ORIGINAL PAPER

A Comparative Study of Septic Complications in HIV-Infected and HIV-Uninfected Women Undergoing Caesarean Section at the University Teaching Hospital, Lusaka, Zambia

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ABSTRACT

Background: There is evidence in support of the benefit of caesarean section for the prevention of mother to child transmission of HIV (PMTCT). Information on the extent of complications and maternal mortality associated with caesarean section in HIV infected women in low resource settings is lacking though some studies have reported increased risk of maternal complications associated with caesarean section in HIV infected women (particularly sepsis).

Objective: This study was designed to determine the incidence of post caesarean maternal complications, particularly those due to sepsis, at the University Teaching Hospital (UTH) and compare complications in HIV infected and HIV uninfected women.

Design and setting: A prospective cohort study documenting complications in women undergoing caesarean section at UTH in Lusaka. All consecutive patients undergoing caesarean section at UTH in September 2010 and with a known HIV status were recruited. Consenting participants were followed up for six (6) weeks after the caesarean section. All complications were documented.

Results: Fifty eight (19.4%) HIV positive and 241 (80.6%) HIV negative women were followed up. Overall, 27 (9%) women had sepsis (6 were HIV positive and 21 were HIV negative; 10.3 vs. 8.7% respectively). The unadjusted odds ratio for sepsis in HIV positive vs. HIV negative women was 1.21 (95% CI 0.40-3.15). Adjusting for potential confounders (age, emergency or elective caesarean section, type of skin preparation, use of pre-eoperative antibiotics, blood loss, duration of operation) did not significantly alter the odds ratio (OR 1.39, 95% CI 0.5-3.6).

Conclusion: Sepsis complicated 9% of caesarean sections at UTH though this complication was not independently associated with HIV status. Further studies are needed to address which factors contribute to post-caesarean complications.

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INTRODUCTION

Elective caesarean section is an effective intervention to prevent perinatal transmission of HIV.[1] However, questions remain regarding the extent of maternal morbidity and complications associated with caesarean section in HIV infected women.[2]

The indications for caesarean delivery have progressively widened and concern is expressed among health professionals and consumers about its increasing use especially with the advent of HIV/AIDS.[3] Caesarean section is a relatively safe surgical procedure though it has well known risks associated with it as well.[4] Maternal morbidity as well as mortality is increased with caesarean section regardless of HIV status.[4]

Furthermore, data suggests that caesarean section is associated with increased risk of complications in HIV positive compared to HIV negative women.[5] Little is

Key words: *HIV, caesarean section, sepsis*

known about this risk in Africa in general and Zambia in particular. There is thus a need for more information on post-caesarean section complications in settings with limited resources, where HIV infection is common and antiretroviral therapy may not be widely available.

HIV/AIDS still remains a major public health problem all over the world with about 33.4 million people infected with the virus worldwide.[6] According to the 2007 Zambia Demographic and Health Survey, 16.1% of women of reproductive age (15 -49years) are infected with HIV.[7] HIV prevalence among antenatal mothers in Lusaka is high, ranging between 15 and 30% in the different clinics.[8]

In the midst of the HIV epidemic, increasing attention has been paid to prevention of HIV transmission from mother to her child (PMTCT). Little has been paid to the adverse maternal consequences of some of these interventions especially caesarean sections. In developing countries, HIV positive pregnant women are at high risk for a number of adverse consequences, especially when HIV disease is advanced.[9] In the study by Marcollet and Goffinet, multivariate analysis which was adjusted for maternal CD4 cell count and antepartum haemorrhage (APH), the relative risk of complications was increased by 1.85 for elective caesarean compared with vaginal delivery.[10]

HIV infection influences decisions for caesarean section; as such caesarean sections have increased globally. At UTH, the institutional caesarean section rate was 18.5% in 2008[11] though the effect of this on maternal morbidity and mortality is not known. It is important to investigate the safety of caesarean sections in the setting of high HIV prevalence. This study was therefore designed to address this information gap so that the findings can be used in the provision of counselling to HIV infected women with regard to delivery plan for informed consent.

METHODS

A comparative prospective cohort study of the association between HIV status and risk of post-caesarean complications at UTH was performed. We used convenience sampling to recruit 305 consecutive consenting patients that underwent caesarean section in September 2010. All patients undergoing caesarean section during the study period were invited to join the cohort by the study staff. After consenting, data was collected using an interviewer-administered questionnaire and also medical records abstraction related to demographics, past history, antenatal care, HIV status, and laboratory data. No extra tests were ordered by the study.

Doctors performing caesarean sections provided the intra-operative data including indication for caesarean section, rank of surgeon, date of operation, antibiotic use, blood loss, and complications at operation. The women that had the caesarean section were then followed up in while they were still in hospital and after discharge, at two and six weeks post-delivery.

The main outcome measure was 'sepsis' defined as febrile illness, wound sepsis, and/or endometritis arising after the caesarean section during the six weeks follow up period. Any other adverse event attributable to the caesarean section, for example, wound dehiscence, need for blood transfusion and maternal death was also recorded.

All information collected was entered in Epi-info Software and analysed using SPSS for Windows Version 18. All tests were two-tailed and a significance level of $P<.05$ was considered statistically significant.

Unadjusted odds ratios were calculated to obtain the odds of complications in HIV positive and HIV negative women. A logistic regression model was developed using plausible variables (for sepsis) to get a best-fit model taking care to check if any of the selected variables were confounders of the main study association between HIV status and sepsis.

RESULTS

A total of 305 patients were recruited into the study. Six were excluded from the analysis because their HIV status was unknown. Of the remaining 299 patients, 58 (19.4%) were HIV positive while 241 (80.6%) were HIV negative.

The socio-demographic and antenatal characteristics of the 299 respondents are shown in Table 1 stratified by HIV status. Compared to HIV infected women, HIV uninfected women were significantly younger (mean age 26.3 vs. 30.2 years), were of significantly lower parity and had less medical conditions in pregnancy.

Table 1: Characteristics of women undergoing caesarean by HIV status

Characteristics		HIV Positive n (%)	HIV Negative n (%)	All N (%)	2-sided p value*
All		58 (19.4)	241 (80.6)	299 (100)	
Age (years)	19 or less	1 (1.7)	38 (15.8)	39 (13.0)	
	20-34	43 (74.1)	169 (70.1)	213 (71.2)	.006
	35+	14 (24.1)	34 (14.1)	47 (15.7)	
		(Mean 30.2)	(Mean 26.3)		
Marital status	Single	8 (13.8)	30 (12.4)	38 (12.7)	
	Married	49 (84.5)	211 (87.6)	260 (87.0)	0.222
	Widowed	1 (1.7)	0 (0)	1 (.3)	
Education	None	3 (5.2)	8 (3.3)	11 (3.7)	
	Primary	20 (34.5)	60 (24.9)	80 (26.8)	
	Secondary	21 (36.2)	110 (45.6)	131 (43.8)	0.382
	Tertiary	14 (24.1)	63 (26.1)	77 (25.8)	
Occupation	Unemployed	44 (75.9)	184 (76.3)	228 (76.3)	
	Formal	11 (19.0)	52 (21.6)	63 (21.1)	0.401
	Informal	3 (5.2)	5 (2.1)	8 (2.7)	
Religion	Christian	58 (100)	237 (98.3)	295 (98.7)	
	Muslim	0 (0)	4 (1.7)	4 (1.3)	1.000
Residence	High density	37 (63.8)	135 (56.0)	172 (57.5)	
	Medium density	11 (19.0)	43 (17.8)	54 (18.1)	0.316
	Low density	7 (12.1)	29 (12.0)	36 (12.0)	
	Rural	3 (5.2)	34 (14.1)	37 (12.4)	
Parity	0	6 (10.3)	85 (35.3)	91 (30.4)	
	1-4	46 (79.3)	139 (57.7)	185 (61.9)	0.001
	>5	6 (10.3)	17 (7.1)	23 (7.7)	
Gestation (weeks)	<28	0 (0)	3 (1.2)	3 (1.0)	
	28-36	9 (15.5)	44 (18.3)	53 (17.7)	
	37-42	49 (84.5)	192 (79.7)	241 (80.6)	0.900
	>42	0 (0)	2 (0.8)	2 (0.7)	
RPR status	Reactive	1 (1.7)	5 (2.1)	6 (2.0)	
	Non-reactive	56 (96.6)	229 (95.0)	285 (95.3)	.999
	indeterminate	1 (1.7)	7 (2.9)	8 (2.7)	
Medical condition in pregnancy	Diabetes Mellitus	1 (1.7)	1 (0.4)	2 (0.7)	
	Hypertensive disorder	8 (13.8)	17 (7.1)	25 (8.4)	.015
	TB	2 (3.4)	0 (0)	2 (0.7)	
	Anaemia	0 (0)	3 (1.2)	3 (1.0)	
	None	47 (81.0)	220 (91.3)	267 (89.3)	
HIV status and prenatal management	On ART > 1 year	13 (22.4)	N/A	13 (22.4)	N/A
	On ART < 1 year	1 (1.7)		1 (1.7)	
	Short course ARVs	40 (69.0)		40 (69.0)	
	None	4 (6.9)		4 (6.9)	

*Chi square (or Fisher exact test when values <5)

There were 272 (91%) emergency caesarean sections and 27 (9%) were elective (see Table 2). The indications for caesarean section (not shown) were similar in the two groups; the top three commonest indications were one or more previous caesarean (28.8%), cephalo-pelvic disproportion (22.4%) and fetal distress (10.4%). In only one woman was PMTCT the sole indication. The type of anaesthesia used, skin preparation, intraoperative findings and procedures are stratified by HIV status of the patient in table 2. More of the HIV positive women had a poorly formed lower segment (15.4% vs. 3.9%), otherwise no significant differences were seen in the two groups.

Table 2: Caesarean section procedures by HIV status

		HIV Positive n (%)	HIV Negative n (%)	All N (%)	p value*
		58 (19.4)	**241 (80.6)**	**299 (100)**	
Type of caesarean	Emergency	50 (86.2)	222 (92.1)	272 (91.0)	.159
	Elective	8 (13.8)	19 (7.9)	27 (9.0)	
Type of anaesthesia	General	57 (98.3)	229 (95.0)	286 (95.7)	.372
	Spinal/epidural	1 (1.7)	12 (5.0)	13 (4.3)	
Surgeon level	JRMO	2 (3.4)	8 (3.3)	10 (3.3)	.367
	PG1	21 (36.2)	89 (36.9)	110 (36.8)	
	PG2	7 (12.1)	55 (22.8)	62 (20.7)	
	PG3	1 (1.7)	5 (2.1)	6 (2.0)	
	PG4	21 (36.2)	67 (27.8)	88 (29.4)	
	Senior Registrar	6 (10.3)	13 (5.4)	19 (6.4)	
	Consultant	0 (0)	4 (1.7)	4 (1.3)	
Skin preparation	Savlon, iodine, spirit	1 (1.7)	9 (3.7)	10 (3.3)	.736
	Savlon with iodine/spirit	40 (69.0)	175 (72.6)	215 (89.2)	
	Savlon only	14 (24.1)	48 (19.1)	62 (25.7)	
	Spirit only	3 (5.2)	9 (3.7)	12 (5.0)	
Skin incision	Transverse	56 (96.6)	227 (94.2)	283 (94.6)	.473
	vertical	2 (3.4)	14 (5.8)	16 (5.4)	
Separate blade for deeper tissue	Yes	5 (8.6)	33 (13.7)	38 (12.7)	.298
	No	53 (91.4)	208 (86.3)	261 (87.3)	
Prophylactic antibiotics used	None	43 (74.1)	173 (71.8)	216 (72.2)	.719
	Any	15 (25.9)	68 (28.2)	83 (27.8)	
	Pre-op	11 (73.3)	46 (67.6)	57 (68.7)	
	Per-op	4 (26.7)	22 (32.4)	26 (31.3)	
Intraop findings (patient can have more than 1 finding)	Adhesions	19 (29.2)	57 (22.4)	76 (23.8)	.003
	Fibroids	5 (7.7)	11 (4.3)	16 (5.0)	
	Poorly formed lower	10 (15.4)	10 (3.9)	20 (6.3)	
	segment	2 (3.1)	16 (6.3)	18 (5.6)	
	Other***	29 (44.6)	160 (63.0)	189 (59.2)	
	None	65 (100)	254 (100)	319 (100)	
	(total)				
Blood loss (estimated)	<500	15 (25.9)	89 (36.9)	104 (34.8)	.247
	500-1000	37 (63.8)	126 (52.3)	163 (54.5)	
	>1000	6 (10.3)	26 (10.8)	32 (10.7)	
Transfused	Yes	4 (7.0)	13 (5.4))	17 (5.7)	.643
	No	54 (93.0)	228 (94.6)	282 (94.3)	
Sutures (sheath)	Nylon	3 (5.2)	15 (6.2)	18 (6.0)	.657
	Chromic catgut	49 (84.5)	191 (79.3)	240 (80.3)	
	Vicryl	6 (10.3)	35 (14.5)	41 (13.7)	
Sutures (skin)	Nylon	10 (17.2)	30 (12.4)	40 (13.4)	.459
	Chromic catgut	2 (3.4)	12 (5.0)	14 (4.7)	
	Silk	43 (74.1)	173 (71.8)	216 (72.2)	
	Vicryl	3 (5.2)	26 (10.8)	29 (9.7)	
Skin closure	Subcuticular	6 (10.3)	37 (15.4)	43 (14.4)	.329
	Interrupted	52 (89.7)	204 (84.6)	256 (85.6)	
Complications at caesarean**	Nil	52 (89.7)	214 (88.8)	266 (89.0)	.851
	Other (bleeding, extension)	6 (10.3)	27 (11.2)	33 (11.0)	
Operation duration	<30	23 (39.7)	119 (49.4)	142 (47.5)	.354
	30-44	30 (51.7)	92 (38.2)	122 (40.8)	
	45-59	3 (5.2)	19 (7.9)	22 (7.4)	
	60+	2 (3.4)	11 (4.6)	13 (4.3)	

*Chi square (or Fisher exact test when values <5)
**includes presence of meconium, vascular lower segment, retroplacental clot.
*** adhesions, extension of lower segment incision, difficulty in achieving haemostatis, bladder damage.

OUTCOME

The main outcome measure for this study was sepsis (septic wound, febrile illness, endometritis). By the sixth week after caesarean section 9.0% women had sepsis though no new cases had occurred after week two. Of the 58 HIV positive women 6 (10.3%) had sepsis compared to 21 of the 241 (8.7%) HIV negative women (Table 3). Similarly, 17 women (5.7%) needed a blood transfusion (6.9% and 5.4% HIV positive and negative women respectively). There were two maternal deaths – both in women that were HIV positive. The first was as result of complications following a ruptured uterus. The second patient had been well on antiretroviral therapy for two years and presented acutely with features of Stevens Johnson syndrome and abruption placentae. She dies soon after caesarean section was performed.

Table 3: Sepsis and blood transfusion as outcomes

	HIV Positive (58 women) n (row %) (column %)	HIV Negative (241 women) n (row %) (column %)	All (299 women) N (%) (column %)
Sepsis (feb, sep, endo) by week 1	5 (41.7) (8.6)	7 (58.3) (2.9)	12 (100) (4.0)
Sepsis (feb, sep, endo) by week 2	6 (22.2) (10.3)	21 (77.8) (8.7)	27 (100) (9.0)
Sepsis (feb, sep, endo) by wk 6 (no new cases from week 2)	6 (22.2) (10.3)	21 (77.8) (8.7)	27 (100) (9.0)
Need for blood transfusion	4 (23.5) (6.9)	13 (76.5) (5.4)	17 (100) (5.7)
Died	2	0	2

The unadjusted odds ratio for sepsis in HIV positive vs. HIV negative women was 1.21 (95% CI 0.46-3.15). The odds ratios for other variables are shown in Table 4 on the next page.

Incorporating possible confounders into a logistic regression model did not significantly alter the odds ratio for sepsis in HIV positive Vs HIV negative women – adjusted OR = 1.39 (95% CI 0.5-3.59%). P = .524. The full logistic regression model is shown in table 5.

Table 5: Odds ratio for sepsis in HIV positive vs. HIV negative women having caesarean section (n=299, only cases with no missing values used in analysis)

	Odds ratio for sepsis	95% CI	P value
No adjustment	1.21	0. 46 -3.15	.682
Adjusted*	1.39	0.5 -3.87	.524

***Adjusted for** emergency or elective caesarean; single or multiple skin preparation used; separate blade used for deeper tissues or not; use of pre-operative antibiotics; blood loss greater than 1000ml; duration of operation >45 minutes or not.

Logistic regression model

Deviance goodness of fit chi-square = 115.13 df = 174 P > 0.999
Deviance (likelihood ratio) chi-square =10.96 df = 8 P = 0.204

Parameter	Odds Ratio	95% CI	P
HIV Positive	**1.39**	**0.5 to 3.87**	**0.524**
Age	0.95	0.89 to 1.02	0.172
Emergency CS	0.91	0.19 to 4.35	0.906
Single skin prep	2.2	0.93 to 5.24	0.074
No separate blade	3.23	0.41 to 25.21	0.263
No pre-op antibiotics	2	0.7 to 5.7	0.193
Blood loss>1000ml	1.63	0.49 to 5.41	0.428
Duration >45mins	1.73	0.52 to 5.76	0.369

DISCUSSION

The objective of this study was to compare the incidence of maternal complications in HIV infected and HIV uninfected women undergoing caesarean section at the University Teaching Hospital. The results from this study indicates that sepsis post caesarean was not significantly higher in HIV positive women compared to HIV negative women.

Studies conducted in Europe and USA reported the incidence of puerperal sepsis of 0-16% in HIV positive women and 0-11% in the HIV negative group – similar to the incidence of post caesarean complications at UTH.

However, socio-demographical factors showed no association with post-operative complications. Regarding the need for transfusion after caesarean section, four (4) cases (6.9%) were among HIV positive women and 13 (5.4%) in HIV negative women. Hence, there was no significant difference between HIV positive and HIV negative women as regards the need for transfusion. HIV status was therefore not a factor associated with need for transfusion.

Table 4: Caesarean section procedures by outcome (sepsis)

		Sepsis n (%)	No sepsis n (%)	All N (%)	
		27 (9.0%)	**272 (91.0)**	**299 (100)**	**Unadjusted odds ratio (95% CI) p value**
HIV Status	Positive	6 (22.2)	52 (19.1)	58 (19.4)	**1.21 (.46-3.15) .682**
	Negative	21 (77.8)	220 (80.9)	241 (80.6)	
Type of caesarean	Emergency	25 (92.6)	247 (90.8)	272 (91.0)	1.27 (0.29-11.65) .999
	Elective	2 (7.4)	25 (9.2)	27 (9.0)	
Type of anaesthesia	General	26 (96.3)	260 (95.6)	286 (95.7)	1.2 (0.16- 53.2).999
	Spinal/epidural	1 (3.7)	12 (4.4)	13 (4.3)	
Surgeon level	JRMO+PG1	10 (37.0)	110 (40.4)	120 (40.1)	.87 (.34-2.1) .838
	PG2,3,4, SR, Cons	17 (63.0)	162 (59.6)	179 (59.9)	
Skin preparation	Savlon **OR** Spirit	10 (37.0)	81 (29.8)	91 (30.4)	1.39 (.59-3.15) .44
	Savlon + other	17 (63.0)	191 (70.2)	208 (69.6)	
Skin incision	Transverse	27 (100)	256 (94.1)	283 (94.6)	N/A
	vertical	0 (0)	16 (5.9)	16 (5.4)	
Separate blade for deeper tissue	No	26 (96.3)	235 (86.4)	261 (87.3)	4.1 (.63-172.3) .223
	Yes	1 (3.7)	37 (13.6)	38 (12.7)	
Prophylactic antibiotics used	None	22 (81.5)	194 (71.3)	216 (72.2)	1.77 (.63-6.19) 0.368
	Any	5 (18.5)	78 (28.7)	83 (27.8)	
Intraop findings (can have >1)	Adhesions, fibroids etc	10 (37.0)	100 (36.8)	110 (36.8)	1.01 (.43-2.29) >.999
	None	17 (63.0)	172 (63.2)	189 (63.2)	
Blood loss (estimated)	>1000 ml	5 (18.5)	27 (9.9)	32 (10.7)	2.06 (.65-5.68) .199
	<1000 ml	22 (21.5)	245 (90.1)	267 (89.3)	
Transfused	Yes	5 (18.5)	12 (4.4)	17 (5.7)	4.92 (1.23-16.7) .01
	No	22 (81.5)	260 (95.6)	282 (94.3)	
Skin closure	Subcuticular	4 (14.8)	39 (14.3)	43	1.04 (.25-3.28) .999
	Interrupted	23 (85.2)	233 (85.7)	256	
Complications at caesarean	bleeding, extension	4 (14.8)	29 (10.7)	33 (11.0)	1.84 (.42-6.05) .292
	Nil	23 (85.2)	243 (89.3)	266 (89.0)	
Operation duration	45+	5 (18.5)	30 (11.0)	35 (11.7)	1.83 (.58-1.51) .272
	<45	22 (81.5)	242 (90.0)	264 (88.3)	

Need limitations etc

As more women go onto ART - ???

CONCLUSION

This study demonstrates that the risk of post-caesarean sepsis is 9% but statistically not significantly different in HIV infected women compared to HIV uninfected women.

A larger study specifically powered to detect a difference in HIV positive vs. HIV negative women is needed to address the issue of post caesarean sepsis in the high HIV prevalence settings.

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REFERENCES

1. Chama CM, Morrupa YY. The Safety of Elective Caesarean Section for the Prevention of Mother to Child Transmission of HIV-1. *J. Obstet Gynecol* 2008; 2: 197 – 9.
2. Panburana P, Phaupradit W, Tantisirin O. Maternal Complications after Caesarean Section in HIV-infected Pregnant Women. Aust NZJ Obstet Gynaecol 2008; 43: 160 – 63.
3. Stephenson PA, Bakoula C, Hemminiki E. Patterns of use of Obstetrical Interventions in 12 Countries. Paediatr Perinat Epidemiol 2003; 7: 45 – 56.
4. Bottom SE, Rossen MG, Soko R. The increase in the Caesarean Birth Rate. N Eng J. Med. 2006; 306: 559.
5. Bjorklund K, Mutyaba T, Nabunya E, Mirembe F. Incidence of Post caesarean infections in Relation to HIV Status in a Setting with Limited resources. Acta Obstet Gynecol Scand. 2005 Oct; 84(10): 967 – 71.
6. Joint United Programme on HIV/AIDS (UNAIDS), World Health Organization (WHO) AIDS Epidemic Update; Geneva Switzerland. UNAIDS/WHO 2009
7. Central Statistical Office (CSO), Ministry of Health (MOH), Tropical Diseases Research Centre (TDRC), University of Zambia and Macro International Inc. 2009. *Zambia demographic and Health Survey 2007.* Calverton, Maryland, USA: CSO and Macro International, Inc.
8. Bakari JP, McKenna S, Myrick A, Mwinga K, Bhat GJ, Allen S. Rapid Voluntary Testing and Counseling for HIV: Acceptability and Feasibility in Zambia antenatal Care Clinics. Ann NY Acad Sci. 2000; 918:64 – 76.
9. McIntyre J. ARVs for Reducing the Risk of MTCT. RHL Commentary. WHO Library No. 9. 2006.
10. Marcollet A, Goffinet F. Differences in Postpartum Morbidity in Women infected with HIV after elective, Emergency Caesarean Section, or Vaginal Delivery. AMJ Obstet Gynaecol 2002; 186 (4): 784 – 9.
11. UTH Labour Ward Delivery Book. 2008. Lusaka.