Variable uptake of recommended interventions to reduce mother-to-child transmission of HIV in Australia, 1982–2005

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ABSTRACT

Objective: To analyse the uptake of interventions known to reduce the risk of perinatal HIV transmission among Australian women with HIV infection (who knew their HIV status before delivery), and identify predictors of uptake.

Design: Retrospective analysis of perinatal HIV surveillance data in Australia.

Patients: Women reported as having HIV infection and having given birth to a child (1982–2005) were identified through three mechanisms: an informal network of clinicians (1982–1993); an active surveillance program through paediatricians (since 1993); and state health department reports of children born to women newly diagnosed with HIV (since 1995).

Main outcome measures: Uptake of interventions — avoidance of breastfeeding (after 1985), use of zidovudine during pregnancy (after 1994), and elective caesarean section (after 1999). Factors associated with uptake of these interventions were identified by univariate and multivariate analyses.

Results: 367 live births were reported in 291 women with HIV infection. Among the subgroup diagnosed with HIV infection before delivery, 4/255 (1.6%) elected to breastfeed (post 1985), 44/185 (24%) did not receive zidovudine (after 1994), and 41/118 (35%) did not have an elective caesarean section (after 1999). In multivariate analysis, there were significant differences in uptake of zidovudine and elective caesarean section according to year of birth and state in which the birth took place.

Conclusion: In Australia between 1982 and 2005, uptake of interventions to reduce mother-to-child transmission of HIV was high. There were significant differences associated with use of zidovudine and mode of delivery according to location of delivery and year of birth.

MJA 2008; 189: 151–154

By 31 December 2005, 22 361 cases of HIV infection had been diagnosed in Australia, primarily transmitted through sexual contact between men. The number of new diagnoses increased by 41% between 2000 and 2005, with an estimated 15 310 people living with HIV/AIDS.[1] About 10% of people living with HIV infection in Australia are women, and many of these are in their reproductive years. With reduced morbidity and mortality since the introduction of effective combination antiretroviral (ARV) therapies and interventions available to virtually eliminate mother-to-child transmission, HIV infection now presents far less of a barrier to parenthood for women with HIV infection in developed countries.

Three key interventions have been shown to significantly reduce mother-to-child transmission of HIV:[2]

- avoidance of breastfeeding (since 1985);[3]
- ARV therapy administered antenatally, during labour and to the newborn child (since 1994);[4] and
- elective caesarean section (since 1999).[5,6]

The patterns of perinatal exposure to HIV in Australia up until 1999 and use of interventions for reducing mother-to-child transmission of HIV have previously been reported.[7,8] In this study, we aimed to determine the uptake of interventions to reduce mother-to-child transmission of HIV in Australia, with an additional 6 years of observation, and to identify predictors of uptake.

METHODS

National surveillance of perinatal exposure to HIV has been undertaken through three mechanisms: an informal network of clinicians who coordinated case notifications in the early years (1982–1993); an active surveillance program through paediatricians since 1993 (Australian Paediatric Surveillance Unit [APSU]); and, since July 1995, state and territory health department reports of children born to women newly diagnosed with HIV infection.

The study population comprised all women diagnosed with HIV infection between 1982 and 31 December 2005 and reported through one or more of these mechanisms to have had a live birth.

Breastfeeding was defined as any breastfeeding regardless of duration. Zidovudine use was defined as use at any time during pregnancy or delivery. Caesarean section was defined as elective if it was initiated before the onset of labour.

Univariate and multivariate analyses, restricted to women whose HIV diagnosis occurred before delivery, were used to investigate factors that might be associated with avoidance of breastfeeding since 1985, use of zidovudine during pregnancy since 1994, and elective caesarean section since 1999. Both univariate and multivariate analysis was performed using a clustered logistic regression model as women could be included in the study more than once if they had more than one child. Variables that were insignificant and were not confounders were removed from the model. Statistical significance was set at $P < 0.05$.

Data were analysed using Stata, version 9 (StataCorp, College Station, Tex, USA).

RESULTS

Based on reports received to 31 December 2005, 367 babies were born to 291 mothers with HIV infection in Australia. During this period, 80 mothers were diagnosed with AIDS and 50 mothers died. The proportion of births for which the maternal diagnosis of HIV infection was made antenatally increased steadily over the study period, reaching 100% by 2005 (Box 1).

Just over half the women in the study population were born in Australia (160; 55%) and, of these, 19 (12%) identified themselves as Aboriginal or Torres Strait Islander. The region of birth for other women was Asia/Pacific (57; 20%), Africa (44; 15%), Europe (14; 5%) and the Americas (5; 2%), with 11 (4%) not reported. A total of 66 women (23%) were born in countries considered to have high HIV prevalence (> 1% of the adult population).

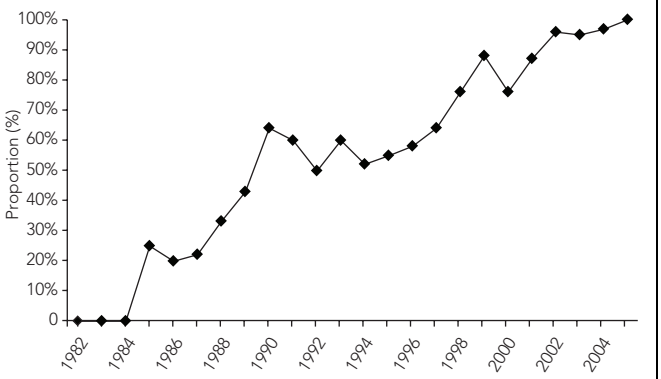
Overall, 255 women in the study population (88%) were diagnosed with HIV before the birth of at least one of their children, and further analysis is based on this group. Avoidance of breastfeeding in this population was at a high level, use of zidovudine during pregnancy increased after 1994, and the proportion of women undergoing elective caesarean section increased after 1999 (Box 2).

Of 185 women aware of their HIV status and delivering after 1994, 24% did not receive zidovudine during pregnancy or delivery. Of these women, almost half received other regimens that did not contain zidovudine (19/44; 43%, including 13 who received three ARVs). Of 118 women aware of their HIV status and delivering after 1999, 35% did not have an elective caesarean delivery. Four women aware of their HIV status and delivering after 1985 (1.6%) elected to breastfeed. Fifty-three women aware of their HIV status and delivering after 1999 (40%) utilised all three interventions (avoidance of breastfeeding, use of zidovudine and elective caesarean section).

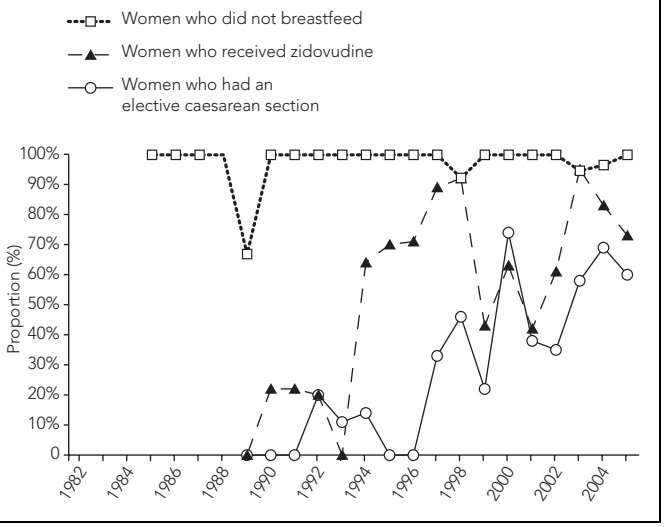
In univariate analyses, the year of birth of the child (after 2001) and year of HIV diagnosis in the mother (after 1997) were significantly associated with increased likelihood of use of zidovudine ($P<0.05$) (Box 3). Use of zidovudine was less likely if the delivery took place in New South Wales and more likely if it took place in Queensland. Only NSW (adjusted odds ratio [AOR], 0.38; 95% CI, 0.17–0.89; $P=0.02$) and the year the child was born (AOR, 3.3; 95% CI, 1.3–8.3; $P=0.01$) remained significant in the multivariate model.

For elective caesarean section, year of birth of the child (after 2002) and being non-Indigenous were significantly associated with increased likelihood of uptake, and women were less likely to have an elective caesarean section if delivering in Western Australia (Box 4). The year of birth (AOR, 3.4; 95% CI, 1.1–10.6; $P=0.04$) and the location of delivery (AOR, 0.03; 95% CI, 0.01–0.14; $P<0.001$) remained significant in the multivariate model.

1 Year of child's birth and proportion of mothers whose HIV diagnosis was made before delivery



2 Uptake of interventions by women aware of their HIV status before delivery



DISCUSSION

The key finding of this study is that the uptake of interventions by women in Australia to reduce mother-to-child transmission of HIV has increased in recent years. Nearly all women elected for alternatives to breastfeeding and most used some ARV therapy. Only the choice of caesarean delivery seems to have been rejected by a substantial proportion of patients in this study.

The data for efficacy and safety of zidovudine during pregnancy have been available since 1994. ARVs reduce mother-to-child transmission of HIV even in women with an HIV viral load < 1000 copies/mL.[9] Current United States guidelines[10] recommend that women who have never received ARVs should receive zidovudine after the first trimester, regardless of HIV viral load, and that women already on a regimen not including zidovudine should commence it after the first trimester unless clinically contraindicated. Regardless of the antepartum regimen, intravenous zidovudine should be administered during the intrapartum period and to the newborn. In contrast, British guidelines do not recommend intrapartum intravenous zidovudine in women receiving at least three ARVs whose HIV viral load is controlled at < 50 copies/mL.[11]

In this Australian population, 43% of women who did not take zidovudine received other ARVs, but not all these women received at least three ARVs. Information regarding HIV viral load at the time of delivery was not routinely collected for women in the study. Possible explanations for inconsistent use of zidovudine include contraindications to zidovudine, such as concurrent use of stavudine, changing understanding of the recommendations by clinicians over time, or patient refusal.

Several studies performed before the widespread use of ARVs demonstrated a clear benefit from elective caesarean section.[5,6] However, the extent of this benefit in women taking ARVs with an HIV viral load below 50 copies/mL is not clear, and this uncertainty is reflected in current guidelines.[10,11] In Australia, there are no national guidelines regarding the preferred mode of delivery in pregnant women with HIV.

Many of the findings reported in this study are consistent with reports from other industrialised countries. The US has also reported that nearly 79% of women received ARVs during pregnancy in areas conducting enhanced surveillance during 1999–2001,[12] and that elective caesarean section rates increased (up to 44%) after 1998.[13] In the United Kingdom, caesarean section rates of 53% and ARV use of 69% have been reported.[14]

A limitation of our study is the absence of detailed information on specific drugs used and the mother's viral load at the time of delivery. Another limitation is that between 1982 and 1993 surveillance relied on an informal network of clinicians, raising the

3 Factors associated with use of zidovudine by the mother

Variable	Zidovudine given,* no.	Unadjusted OR (95% CI)	*P*
Year child born†			
⩽ 2001	74/108	1	
> 2001	67/77	3.1 (1.3–7.5)	0.01
Year mother born†			
⩽ 1971	75/97	1	
> 1971	64/86	0.85 (0.4–1.8)	0.7
Year mother diagnosed with HIV†			
⩽ 1997	70/102	1	
> 1997	71/83	2.7 (1.2–6.1)	0.02
Age of mother at delivery† (years)			
⩽ 29	68/90	1	
> 29	71/93	1.0 (0.5–2.2)	0.91
Born in Australia			
No	65/87	1	
Yes	73/95	1.1 (0.52–2.4)	0.8
Indigenous			
Yes	10/12	1	
No	130/172	0.6 (0.1–3.1)	0.6
Maternal mode of exposure			
High prevalence country			
Yes	39/50	1	
No	99/132	0.9 (0.35–2.1)	0.7
Heterosexual contact			
Yes	86/116	1	
No	52/66	1.3 (0.57–2.9)	0.53
Injecting drug use			
Yes	15/21	1	
No	123/161	1.3 (0.45–3.7)	0.6
Maternal CD4 count at delivery, cells/μL			
< 200	8/13	1	
201–500	41/53	2.1 (0.5–8.5)	0.3
> 500	59/69	3.7 (0.9–15)	0.1
Maternal CD4 count at diagnosis, cells/μL			
< 200	16/20	1	
201–500	44/56	0.9 (0.2–3.6)	0.9
> 500	48/61	0.9 (0.2–3.4)	0.9
Location of delivery			
NSW reference group‡	80/90	1	
NSW	61/90	0.4 (0.18–0.87)	0.02
Qld reference group§	111/152	1	
Qld	30/33	3.7 (1.05–13.03)	0.04

OR = odds ratio. * Antepartum or intrapartum. † Continuous variables were transformed into categories based on quartiles. ‡ States grouped together for NSW univariate analysis: ACT, NT, Qld, SA, Tas, Vic and WA. § States grouped together for Qld univariate analysis: ACT, NSW, NT, SA, Tas, Vic and WA. ◆

4 Factors associated with choice of elective caesarean section by the mother

Variable	Elective caesarean section, no.	Unadjusted OR (95% CI)	*P*
Year child born*			
⩽ 2002	37/69	1	
> 2002	40/49	3.8 (1.4–10.3)	0.007
Year mother born*			
⩽ 1972	43/64	1	
> 1972	34/54	0.83 (0.35–1.95)	0.67
Year mother diagnosed with HIV*			
⩽ 1999	45/69	1	
> 1999	32/49	1.0 (0.42–2.4)	0.99
Age of mother at delivery* (years)			
⩽ 29	38/60	1	
> 29	39/58	1.19 (0.51–2.78)	0.69
Born in Australia			
No	41/56	1	
Yes	36/61	0.53 (0.24–1.15)	0.11
Indigenous			
Yes	3/11	1	
No	74/107	5.9 (1.4–25.6)	0.02
Maternal mode of exposure			
High prevalence country			
Yes	22/30	1	
No	55/88	0.61 (0.2–1.8)	0.4
Heterosexual contact			
Yes	50/77	1	
No	31/41	1.7 (0.6–4.6)	0.32
Injecting drug use			
Yes	5/11	1	
No	72/107	2.5(0.59–10.35)	0.2
Maternal CD4 count at delivery, cells/μL			
< 200	8/9	1	
201–500	23/30	0.41 (0.04–3.9)	0.44
> 500	31/44	0.29 (0.03–2.8)	0.29
Maternal CD4 count at diagnosis, cells/μL			
< 200	9/13	1	
201–500	22/33	0.89 (0.21–3.8)	0.87
> 500	21/41	0.47 (0.12–1.8)	0.27
Location of delivery			
WA reference group†	74/95	1	
WA	2/23	0.03 (0.01–0.12)	< 0.001

OR = odds ratio. * Continuous variables were transformed into categories based on quartiles. † States grouped together for WA univariate analysis: NSW, VIC, QLD, SA, TAS, NT and ACT. ◆

possibility of missed cases. Coverage and completeness of maternal data may be improved by expanding the reporting network to include doctors involved in the mother's HIV care, and obstetricians providing antenatal care.[15,16] Nevertheless, APSU data are the most comprehensive statistics available in Australia on women who are infected with HIV and having children.

The high uptake of preventive interventions in women known to have HIV infection who are having children in Australia is encouraging, but no cause for complacency. Some geographical variation in uptake of certain interventions highlights the need for national guidelines to be developed and implemented. More importantly, the unknown number of women with HIV infection who are giving birth undiagnosed emphasises the need to ensure that all women have access to HIV testing and the potential benefits for their health and the health of their babies.

ACKNOWLEDGEMENTS

The activities of the APSU are supported by the Australian Government Department of Health and Ageing (National Health and Medical Research Council [NHMRC] Enabling Grant No. 402784 and NHMRC Practitioner Fellowship No. 457084 [Elizabeth Elliott]); Discipline of Paediatrics and Child Health, University of Sydney; and the Royal Australasian College of Physicians.

The National Centre in HIV Epidemiology and Clinical Research (NCHECR) is funded by the Australian Government Department of Health and Ageing, and is affiliated with the Faculty of Medicine, University of New South Wales. The NCHECR Surveillance Program is a collaborating unit of the Australian Institute of Health and Welfare. Its work is overseen by the Ministerial Advisory Committee on AIDS, Sexual Health and Hepatitis.

Michelle Giles is an NHMRC Postgraduate Fellow, Sharon Lewin is an NHMRC Practitioner Fellow, and Margaret Hellard is an NHMRC Career Development Fellow and Senior VicHealth Fellow.

COMPETING INTERESTS

Sharon Lewin has received funding to attend meetings by Gilead, Pfizer, Roche and Boehringer. She received educational grants from Roche and has sat on advisory boards for Roche and Pfizer.

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(Received 27 Aug 2007, accepted 2 Mar 2008) ❑