Live births of HIV+ mothers. Are they different from others?

A study from Rio de Janeiro City, Brazil, 1999 – 2001.

Saraceni V, Rapparini C, Cruz M, Lauria LM, Dias M, Ratto K, Durovni B

Rio de Janeiro City Health Department - Brazil

Background

The use of antiretrovirals (ARV) for the prophylaxis of HIV vertical transmission (VT) dramatically reduces the number of new cases of HIV infection by this route. Since the introduction of AZT as in PACTG 076, as we move to more complex regimens to the mother, the studies focus on the HIV status of the exposed children, caring less to their birth conditions. Few studies examined the relation between ARV exposure and low birth weight (weight < 2,500g) or premature birth (gestational age < 37 weeks).

We've been testing women for HIV during pregnancy and following HIV+ pregnant women since 1996 in Rio de Janeiro City (RJC). In 1999, we started counseling and testing women without HIV results during labor, in order to have the opportunity to intervene with IV AZT and oral solution for the newborn. Once tests, ARV and formula are available for all pregnant women and their babies, we decided to examine the profile of live births from HIV+ mothers and compare them to a sample of the Live Born Database of RJC, from 1999 to 2001, when the surveillance system got better.

Objectives

- To evaluate HIV + mothers' socio-demographics and babies birth's conditions, comparing them to a sample of the Live Born Database of RJC;
- Once established the birth weight and the gestational age at birth of HIV exposed children, to evaluate their possible relationship with maternal age and education, fetal ARV exposure and mode of delivery (MOD);
- To evaluate the possible relationship of exposed children HIV status at six or more months with maternal age and education, low birth weight (LBW), premature birth (PB), MOD and use of ARV to prevent VT.

Methods

Study population: HIV+ women who delivered of live born babies from January 1st, 1999 to December 31st, 2001, reported to the RJC Health Department (n=1,494).
Comparison group: a 1% random sample of each year (1999, 2000, 2001), obtained from the Live Born Database of RJC, theoretically free of HIV.
Comparison of the two groups, regarding maternal age and education, MOD, gestational age at birth and birth weight, using the ?2 test for homogeneity between proportions (a=0.05). The relationships between the variables described in the objectives were performed using univariate and bivariate analysis and logistic regression, controlling for potential confounders.

Results

Table 1 presents the comparison between HIV+ and HIV- mothers, regarding the maternal age and education. The proportion of adolescent mothers is lower for HIV+ than for HIV-. However, the HIV+ women were less educated. The proportion of C-section among the HIV+, was lower for the three years, opposed to national guidelines that recommends elective C-section (ECS) as the mode of delivery for HIV+ women whose viral load is = 1,000 copies/ml. Fortunately, the number of ECS is increasing (?2 test for trend, p= .000). For the HIV exposed babies, the proportions of LBW and PM were consistently and significantly greater than for those not exposed. The t-test for equality of means resulted not significant, showing that the weight at birth's distributions were similar for both groups. The profile of pregnant HIV+ women and their babies is resumed as a group in Table 2.
The results of the univariate analysis are shown in Table 3. PM was associated ECS (RR=1.71, 95% CI 1.17-2.51). LBW was associated with PB (RR=6.74, 95% CI 5.41-8.39). HIV infection was associated with no prophylaxis (RR=9.84, 95% CI 5.71-16.97) and other MOD not ECS (RR=2.39, 95% CI 1.06-5.36). As PB contributed to LBW, the association of the latter with child HIV+ outcome was explored by stratification of the former independent variable, resulting in an adjusted RR=1.29 (95% CI 0.42-3.98). The association of ECS and PB could be distorting the relationship between the latter and child HIV+ outcome. The effect of PB on child HIV+ outcome is modified by ECS in that is much stronger on children born this way than in children born by other MOD, as shown in Table 4.

Results

We have examined the possibility of mothers less educated being associated with the occurrence of no prophylaxis. However, one of the cells had a zero value, so the analysis wasn't reliable.
In the logistic regression analysis, we use the variables that showed prior statistical significance in the models. When examining the child HIV+ outcome, the regression was performed with "enter" method to force the entry of variables that had a biologic plausibility to be in the causal pathway. All the results are shown in Table 5.

Table 1 – Comparison of proportions of the characteristics of HIV+ and HIV- mothers and their live newborns, RJC, 1999–2001.

	HIV+ (n = 460)	1999 HIV- (n = 1,148)	p-value	HIV+ (n = 491)	2000 HIV- (n = 961)	p-value	HIV+ (n = 543)	2001 HIV- (n = 900)	p-value
Maternal age									
< 20 years	13.8	19.5	.008	12.7	17.6	.008	10.8	19.9	.000
? 20 years	86.2	80.5		87.3	82.4		89.2	80.1	
Maternal education									
< 8 years	35.6	36.5	.759	60.2	40.3	.000	64.3	40.0	.000
? 8 years	64.4	63.5		39.8	59.7		35.7	60.0	
Mode of delivery									
Vaginal	50.2	51.9	.655	42.8	51.9	.002	42.7	51.5	.001
C-section	49.8	48.1		57.9	48.1		57.3	48.5	
Gestational age at birth									
< 37 weeks	11.9	3.2	.000	11.7	8.4	.021	12.0	8.1	.018
? 37 weeks	88.1	96.8		88.3	91.6		88.0	91.9	
Birth weight									
<2,500 g	17.2	9.4	.000	15.5	9.6	.000	15.9	8.1	.000
?2,500 g	82.8	90.6		84.5	90.4		84.1	91.9	

Table 2 –Profile of pregnant HIV+ women and their live newborns, RJC, 1999–2001.

Characteristics	Description
Maternal age	Range: 14 -43 y, median=26 y, % adolescents: 12.4
Maternal education	< 8 years of schooling: 53.5%
CD4+ cell count	Range: 31 -1090 cells/mm^3, median=350, SE=203.81 (n=191)
Viral load	Very small number available for analysis
Gestat . age birth	Range: 28- 42 w, median=39 w, <37 w: 11.9%
Birth weight	Range 630-4,820g, median=3,052, SE=595.5, <2,500: 16.2%
Mode of delivery	Elective cesarean section: 30.9%, Other: 69.1%
HIV VT prophylaxis	Yes: 89.7%, No: 10.3%; 3 parts of PACTG 076: 73.6%
Fetal ARV exposure	Yes: 80.5%, No: 19.5%
Children HIV status	Positive: 6.7%, Negative: 93.3%

Table 3 – Univariate analysis:RR, 95% CI and p-values. HIV+ women and their live newborns, RJC, 1999–2001.

Outcome	Independent variables	Risk ratio	95% CI	p-value
Premature birth	Fetal ARV exposure	1.41	1.00-1.99	.054
	Elective C -section	1.71	1.17-251	.005
	Maternal age < 20 y	1.00	0.63-156	.985
	Education < 8 y	0.85	0.60 -1.12	.354
Low birth weight	Fetal ARV exposure	1.15	0.83-158	.400
	Premature birth	6.74	5.41-8.39	.000
	Maternal age < 20 y	1.37	0.98-193	.072
	Education < 8 y	1.22	0.91-1.63	.185
HIV+ child	Maternal age < 20 y	0.66	0.21-2.09	.345
	Education < 8 y	1.70	0.76-3.83	.192
	Not elective C -section	2.39	1.06 -5.36	.028
	Premature birth	1.96	0.86-4.51	.113
	Low birth weight	1.69	0.75-3.74	.209
	No prophylaxis	9.84	5.71-16.97	.000

Table 4 –Association of PB & HIV+ outcome, by MOD, RJC, 1999–2001.

		HIV+ child	RR	95% CI	p-value
Premature birth		Elective C-S	7.92	1.94-32.33	.001
		Other mode	1.05	0.34 -3.31	.930
		($?^2$ test for the presence of interaction: 4.76)			

Table 5 –Logistic regression analysis, OR, CI, p-values, RJC, 1999–2001.

Outcome	Variables	OR ($?^E$)	95% CI	p-value
Premature birth	ECS	1.875	1.20-2.78	
Low birth weight	PB	17.76	11.85-26.81	
HIV+ child	No prophylaxis	15.05	4.65-48.78	.000
	Not ECS	1.73	0.70-4.27	.231
	Mat .age <20y	0.45	0.09-2.18	.323
	PB	1.46	0.40-5.32	.568
	Lbw	1.20	0.36-4.02	.770

Discussion

As demonstrated above, we have an excess of PB and LBW among HIV exposed babies. Although it can be partially explained by their lower education, when compared with the sample of the city, as a proxy of lower socio-economical status, we were able to shown an almost significant association between fetal ARV exposure and PB (p=.054). The two factors must be contributing to those outcomes, together with ECS. PB is associated LBW. Both conditions are amenable to prevention with improvement of the quality of antenatal care, including a good evaluation of gestational age, and appropriate management of ARV drugs.
Also of notice is the fact that 10% didn't receive prophylaxis, but it's going down (?2 test for trend, p= .013), In fact, 7% of pregnant women are out of antenatal care yearly in our city.
As one might have expected, ARV prophylaxis had a huge impact on HIV VT. Lack of diagnosis and, consequently, lack of administration of ARV were associated with HIV+ child outcome [OR=15.05 (95% CI 4.65-48.78), even after controlling for other variables, including ECS. This MOD has a role yet to be played in our city, coupled with other measures to reduce even further the HIV VT, here shown above 6%. The national recommendations for ARV use in pregnancy are being revised on a regular basis, and since the end of 2001 the regimen of choice to achieve a great impact on viral load is triple therapy. All will contribute to reduce HIV VT to a very lower level.

Author's e - mail: valeria@alternex.com.br