

Elimination of Mother-to-Child Transmission of HIV, an experience from Oman

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Received date: 19 Dec 2016; Accepted date: 24 Jan 2017; Published date: 27 Jan 2017.

Citation: Jaffer YA, Al-Awaidy ST (2017) Elimination of Mother-to-Child Transmission of HIV, an experience from Oman. J HIV AIDS 3(1): doi: <http://dx.doi.org/10.16966/2380-5536.136>

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Abstract

Background: The transmission of HIV from HIV-infected mother to her child is the most common route of HIV transmission in children. In 2009, HIV screening among pregnant women was introduced in Oman as part of antenatal care integrated into primary health care. We describe Oman's experience of implementing prevention of mother-to-child transmission (MTCT) of HIV program.

Methods: A national HIV screening and counselling for pregnant women was implemented as a component of antenatal care at primary health care. Upon confirmation of a positive test, antiretroviral therapy (ART) is provided at tertiary or secondary care.

Results: Cumulatively 424,077 pregnant women attended ANC during the period (July) 2009-2014 with high levels of ANC coverage >95% of pregnant woman had at least one ANC clinic visit; of those 98% of the pregnant women received counseling and tested for HIV. Ninety HIV positive cases were identified resulting in HIV sero-prevalence of 0.02% and 85 (94%) were age group 20-49 years. During the same period, 31 infant were born with HIV; the annual average for transmission rate was 39%; while the annual HIV newborn due to MTCT is 10 per 100,000 live births.

Conclusions: Introduction of HIV testing and counseling services was very successful, however mother-to-child HIV transmission rate is still below the target, therefore the contributing barriers need to be identify and managed.

Keywords: Elimination; Antenatal care; HIV testing among pregnant woman; Prevention of mother-to-child transmission; PMTCT; mother-to-child transmission; MTCT; maternal and child health

Introduction

Prevention of mother-to-child transmission (PMTCT) of HIV has been at the forefront of the HIV prevention activities of the international community since 1998, especially after the revolutionary antiretroviral therapy [1] that had offered a promising low-cost intervention, which could considerably reduce mother to child transmission (MTCT) [2]. Universal screening of all pregnant women is cost-effective and has demonstrated reduction in HIV-1 maternal transmission even in low prevalence settings [3-5]. Over 90% of new infections among infants and young children occur through mother to-child transmission [2], further, globally, providing ARV treatment for pregnant women living with HIV has averted more than 900 000 new HIV infections among children since 2009 [6].

In the absence of any interventions, the risk of HIV transmission rates varies between 15 to 20% [7,8]. Oman initiated the maternal and child health (MCH) program in 1987, all primary health care (PHC) facilities provided standard antenatal care (ANC), and postnatal care (PNC) to women in their respected catchment areas.

Each pregnant woman in Oman is registered at a local PHC facility that provides her with standard routine antenatal care and an antenatal card that lists the services received. This card includes residential address; unique identification number and all the information regarding the pregnant women including tests which have been performed. The card is updated at each ANC visit. Health facilities also use a hard copy of

the registration database for their catchment population containing information on the ANCs and the screening results. The delivery takes place at a regional secondary care hospital and women are then referred back after discharge for PNC to local PHC facility. ANC coverage is high, 99.2% in 1995, almost 100% in 2010 and thereafter is at this level till date (elimination of MTCT target $\geq 95\%$), while institutional delivery reached 93.7% 1995, and 98% in 2010 and is maintained at this level till date [9,10]. Cumulatively, 2506 HIV positive cases were reported nationally between 1984 and 2014. Of these, 689 (27%) HIV positive cases were women and 492 (71%) were above 25 years (Table 1) with a median age of 35 years.

In July 2009, HIV screening was initiated nationally for all pregnant women attending ANC clinics as a routine component of the package of care in all antenatal, postpartum care settings in public and private PHC facilities.

The programme objectives include early detection of HIV among pregnant women, provision of care and support to HIV positive women and prevention of HIV transmission from women to their infants. This paper describes Oman's experience of implementing PMTCT of HIV program aiming at elimination of mother-to-child HIV transmission.

Methodology

Data were collected between July 2009 to 2014 from all new antenatal registrants regarding antenatal care coverage, coverage of pregnant woman tested for HIV, maternal demographics (age and residency), and status of live infants born to HIV-positive pregnant woman.

	Calculation	WHO elimination target	Year of report						P value
			Jul-Dec (2009) No (%)	2010 No (%)	2011 No (%)	2012 No (%)	2013 No (%)	2014 No (%)	
		-							-
Registered pregnant women at ANC *coverage at least one ANC clinic visit		≥ 95%	34400 (>98)*	67480 (>98)*	72783 (>98)*	78934 (>98)*	78934 (>98)*	87658 (>98)*	
Coverage of woman received HIV testing		≥95%	33822 (98)	67131 (98)	72321 (97)	71354 (90)	78934 (98)	87658 (98)	0.998
Pregnant women testing HIV positive (a)		-	5	21	16	17	22	9	<0.001
HIV live infants born to HIV-positive pregnant women (b)		-	6 cases (all year) 3 cases(July-Dec)	5	10	6	4	3	0.062
Alive births (c)		-	27,975	55,712	57,323	61,549	66,772	68,293	-
Percentage of HIV new born infants born to HIV infected mothers	b/a*100	Transmission rate of either <5% in breastfeeding populations or <2% of non- breastfeeding populations	60	23	63	35	18	33	<0.001
New HIV infections due to MTCT of HIV per 100,000 live births	b/c*100,000	≤ 50 new-born infection per 100,000 live births	11	9	17	10	6	4	0.998

Table 1: Coverage of prevention of mother-to-child transmission, Oman, 2009 (July-December) -2014.

Data regarding HIV-positive pregnant women receiving ART for prevention of MTCT and HIV-exposed infants receiving ART for PMTCT or causes of not receiving ART were not systematically collected; therefore these data will not be presented in this paper. Prevalence of HIV among HIV-pregnant woman, rate of newborn infection per 100,000 live birth and HIV transmission rate were calculated.

The data analysis was conducted using Epi-Info 6 software and *p* value of 0.05 or less is considered significant.

PMTCT Program Description

PMTCT strategy is being implemented in two levels, the first at primary health care (PHC) were screening and counseling for pregnant woman is implemented. Thereafter, if the result is positive, she will be referred to either secondary or tertiary care for follow-up and ART administered by the HIV physician along with the obstetrician.

The national guidelines spelled out the policy and the package of care to be delivered through PMTCT strategy which included routine antenatal pre and post-test counseling and testing, client flow, blood sample flow and roles and responsibilities of the health team at primary health care (PHC), follow-up and flow of patient at secondary and tertiary care were also spelled it out have evolved and are widely implemented [10].

HIV screening

At PHC and during the first ANC visit, data are collected from all new antenatal registrants regarding maternal demographics including age, marital status, in addition to obstetric history, history of blood transfusions, illicit drug use, and history of medical and HIV/AIDS contact. Verbal consent is obtained prior to collection of the sample for HIV.

Samples are tested using enzyme-linked immunosorbent assay (ELISA) at public health governorate laboratories based on WHO recommendations and national guidelines (Figure 1). All newborn to HIV mothers were tested for HIV within 48 hours of birth based on national guidelines (Figure 2) [10].

One public health laboratory is dedicated at each governorate for ELISA HIV testing. The national laboratories (CPHL) participated in the internal quality assurance programme (QAP) by the United Kingdom national external quality assessment services (UK NEQAS).

ANC related activities, including HIV counseling and laboratory HIV testing are financially supported by the government and provided free of charge in government health facilities for all Omanis and residents.

HIV counseling at PHC

Trained counselors were assigned to ANC clinics located in all PHC. All pregnant women were offered pre-test counseling on first visit covering the health implications of HIV on mother and infant and post-test counseling services after test results is ready.

Antiretroviral therapy (ART) at secondary and tertiary health care

HIV positive pregnant woman were offered ART and are managed and followed-up at secondary and tertiary care hospitals. The antiretroviral drugs are made accessible to all the governorate tertiary and secondary health care settings. ART regimens is initiated for positive pregnant woman regardless of WHO clinical stage or CD4 cell count and is given once-daily fixed-dose combination of TDF (tenofovir)+FTC+(emtricitabine) EFV (efavirenz) as first line ART in pregnant women and zidovudine (AZT) chemoprophylaxis is given to infants born to HIV-infected mothers.

Post-natal period

The HIV-positive mother and the child will be followed and monitored at the secondary and tertiary care.

MTCT monitoring system

MOH collects monthly summaries from PHC including HIV testing results of pregnant woman and coverage of HIV testing by institution, coverage of counseling, and at secondary and tertiary hospitals the information collected including number of children born to HIV positive mothers, ART coverage for prevention of MTCT and chemoprophylaxis is given to infants born to HIV-infected mothers. Monitoring of the reports including ART is an integral part of the programme conducted by the physician at the assigned health care center regularly for adherence, treatment failure, and possible toxicities and also to assess the need to modify or substitute ARV drugs.

Oversight and coordination

The national advisory committee for maternal and child health (NMCHC) oversees the progress of the programme. The committee members consists of a wide range of experts such as public health, epidemiologists, obstetrics and gynecology, pediatric infectious diseases, statistician and health information experts in addition to representatives from WHO, UNICEF and UNFPA. The committee is having an authority to invite experts from other departments including HIV and AIDS prevention and control section, PHC and CPHL departments.

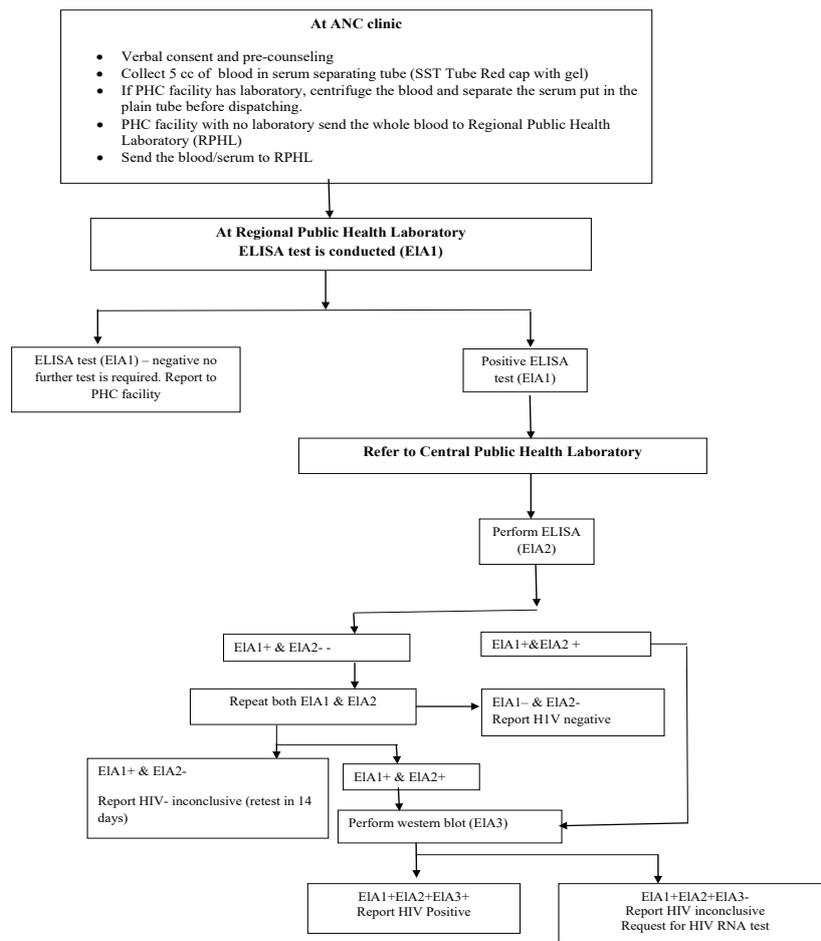


Figure 1: HIV testing algorithm for woman attending antenatal clinic (ANC), Oman
A=Assay, EI=ELISA

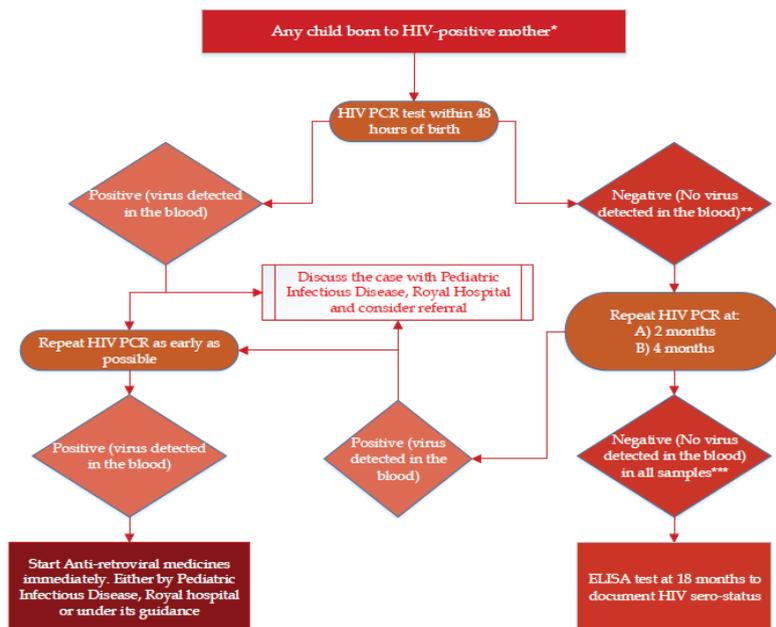


Figure 2: HIV testing algorithm for children under 18 months*, Oman
A=Assay, EI=ELISA

Community action

Regular series of articles, interviews and media programs are delivered to the community and specifically to the women attending ANC clinic on the importance of HIV screening.

Programme monitoring

The programme adopted a number of performance monitoring indicators conducted at primary health care level, including number and percentage of woman tested and positive for HIV and children born with HIV. Monitoring indicators also included number and proportion of pregnant woman treated with ART. Further, an algorithm was developed for reporting results of HIV positive woman (Figure 3). MTCT rates were calculated based on infant HIV test results reported.

Ethics approval

The study was approved by the national maternal and child health and HIV and AIDS committees. Patient identities were kept confidential.

Results

Cumulatively, 424,077 pregnant women were registered in the ANC clinics across the country from July 2009 to 2014 [9], with high levels of ANC coverage, where >95% of pregnant woman had at least one ANC clinic visit. Of these, 421,125 (98%) pregnant woman had received HIV testing and pre and post counseling (Table 1).

The annual percentage of HIV testing was 98% in 2009 (July-December), 98% in 2010, 97% in 2011, 90% in 2012, 98% in 2013, 98% in 2014. Of the total pregnant woman screened, 90 HIV positive cases were identified suggesting a cumulative HIV sero-prevalence among pregnant women of 0.02%. The annual distribution of the cases was 5 in 2009 (July-December), 21 in 2010, 16 in 2011, 17 in 2012, 22 in 2013, and 9 in 2014 ($p<0.001$), (Table 1). Among the newly diagnosed of HIV-positive pregnant woman, 85 (94%) were within the age group 20-49 years, with a median age of 35 years. Stratifying the national cumulative HIV positive pregnant cases by governorate shows that the greatest number of cases was reported from the governorates Muscat 26 (29%), followed by North Al Batinah 24 (27%), Buraimi 15 (17%), Dhofar 8 (9%), no cases reported from Dakhiliya, Musandam and Wusta Governorates (Figure 4).

During the same period, 31 infants were HIV positive, born to HIV-positive mothers; the annual distribution of the cases was 3 in 2009 (July-December), 5 in 2010, 10 in 2011, 6 in 2012, 4 in 2013, and 3 in 2014. The percentage of mother-to-child transmission of HIV were 60, 23, 63, 35, 18, and 33 respectively ($p<0.001$), and the annual average was 39%. No information was collected on segregation into breastfeeding and non-breastfeeding among the HIV children born to HIV positive mothers. While the rates of infection due to MTCT per 100,000 live births were 11, 9, 17, 10, 6 and 4 respectively and the annual average is 10 per 100,000 live births (Table 1). ART was used for HIV-positive pregnant women as well as prophylaxis is given to infant born to HIV-positive mothers, however no information is published on uptake, completion of prophylaxis or causes of not receiving/refusing of use ART.

Discussion and Conclusion

WHO has adopted PMTCT strategic vision towards achieving universal PMTCT coverage with the ultimate goal to move towards eliminating new HIV infections among children and keeping their mothers alive [1]. Few countries illustrated that elimination of mother-to-child transmission of HIV is possible, namely Armenia, Republic of Moldova, Thailand and Belarus.

Oman has demonstrated progress towards prevention of mother-to-child transmission of HIV by implementing central strategies including ANC, HIV testing of all pregnant women (including pre and post counseling), and use of ART for HIV-positive pregnant women and ART chemotherapy for children born to woman living with HIV.

Oman has ANC coverage of 98% of pregnant woman with at least one ANC clinic visit for years {WHO target ANC coverage of ≥ 95 (at least one visit). Almost all pregnant women were tested for HIV and this sustains a national high screening coverage of >98% nationally [9] (elimination screening coverage target $\geq 95\%$) [10], with pre and post counseling of pregnant women. This is important as HIV counseling and testing for pregnant women is a key factor for successful prevention of maternal-to-child transmission [10].

Our study shows that the average percentage of HIV new born infants born to HIV infected mothers is 37%, similarly the trend of MTCT transmission rate remains above the target levels of WHO elimination

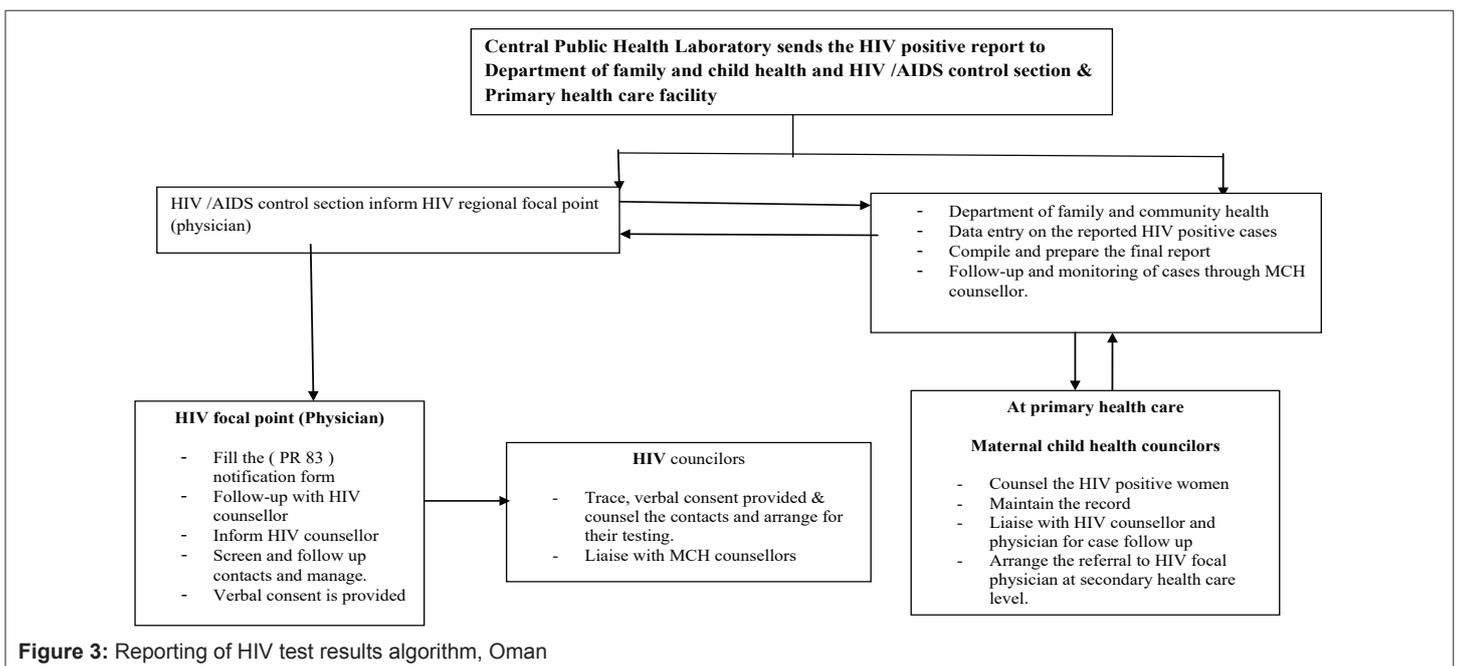
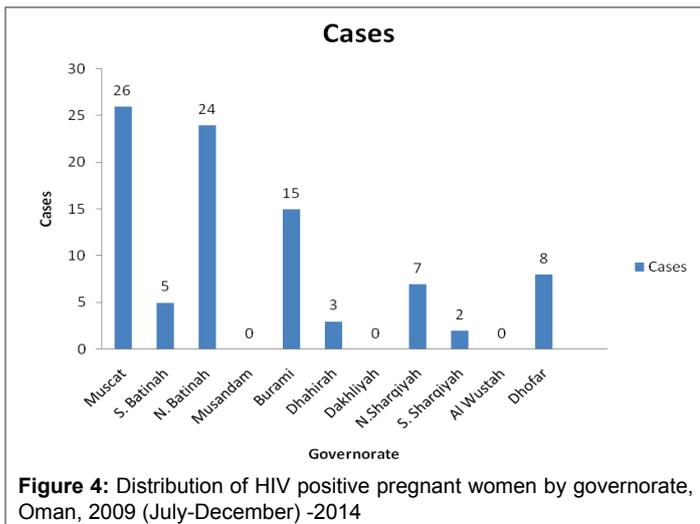


Figure 3: Reporting of HIV test results algorithm, Oman



programme urgently needs to embark on rigorous research to evaluate the impact of this potentially important intervention related to non-adherence and drop-out and to inform policy makers and program managers about adherence and uptake of ART among HIV-positive mothers and their children.

The programme already has taken steps towards systematically and regularly collecting information on use of ART and chemoprophylaxis among HIV-positive mothers and infant and adherence rate and issues related to non-adherence and dropping out of care.

In conclusion, Oman has established a strong MTCT programme, with universal coverage of services available across the country, however, the program needs to continue maintaining and achieving a high coverage of ART treatment and chemoprophylaxis for HIV-positive mothers and children at secondary and tertiary care to ensure further reduction in HIV infections among infants born to HIV-positive mothers to zero.

Acknowledgment

We are highly in debt to H.E. Dr. Ali Bin Moosa, late H.E. Dr. Ali Jaffer Mohammed, late H.E. Dr. Ahmed Al Ghassani, Late Dr. Rauf Al Suwaid, Dr. Ali Baomar, and staff of DFCH, MCH department and HIV/AIDS prevention and control section staff, governorate MCH staff and epidemiologists, Dr. Said Al Baqlani, Dr. Suleiman Al Busaidy, Dr. Mohammed Faraj, Miss Majda Al Wahaibi and Jomana Hermez for their valuable guidance and support.

Conflict of Interest

The authors declare no conflict of interest.

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targets (elimination target is a transmission rate of either <5% in breastfeeding populations or <2% in non-breastfeeding populations) [10,11]. Although the new HIV infection due to MTCT per 100,000 live births meets the WHO elimination target, this indicator is not essential for Oman since it is an HIV low prevalence country [11].

The progress towards elimination of MTCT in Oman was implemented very well at PHC, however it is insufficient and does not meet the WHO elimination impact targets [12]. This is shown by mother-to-child transmission of HIV trend rates. Several contributing factors may explain this trend, firstly, HIV-exposed infants might not receive full chemoprophylaxis services due to loss to follow-up or drop-out ;secondly, lack of programme integration between PHC and antenatal programme; thirdly, poor provider attitudes and perceptions on care and fourthly, and lack of antiretroviral adherence and drop-out [13].

Non-adherence and drop-out can be attributed to combination of factors including no systematically defaulter retrieval of the cases at clinic, limited follow-up of the cases and partners (husbands), literacy of the parents, poor adherence to PMTC guidelines by the hospital secondary or tertiary care staff and lack or insufficient of psychosocial support of the parents.

There are many opportunities that could be implemented to address the issue of adherence and drop-out, include active women involvement in interventions such as mother-to-mother support, peer support and outreach groups i.e. home visits by the Willayat (district) councilors health care or social workers, who can help address the causes of non-adherence and drop-outs. In addition to, involving women themselves in the technical committee, which can also help improve the services through addressing challenges based on their local demand. Other support includes well-trained and competent counsellors, good communication between healthcare providers and women receiving HIV testing as part of their antenatal care. Additional factors include less prone to dropping-out if they could receive their care at PHC facilities this option needs to be studied thoroughly; during the antenatal booking visit which is a sensitive time when much information is being exchanged, and it is important that the information on providing chemoprophylaxis be imparted in such a way at this time that it is both acceptable and effective. Further, the community should also empower to understand the importance of chemoprophylaxis and demand their rights in treatment and finally lack of ownership could be solved by establishing a technical committee or task force, with well-defined roles and responsibilities in order to monitor all the programme activities at services levels.

The findings of this study are of particular concern as Oman aims to eliminate new HIV infections among children to zero; therefore, the