Uptake and factors that affect enrolment into the prevention of mother-to-child transmission of human immunodeficiency virus programme in rural Limpopo Province

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Abstract

Background: Before 2006, the uptake into the prevention of mother-to-child transmission (PMTCT) for HIV programme was low in South Africa. We determined PMTCT programme uptake, and identified factors that affected enrolment into the PMTCT programme in the rural Limpopo province.

Method: This cross-sectional study, conducted from 21 July to 20 August 2008, involved 200 consecutive women who met the inclusion criteria in the immediate postpartum period. An interviewer-administered questionnaire was used to obtain information on participants' knowledge and experience of, satisfaction with, and motivation for, enrolling in the PMTCT programme. Main outcome measures included voluntary counselling and testing (VCT) and PMTCT programme uptake rates, and factors reported to influence enrolment into the programme.

Results: Of the 200 invited women, 169 (84.5%) responded. The mean age of participants was 25 years ± standard deviation. The human immunodeficiency virus prevalence rate was 23.6%. VCT and PMTCT programme uptakes were 96.9% and 90.9% respectively. Participants reported being aware of (95.2%) and satisfied with (81.6-97.4%) various aspects of the PMTCT programme.The safety of their babies was reported by most participants to be their motivation for enrolment (71.1%). Participants in the age-group 20-29 years were more likely than others to enrol in the PMTCT programme (p-value = 0.01).

Conclusion: VCT and PMTCT programme uptakes were high and influenced by good knowledge, satisfaction with the PMTCT programme and participants' concern for the safety of their babies.

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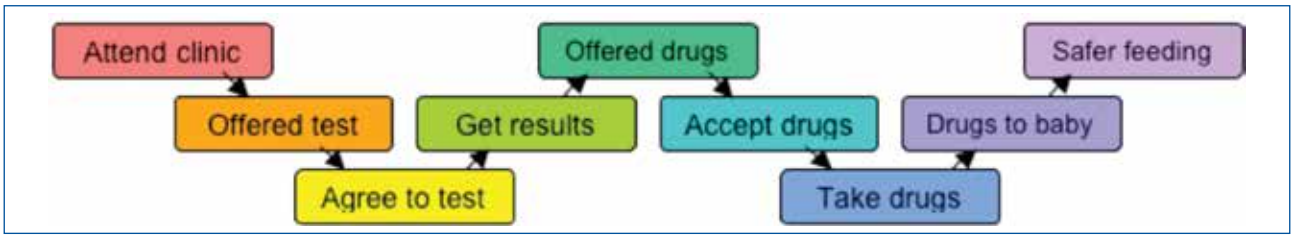
Introduction

The effectiveness of the prevention of mother-to-child transmission (PMTCT) programme in reducing the proportion of babies born to human immunodeficiency virus (HIV)-positive women has been confirmed in many studies across the globe and has offered relief in many countries which have been ravaged by HIV/acquired immune deficiency syndrome.[1-4] It was also hoped that providing a simple PMTCT programme (Figure 1) and free antiretroviral (ARV) therapy to HIV-infected mothers and newborn babies would increase utilisation of this service. However, while more than 2-million HIV-infected women give birth annually worldwide, as at 2005 only 9% of them had received PMTCT intervention,[1] confirming findings of studies from both developed and developing countries that PMTCT services are under-utilised.[2-5]

Mother-to-child transmission (MTCT) occurs when HIV is passed from an infected mother to her unborn baby during pregnancy, birth or breastfeeding. Scientific interventions to prevent MTCT inform PMTCT programmes in this regard. The primary prevention of infection among women of reproductive age and of unwanted pregnancies among those who are already infected, PMTCT ARV intervention and the provision of support for such families form the four-prong approach adopted by the World Health Organization.[7]

In South Africa, HIV prevalence among pregnant women appears to have stabilised in the last five years and was estimated to be 29.5% in 2011. The Limpopo province demonstrated a steady increase from 21.4% in 2009, to 22.1% in 2011.[8] More than 95% of women who are in need of PMTCT services were judged to be covered in 2011.[8] Without the PMTCT programme, the risk of MTCT of HIV in South Africa is deemed to be between 19% and 36%, depending on whether the child is breastfed or not.[7] However, these rates can be reduced to less than 4% if the PMTCT programme is well implemented.[9,10] Globally, the current agenda for PMTCT is elimination of MTCT.[1]



Source: Avert

Figure1: Prevention-of-mother-to-child transmission flow chart[6]

In order to understand and address low uptake of PMTCT programme, it was important to identify factors that influence pregnant women who accept VCT and enrol in the PMTCT programme. The current research targeted postpartum women, given that these women would have already had an opportunity to undergo VCT and enrol in the PMTCT programme during their pregnancies. Most available data on factors that affected PMTCT programme uptake at the time that the current study was commissioned were from the antenatal period and would have excluded uptake in the peripartum period. This article reports on the findings of the study and discusses the clinical, public health and policy implications.

Method

Design and study setting

This cross-sectional descriptive study was conducted in the maternity ward of a provincial hospital in the rural Limpopo province. This maternity ward receives high-risk patients and complicated deliveries from approximately 12 feeder clinics and surrounding district hospitals. Between 250 and 300 deliveries were conducted in this maternity centre every month during the study period. In the 12 months that preceded the study, antenatal HIV prevalence in this hospital averaged 28.5%.

Professional nurses and advanced midwives who had been trained on VCT and PMTCT programme, offer and provide VCT and PMTCT programme in this hospital. Trained lay counsellors are utilised in the clinics for voluntary counselling, while professional nurses conduct blood tests on the patients. In both the hospital and the clinics, a rapid HIV test algorithm is used, wherein the first test results are confirmed with ACON HIV 1/2/0® (Abon Biopharm, Hangzhou, China). In the case of a discordant test result, the enzyme-linked immunosorbent assay (ELISA) test is used for confirmation.

Consecutive postnatal women who met the inclusion criteria were recruited to participate in the study until the required sample size was met. All postpartum women (booked and unbooked), who delivered in the maternity ward were recruited into the study. Criteria for exclusion were delivery of a stillbirth or early neonatal deaths, an inability to speak English, Sotho or *Xitsonga*, serious obstetric complications, e.g. eclampsia, and psychiatric patients who were either depressed or mentally incompetent. Informed consent was obtained after adequate information had been given to the participants using a standard participants' information sheet printed in English, Sotho and *Xitsonga*. Those who consented were interviewed. The forms of those who declined were kept blank and marked as "refusal".

Measurement tool and data collection

An interviewer-administered questionnaire, designed in English, and translated into the two local languages, Sotho and *Xitsonga*, was used for data collection. This questionnaire was developed by the researcher and piloted in another hospital four months before the main study. It collected information on participants' demographical information, their awareness of the existence of the VCT and PMTCT programmes, knowledge of, and satisfaction with aspects of it, and factors that influenced participants' enrolment therein. The validity of this questionnaire was enhanced by being translated back into the English language by two different sets of translators (a doctor and a professional nurse, both of whom were native speakers of the local languages) for congruency. A staff nurse who was trained on the study procedure served as a research translator and assisted the researcher during the interview when participants could not speak English.

Each participant was asked to confirm her preferred language and was given a copy of the introductory format which presented the researcher and the nurse translator, the purpose of the study, and formally invited her to voluntarily participate. Participants who agreed were taken into a private room in the postnatal ward where written informed consent was obtained. Those who declined were reassured of their rights to do so and their forms were kept blank and marked "refusal". The researcher administered the English-version questionnaire to participants who could communicate in that language, while the nurse translator assisted with the Sotho or *Xitsonga* versions, where necessary. One participant was assessed as needing further psycho-social counselling during the interview and was referred to a psychologist.

Data entry and analysis

Data were entered onto and analysed using the Epi Info™ software (version 3.4.1, 2007). Apart from descriptive statistics, Student's t-test and chi-square statistics were used to test associations between the demographic variables and uptake of VCT and enrolment into the PMTCT programme. Outcome measures included the HIV prevalence rate, the VCT and PMTCT programme uptake rate, the proportion of participants who were aware of, and

satisfied with, aspects of the programme, and the reported factors that influenced enrolment into the programme. Associations with a p-value < 0.05 were considered to be statistically significant.

Ethical considerations

Ethics clearance was obtained from the Human Research Ethics Committee (Medical) of the University of Witwatersrand (clearance number M060726) and the Ethics Clearance Committee of the University of Limpopo on behalf of the Limpopo Provincial Government (clearance number 012/2008). Written consent was obtained from women who agreed to participate in the study. The interviews were kept confidential. The data were coded and were only accessible to the research team.

Results

Of the 200 postpartum women who were invited to participate in the study, 169 agreed; a response rate of 84.5%.

The majority of the 169 participants were between 20 and 29 years of age (50.9%), single (63.9%), had a secondary school education (84%) and a household income less than R2 500 per month (59.8%). Other demographic characteristics of the study participants are as presented in Table I.

Of the 169 participants who agreed to participate, only 161 (95.3%) were aware of the PMTCT programme. Six of these 161 participants, whose data on PMTCT were captured, did not undergo VCT. Four (66.7%) were afraid to discover their HIV status and of social stigma. One (16.7%) did not believe that the HIV infection existed and one (16.7%) was unaware of how to go about ascertaining her status. None of these women had approached any health worker for assistance on VCT and PMTCT programme. Only 155 (of the 161) tested for HIV. This translates to a VCT uptake of 96.3%. The PMTCT results are shown in Figure 2.

Table I: Participants' demographic characteristics

Characteristics	n (%)
Age (years)*	
< 20	33 (19.5)
20-29	86 (50.9)
30-39	45 (26.6)
≥ 40	5 (2.9)
Attended antenatal care	
Yes	165 (97.6)
No	4 (2.4)
Marital status	
Single	108 (63.9)
Married	61 (36.1)
Cohabiting with a partner	
Yes	90 (53.3)
No	79 (46.7)
Number of babies before this pregnancy	
None	83 (49.1)
1-2	68 (40.2)
> 2	18 (10.7)
Miscarriage	
Yes	21 (12.4)
No	148 (87.6)
Level of education	
None	3 (1.7)
Primary	15 (8.9)
Secondary	142 (84)
Tertiary	9 (5.3)
Household income	
None	35 (20.7)
Less than R2 500.00	101 (59.8)
R2 500.00 - R5 000.00	23 (13.6)
More than R5 000.00	10 (5.9)

*: mean 25 years, ± 6.7 (standard deviation)

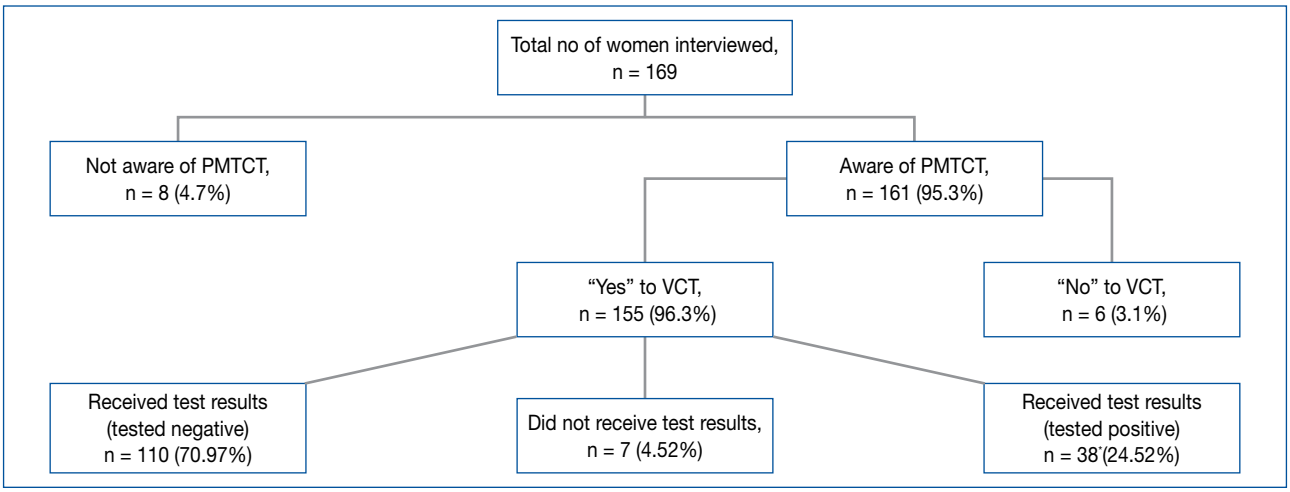


Figure 2: Prevention of mother-to-child transmission results
*: All identified human immunodeficiency virus-positive women received intervention according to national prevention of mother-to-child transmission protocol
PMTCT: prevention of mother-to-child transmission, VCT: voluntary counselling and testing

Table II: Participants' knowledge of the prevention of mother-to-child transmission programme

Awareness of the PMTCT programme	n (%)
Yes	161 (95.2)
No	8 (4.7)
Sources of knowledge	
Healthworker only	151 (93.7)
Healthworker and print and electronic media (television, radio and newspapers)	96 (59.6)
Healthworker, school and peer educators	16 (9.9)
Partner or friend	2 (1.2)
What do you know about the programme?	
VCT for pregnant women	161 (95.3%)
Enrolment of HIV-positive pregnant mothers	148 (87.6%)
Medication for mother and child	153 (90.5%)
Timing of ARV medication	86 (50.9)
HIV testing of the child at a certain age	127 (75.2)
Follow-up of the mother and child	137 (81.1)

ARV: antiretroviral, HIV: human immunodeficiency virus, PMTCT: prevention of mother-to-child transmission, VCT: voluntary counselling and testing

Of the 155 who tested for HIV, 38 (24.5 %) tested positive and enrolled in PMTCT, 110 (70.9%) tested negative, while seven (4.5%) participants did not obtain their test results. Of the seven participants who did not receive their results, one participant reported testing HIV-positive, but did not enroll in the PMTCT programme. Therefore, the overall positivity rate was 39/155 (25.2 %), with 38 women (24.5%) enrolled. PMTCT programme uptake was 97.4% (38 of 39) of the eligible HIV-positive participants.

As reported above, 161 of 169 participants were aware of the PMTCT programme. Of these, 93.7% (151) acquired their knowledge from healthcare workers, while 63.6% (102) obtained additional information from the mass media. More than 70% of participants reported that they knew the contents of the programme and 61.7% had discussed PMTCT with friends or relatives. The least known aspect of the PMTCT programme was the timing of medication. Further details about participants' knowledge are shown in Table II.

Of the 38 participants who tested positive and were enrolled in the PMTCT programme, the majority reported satisfaction with the hospital staff (89.5%), organisation of the programme (97.4%), and drug supply (81.6%). Only five (13.2%) of those enrolled reported drug side-effects as a negative experience of their enrolment. The majority (71.1%) reported that the safety of their unborn babies was the motivating factor for enrolling in the programme. Participants' experience of, and factors that affected participants' enrolment in the PMTCT programme, are summarised in Table III.

The statistical association between participants' demographic variables and VCT and PMTCT programme uptakes (Table IV) was tested for. Only age was significantly associated with VCT uptake and enrolment in PMTCT programme. Compared to other age groups, women in the age group 20-29 years were more likely to accept VCT and enroll for PMTCT (χ^2=11.0654, p-value = 0.0114).

Table III: Participants' experiences of and motivation to enrol in the prevention of mother-to-child transmission programme

Questions	n (%)
Were you put on the PMTCT programme in this pregnancy?	
Yes	38 (22.5)
No	124 (73.4)
Unknown	7 (4.1)
Satisfaction with aspects of the programme	
Hospital staff	
Yes	34 (89.5)
No	4(10.5)
Organisation of the programme	
Yes	37 (97.4)
No	1 (2.6)
Drug supply	
Yes	31 (81.6)
No	7 (18.4)
Experience of side-effects	
Yes	5 (13.2)
No	33 (86.8)
What motivated you to enroll in the programme?	
Safety of the baby	27 (71.1)
Partner	1 (2.6)
Self	2 (5.3)
Uncertainty about everything	7 (18.4)
Need treatment	1 (2.6)

PMTCT: prevention of mother-to-child transmission

Table IV: Relationships between selected socio-demographic variables and enrolment in the prevention of mother-to-child transmission programme

Demographic variable	HIV uninfected n (%)	HIV infected n (%)	X^2	p-value
Age group (years)				
< 20	30 (24.2)	1 (2.6}		
20-29	56 (45.1)	26 (68.4)	11.0654	0.0114
30-39	34 (27.4)	10 (26.3)		
≥ 40	4 (3.2)	1 (2.6)		
Marital status				
Single	82 (66.1)	22 (57.9)		
Married	42 (33.9)	16 (42.1)	1.1669	0.5580
Live with a partner				
Yes	61 (49.2)	25 (65.8)	2.8651	0.4457
No	63 (50.8)	13 (34.2)		

HIV: human immunodeficiency virus

Discussion

This study found a high uptake of VCT (96.3%) and PMTCT programme (97.4%) among study participants in this rural setting. These results indicate that pregnant women are

receptive to VCT and PMTCT programme and it is possible to achieve high uptake rates, even in a rural setting. These findings align closely with the report that more than 95% of pregnant women tested for HIV in 2009, and that 88% of those who tested HIV-positive received prophylactic ARV in the same year in South Africa.

Given the efficacy of the ARV regimen in HIV-infection control, and especially where adherence to treatment is good, high VCT and PMTCT programme uptakes can translate into a significant reduction in the burden of HIV infections in the paediatric population. This benefit is now a reality in South Africa, where a MTCT rate of less than 4% has recently been achieved.[10] A secondary, but important, benefit of this high uptake, is that VCT and PMTCT programme have the potential to serve as a gateway for HIV-infected women into the comprehensive highly active antiretroviral treatment (HAART) programme. The high uptake of VCT and PMTCT programme should be maximised to ensure that HIV-positive pregnant women, whose CD4 count and clinical staging qualify them for HAART, are started on lifelong HAART.

The HIV prevalence rate of 25.2% found among participants in this study compares well with the reported national prevalence rate of 29.5% among pregnant women in 2011.[7] However, this rate is very high and brings to bear the need to intensify HIV primary prevention strategies among women of childbearing age, as advocated in the four-prong approach by the WHO.[8] This should be the ideal focus, but mothers who are already infected should be identified through Provider-initiated Counselling and Testing (PICT), and offered ART as a form of secondary prevention. This is crucial because although their infants could be saved with antiretroviral medication, their long-term survival is closely linked to the mother being alive and healthy.

In contrast to the findings of a study conducted in Vietnam,[11] where women were unaware that medication could prevent MTCT, the high level of awareness and sound knowledge of the processes and expected outcomes of the PMTCT programme could explain why participants in this study accepted VCT, and why those who tested positive enrolled in the PMTCT programme. The uptake of VCT is regarded as the entry point into the PMTCT programme and factors which influence the uptake of VCT also directly encourage enrolment into the PMTCT programme. This relationship has been shown in most sub-Saharan Africa countries.[12-15] However, no such relationship was found in Vietnam where a VCT uptake of 85% was associated with a PMTCT programme uptake of 20%. The low PMTCT programme uptake in Vietnam could be explained by the absence of knowledge and health education, as well as high-quality counselling. It has been shown that client-counsellor dynamics during pre-test counselling are pivotal in determining uptake and participation in PMTCT programmes, and that the counsellor profile strongly influences the nature of these interactions.[14] In the current study, the positive experience reported by participants and their satisfaction with most aspects of the programme may be a reflection of this high-quality counselling and could account for the high PMTCT uptake. Therefore, counselling on PMTCT should address the fears and needs of HIV-positive pregnant women. In addition, it should emphasise the support that is available to them and their unborn babies.

Previous studies have reported that factors associated with having an HIV test, included being interviewed at an urban site and having a high PMTCT knowledge score.[16] The findings of the current study suggest that high VCT and PMTCT programme uptakes are not an urban-only phenomenon, but can be achieved in other settings by assuring good knowledge of HIV among patients with high-quality health education. Government's awareness campaign strategies appear to have been successful in rural areas and should be sustained. Capacitating all categories of health workers to effectively dispense information, as well as the use of mass media, are a successful means of ensuring the sustainability of these gains.

Painter et al (2005)[17] presented the reasons why women did not participate in a PMTCT programme in Abidjan. Among the reasons cited, most participants reported difficulties with clinical staff or procedures, while others did not believe the test results. Contrary to these findings, in the current study, the vast majority reported being satisfied with clinical staff attitudes. Healthcare workers, especially nurses in the antenatal clinics, contributed the most to the awareness and high level of knowledge among participants in the current research setting. In addition to staff attitudes, patient flow from one service point to the other was explored. The vast majority of participants (97.4%) reported being happy with the clinic's organisation. Satisfaction with aspects of the PMTCT programme might have also contributed to the high VCT and PMTCT programme uptake in the current study. Providers are key to the achievement of PMTCT programme uptake and outcomes. This extends to making mothers aware of PMTCT programme and its benefits, and maintaining relationships with patients that facilitate longitudinal compliance with PMTCT protocols.

ARV drugs are not always freely available in developing countries. This may account for the low PMTCT programme uptake rates that have been reported in many countries. However, the availability of ARV drugs is nearly 100% in South African public hospitals and primary care facilities.[7] This partly explains the high enrolment into the PMTCT programme. Therefore, it would appear that governments in sub-Saharan Africa have adequately addressed HIV problems and are responding appropriately by providing the necessary available resources.

The majority of participants (86.8%) who enrolled in the PMTCT programme did not report experiencing any major side-effects from the ARVs. Side-effects are always a major setback with regard to patient adherence. They caused major concern for the government of South Africa, who prevaricated on ARV implementation with regard to PMTCT and HIV treatment, until the Constitutional Court ruled against the government's position in 2002.[18] Years after this concern was raised by the government, studies[9,10] (including the current study) have shown that ARVs remain largely tolerable. This holds good prospects for the PMTCT

programme in being able to reduce the paediatric burden of HIV infection.

Significant association was found for VCT uptake and maternal age group, 20-29 years. Mothers in this age group were more likely to accept VCT and enrol for PMTCT programme than those in the other age groups (p-value = 0.0114). This age group represented the modal age group in this study, and pregnant women in this age group were more likely to be newly married and to have high hopes for the future. This explanation is a proposition and the extent to which it is true needs to be ascertained by future studies. Adolescents are a high risk group for HIV transmission[19] and MTCT risk is very high regarding incidents of HIV infection in pregnancy.[19] It was notable in this study that the adolescent age group did not have an association with PMTCT programme uptake. Adolescent reproductive health needs should be prioritised in PMTCT approaches to ensure the success of the elimination of MTCT agenda.

Most studies on PMTCT programme uptake have been conducted during the antenatal period and have tended to equate VCT uptake with PMTCT uptake.[4,11,16,17] This is not always so. Testing positive and being offered ARV do not equate to ingestion of the ARVs as shown in a Zambian study which found that one third of patients who were given nevirapine never took it.[15] In the same manner, in the current study, it was assumed that PMTCT programme uptake could be more accurately estimated in the postnatal period, since this approach would not exclude the peripartum period (Figure 2). This assumption was subject to the threat of reporting bias and may have led to over-reporting of PMTCT programme uptake, since findings were based on information reported by participants, and not on physical verification of ARV ingestion.

The methods in the current study involved the use of an interpreter and might have introduced information bias, especially because confidential and sensitive information, such as participants' HIV status, is better divulged on a one-on-one basis, than in the presence of a third party. In addition, attempts to give socially desirable responses could have influenced some of the positive remarks made by participants with regard to their satisfaction with aspects of the programme. The exclusion of patients with complications meant that the sample population was not representative of the general pregnant women population, but skewed towards noncomplicated cases. However, these noncomplicated cases represent typical patients who are cared for in primary care. Therefore, these findings are useful in the primary health care setting.

Conclusion and recommendations

This study demonstrates that VCT and PMTCT programme uptakes were very high in this rural, and less resourced, maternity setting. Participants' concerns for the safety of their unborn children, their knowledge and awareness of PMTCT, and their satisfaction with aspects of the PMTCT programme, were factors that positively influenced enrolment into the latter. Since high knowledge and awareness influence PMTCT programme enrolment, training of more lay counsellors could be effective in order to sustain high VCT and PMTCT programme uptakes.

When mothers are well educated on the benefits that a PMTCT programme has on their offspring, they rarely refuse it. This understanding could be integrated into the pre-service training of healthcare workers and continuous in-service refresher training for all health officers, especially in high-prevalent settings, such as South Africa.

Conflict of interest

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this paper.

References

1. Report on the global AIDS epidemic. Joint United Nations Programme on HIV/AIDS, World Health Organization; 2012.
2. Elizabeth AP, Piwoz EG. Prevention of mother-to-child transmission of HIV in Asia: practical guidance for programs. Washington, DC: The Linkage Project, 2002; p. 6.
3. Salojee H, Violari A. HIV infection in children: clinical review. BMJ. 2001,323(7314):670-674.
4. Shetty AK, Marangwanda C, Stranix-Chibanda L, et al. Feasibility of preventing mother to child transmission of HIV using peer counsellors in Zimbabwe. AIDS Research and Therapy [homepage on the Internet]. c2005. Available from: http://www.aidsrestherapy.com/content/5/1/17
5. Mills E. Swimming in confusion: a qualitative study of factors affecting uptake and adherence to antiretroviral treatment in South Africa. Cape Town: Centre for Social Science Research, University of CapeTown, 2008.
6. Tindyebwa D, Kayita J, Musoke P, et al, editors. Epidemiology, preventing paediatric HIV infection: handbook of paediatric AIDS in Africa. Kampala: African Network for the Care of Children Affected by AIDS (ANECCA), Kampala, 2005; p. 38.
7. The National Antenatal Sentinel HIV and Syphilis Prevalence Survey, South Africa, 2010. Pretoria: National Department of Health.
8. Coutsoudis A, Pillay K, Spooner E, et al. Method of feeding and transmission of HIV-1 from mother to children by 15 months of age: prospective cohort study from Durban, South Africa. AIDS. 2001;15(3):379-879.
9. South Africa PMTCT programme reduces mother to child transmission to under 4% [homepage on the Internet]. Available from: http://aidsmap.com/South-Africas-PMTCT-programme-reduces-mother-to-child-transmission-to-under-4/page/1880446/
10. Nguyen TA, Oosterhoff P, Ngoc YP, et al. Barriers to access prevention of mother-to-child transmission for HIV positive women in a well resourced setting in Vietnam. Aids Ther Res [homepage on the Internet]. c2010. Available from: http://www.aidsrestherap.com/content/5/1/7
11. Meda N, Msellati P, Welffens-Ekra C, et al. The reduction of mother-to-child transmission of HIV infection in developing countries: potential intervention strategies, obstacles to implementation and perspectives. The Reduction of Mother to Child Transmission of HIV Infection in Africa Group. Sante. 1997;7(2):115-125.
12. Clark PA. Mother-to-child transmission of HIV in Botswana: an ethical perspective on mandatory testing. Dev World Bioeth. 2006;6(1):1-12.
13. Varga C. Factors influencing teen mothers' enrolment and participation in Prevention of Mother-to-Child HIV transmission services in Limpopo Province, South Africa. Qual Health Res. 2008;18(6):786-802.
14. Stringer JS, Sinkala M, Maclean CC, et al. Effectiveness of a city-wide program to prevent mother-to-child HIV transmission in Lusaka, Zambia. AIDS. 2005;19(12):1309-1315.
15. Creek T, Ntumy R, Mazhani L, et al. Factors associated with low early uptake of a national programme to prevent mother to child transmission of HIV (PMTCT): results of a survey of mothers and providers, Botswana, 2003. SpringerLink [homepage on the Internet]. c2008. Available from: http://www.springerlink.com/content/7004821337707725
16. Painter TM, Diaby KL, Maria DM, et al. Socio-demographic factors associated with participation by HIV-1 positive pregnant women in an intervention to prevent mother-to-child transmission of HIV in Cote d'Ivoire. Int J STD AIDS. 2005;16(3):237-242.
17. Dorrington RE, Johnson LF, Bradshaw D, Daniel T. The demographic impact of HIV/AIDS in South Africa: national and provincial indicators for 2006. Cape Town: Centre for Actuarial Research, South African Medical Research Council and Actuarial Society of South Africa; 2006.
18. Preventing mother to child transmission (PMTCT) in Practice (Preventing mother-to-child transmission worldwide) [homepage on the Internet]. c2008. Available from: http://www.avert.org/pmtct-hiv.htm
19. Amoran OE, Salami OF, Oluwole FA. A comparative analysis of teenagers and older pregnant women in the utilization of prevention of mother to child transmission of HIV PMTCT service in Western Nigeria. BMC Int Health Hum Rights. 2012;12:13.