2.00	30.00	2.00	358		Induced abortion	53.32	1.94	40.46	4.28	312
	Spontaneous abortion	72.68	1.46	0.98	24.88	1117		Spontaneous abortion	71.72	1.55	1.22	25.51	992
	Total	88.05	1.35	4.19	6.41	14518		Total	87.03	1.04	4.78	7.15	12908
25-29	Live birth	90.43	0	4.35	5.22	1544	Antenatal check up	Live birth	98.84	1.16	0	0	40765
	Stillbirth	85.71	0	14.29	0	49	Yes	Stillbirth	92.59	7.41	0	0	1167
	Induced abortion	28.57	14.29	57.14	0	71		Induced abortion	97.48	2.52	0	0	691
	Spontaneous abortion	75.00	0	8.33	16.67	216		Spontaneous abortion	98.03	1.97	0	0	2677
	Total	85.82	0.71	7.80	5.67	1880		Total	98.59	1.41	0	0	45300
30-34	Live birth	75.00	0	12.50	12.50	194	No	Live birth	98.55	1.45	0	0	17673
	Total	75.00	0	12.50	12.50	194		Stillbirth	89.80	10.20	0	0	305
35 and above	Live birth	100.00	0	0	0	39		Induced abortion	97.30	2.70	0	0	84
	Total	100.00	0	0	0	39		Spontaneous abortion	96.45	3.55	0	0	452
								Total	98.29	1.71	0	0	18514
Place of residence							Religion							
Rural	Live birth	91.28	1.21	2.65	4.87	52013	Hindu	Live birth	91.00	1.05	2.90	5.05	46189
	Stillbirth	85.02	7.34	0.92	6.73	1337		Stillbirth	85.57	7.22	1.37	5.84	1182
	Induced abortion	52.75	0.92	41.28	5.05	834		Induced abortion	51.68	0.84	42.44	5.04	954
	Spontaneous abortion	73.78	1.97	0.93	23.32	3335		Spontaneous abortion	73.26	1.65	1.30	23.79	3434
	Total	89.31	1.41	3.14	6.14	57519		Total	88.83	1.24	3.54	6.39	51759
Urban	Live birth	89.41	0.92	3.94	5.73	10058	Muslim	Live birth	91.16	1.63	2.51	4.70	9972
	Stillbirth	81.40	9.30	4.65	4.65	223		Stillbirth	83.12	6.49	1.30	9.09	262
	Induced abortion	60.94	3.13	34.38	1.56	340		Induced abortion	72.09	4.65	23.26	0	131

Contd....

Predictors		Previous outcome of pregnancy	Live birth	Stillbirth	Induced abortion	Spontaneous abortion	N
Age at living with husband (yr)		Spontaneous abortion	70.62	0.56	1.69	27.12	1005
		Total	86.95	1.12	4.65	7.28	11626
Caste	Schedule castes/ Schedule tribes	Live birth	91.82	1.23	1.67	5.29	547
		Stillbirth	81.72	10.75	1.08	6.45	268
		Induced abortion	50.00	-	45.65	4.35	1322
		Spontaneous abortion	74.43	0.91	0.91	23.74	25329
		Total	89.93	1.44	2.18	6.45	25541
	Other backward class	Live birth	91.42	1.19	2.85	4.54	675
		Stillbirth	86.94	6.76	1.35	4.95	509
		Induced abortion	56.52	1.86	37.27	4.35	1863
		Spontaneous abortion	72.84	2.08	0.87	24.22	28588
		Total	89.41	1.40	3.32	5.87	
	Other	Live birth	88.81	0.98	4.23	5.97	12217
		Stillbirth	80.00	5.45	1.82	12.73	308
		Induced abortion	52.05	1.37	42.47	4.11	374
		Spontaneous abortion	72.61	1.66	1.66	24.07	1093
		Total	86.46	1.13	4.91	7.50	13992

Wealth index / Education		Previous outcome of pregnancy	Live birth	Stillbirth	Induced abortion	Spontaneous abortion	N
		Spontaneous abortion	73.12	2.15	0	24.73	591
		Total	89.63	1.82	2.62	5.93	10956
	Christian	Live birth	100.00	0	0	0	3553
		Total	100.00	0	0	0	3553
	Others	Live birth	84.91	0	5.66	9.43	2563
		Stillbirth	0	100.00	0	0	58
		Induced abortion	0	0	100.00	0	65
		Spontaneous abortion	75.00	0	0	25.00	191
		Total	80.00	3.33	6.67	10.00	2877
Education	No education	Live birth	92.05	1.29	2.02	4.64	31271
		Stillbirth	86.12	9.39	0.41	4.08	760
		Induced abortion	52.90	2.17	39.13	5.80	320
		Spontaneous abortion	76.01	1.41	0.71	21.87	1503
		Total	90.41	1.51	2.43	5.65	33854
	Primary education	Live birth	88.45	1.74	3.64	6.17	5013
		Stillbirth	82.35	0	0	17.65	142
		Induced abortion	64.29	0	28.57	7.14	75
		Spontaneous abortion	56.52	6.52	4.35	32.61	309
		Total	85.75	1.97	4.09	8.18	5539
	Above primary education	Live birth	89.15	0.83	4.44	5.58	
		Stillbirth	81.48	4.63	3.70	10.19	658
		Induced abortion	55.38	0.77	41.54	2.31	779
		Spontaneous abortion	71.36	1.64	1.17	25.82	2528
		Total	86.48	0.98	5.14	7.40	29752

Values are in percentages

Table III. Hazard ratios (HR) showing the relative risk of stillbirth by obstetric complications and background characteristics of currently married women in age group 15-49 yr in Uttar Pradesh, India, 2007-2008

Predictors	Hazard ratios (HR)	95 % CI for HR	
		Lower	Upper
Obstetric complications			
No pregnancy complication®	1		
Any pregnancy complication	1.11**	0.8	1.55
Previous pregnancy outcome			
Live birth®	1		
Stillbirth	8.11**	5.21	12.64
Induced abortions	2.13	0.78	5.78
Spontaneous abortions	2.39**	1.39	4.1
Antenatal check up			
Any ANC®	1		
No ANC	1.03	0.74	1.42
Age at which women living with husband (yr)			
15-19®	1		
20-24	0.69	0.46	1.04
25-29	0.27	0.04	1.94
30 and above	0	0	1.11
Place of residence			
Rural®	1		
Urban	0.57*	0.34	0.97
Caste			
Schedule caste/Schedule Tribe®	1		
Other backward class	1.08	0.73	1.58
Others	1.02	0.61	1.68
Religion			
Hindu®	1		
Muslim	1.3	0.89	1.89
Others	2.27	0.55	9.31
Education			
No education®	1		
Primary education	1.55	0.78	3.07
Above primary education	1.40	0.94	2.07
Wealth index			
Poor®	1		
Rich	0.93	0.67	1.3
Chi² test		141.06**	

®Reference category; *P* *<0.05, **0.01

Table IV. Hazard ratios (HR) showing the relative risk of spontaneous abortion by obstetric complications and background characteristics of currently married women in age group 15-49 yr in Uttar Pradesh, India, 2007-2008

Predictors	Exp(B)	95 % CI for Exp(B)	
		Lower	Upper
Pregnancy history			
Live birth®	1		
Stillbirth	1.48	0.94	2.34
Induced abortions	0.49*	0.26	0.92
Spontaneous abortions	5.70**	4.88	6.66
Age at which women living with husband (yr)			
15-19®	1		
20-24	0.59**	0.49	0.71
25-29	0.28**	0.14	0.57
30 and above	0.47	0.07	3.38
Place of residence			
Rural®	1		
Urban	1.02	0.85	1.23
Caste			
Schedule castes/Schedule Tribes	1		
Other Backward Class	0.92	0.77	1.09
Others	0.96	0.78	1.19
Religion			
Hindu®	1		
Muslim	0.81*	0.67	0.97
Others	1.58	0.75	3.33
Education			
No education®	1		
Primary education	1.74**	1.29	2.34
Above primary education	1.69**	1.44	1.99
Wealth index			
Poor®	1		
Rich	1.46**	1.24	1.71
Chi² test value and significance		809.97**	

P *<0.05, **0.01; CI, confidence interval
Exp(B), shows exponential β coefficient values

be provided proper counselling and comprehensive health knowledge about obstetric complications so that they can seek proper medical care to avoid adverse pregnancy outcomes in future. The ideal mechanism is to provide health knowledge through lower level health workers. Strengthening of government health centers in terms of specialized services for gynaecological and obstetric complications at the local level is important to avoid unnecessary delay of the services and expenditures in impoverished families.

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