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Assessment of “Trends in HIV test and Sero prevalence” among randomly selected Antenatal Care attendees in government health centers in Addis Ababa.

**A thesis presented to the School of Graduate Studies of Addis Ababa
University**

By

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**In partial fulfillment of the requirement for the Master Degree in
Public Health (MPH)**

Declaration

I the under signed, declare that this is my original work, has not been prepared for a degree in this or other universities, and that all sources of materials used for the thesis have been fully acknowledged.

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Acknowledgement

I would like to thank AAU for funding this project and giving me the opportunity to conduct this research work from which I learnt a great deal of lessons. I also thank both technical and administrative staff at Community Health Department of the Medical Faculty, AAU for their direct or indirect contributions towards successful accomplishment of this thesis work.

I would like to express my deepest thank to my advisor Professor Ahmed Ali for his unreserved professional advices in both technical and administrative issues regarding this thesis since its inception, with out whose dedicated efforts the realization of this thesis work would be impractical.

I world like to thank Dr. Fikre EnkuSilase Head, Community Health Department, Medical Faculty AAU, for his constructive inputs especially during development of an initial research proposal for this thesis, by clarifying statistical concepts and providing professional advices through critical review of the initial research proposal.

I would like to extend my deepest appreciation and thanks to the staff at Nigat Project especially to Dr. Aida Abashawle and Dr. Abubeker Bedri for their timely assistance in providing me with complementary data for this thesis, with out whose help the completeness of this thesis would be unthinkable.

I would like to acknowledge the staff at Addis Ababa City Administration Health Bureau, for their unbureaucratic services in providing me with all relevant information I needed both during development of the initial research proposal and write up of the final thesis.

Last, but not least I would like to extend my heartily thanks to the health service staff at Kolfe, T/hayimanot, Lideta and Addis Ketema health centers for their friendly cooperation and dedication of their useful time and energy during the time of data collection and subsequent visits to the health centers. I specially thank Sr. Munit, Ato Mesay, Ato Yohanis and Sr.Zerfu, who were Nurses in charge of PMTCT services at their respective health centers.

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Acronyms

AAAHB	Addis Ababa Administration Health Bureau
ABC	CDC's Active Bacterial Core Surveillance/Emerging infections program
AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
ART	Anti Retroviral Therapy
BCC	Behavioral Change Communication
CDC	Center for Disease Control and Prevention
ELISA	Enzyme Linked Immuno absorbent Assay
HAPCO	HIV/AIDS Prevention and Control Office
HIV	Human Immune Deficiency Virus
IEC	Information Education Communication
MOH	Ministry of Health
MTCT	Mother to Child Transmission
PEPFAR	President Bush's Emergency Plan for AIDS Relief.
PLWHA	People Living with HIV/AIDS
PMTCT	Prevention of Mother to Child Transmission
PRAMS	Pregnancy Risk Assessment Monitoring System.
RPM-Plus	Rational Pharmaceuticals Management-Plus
UNAIDS	United Nation Program on AIDS
VCT	Voluntary Counseling and Testing
WHO	World Health Organization

Abstract

Despite increasing availability of PMTCT of HIV services, improved awareness of women about MTCT of HIV and grave psychological, social and economic consequences that MTCT of HIV poses at all socio-economic levels, information based on serial data from PMTCT program are limited at global, regional and national levels to assess and track trends in service utilization and HIV sero prevalence among pregnant mothers.

Therefore, to assess trends, in HIV test and sero prevalence among ANC attendees in government owned health centers in Addis Ababa since 2002, a retrospective record review was conducted in Addis Ababa in April 2007.

A total of 2402 randomly selected individual PMTCT counseled client's records from 2002- 2006 were reviewed retrospectively. All required data related to client's HIV test and relevant socio demographic factors were gathered. Data entry, cleaning and analysis were subsequently conducted using Epi-Info software program. Analysis was done mainly focusing on changes in HIV tests and sero prevalence from one year to another during the study period (2002-2006) and comparing each year's prevalence with the one in 2002.

For the years 2002-2006, the overall prevalence of HIV test among PMTCT counseled ANC attendees and sero-prevalence among voluntarily tested ANC attendees were, 93% (range, 88.3% - 96%) and 9.5% (range, 6% - 13.2%) respectively.

Prevalence of HIV testing acceptance among counseled ANC attendees has significantly increased (p -value < 0.05 , χ^2 for trend=4.490) from 90% in 2002 to 96% in 2006.

Taking the 2002 HIV sero prevalence rate of 11.7% in this study as baseline prevalence, no statistically significant decline (χ^2 for trend =1.391, p value > 0.1), in HIV sero prevalence was observed since 2002. Moreover, only 39% of pregnant mothers in Addis Ababa utilized PMTCT services.

Trends in HIV testes among PMTCT counseled ANC attendees in Addis Ababa are increasing mainly because of an opt-out strategy. HIV sero prevalence among ANC attendees in Addis Ababa has not shown any significant decline since 2002, though figures show mixed pattern of increase and decline among this group of mothers. PMTCT services utilization rate is generally low among pregnant mothers in Addis Ababa.

1. Introduction

1.1 Background

The World Health Organization estimates that approximately 40 million people are living with HIV/AIDS worldwide and that 28 million of these reside in sub-Saharan Africa where 55% of infected adults are women among which 90% are in their reproductive years. (1). In addition, among an estimated 600,000 new born who are infected each year, two-thirds of them are found in these countries. MTCT rates of HIV vary from 21-43% in untreated women in sub-Saharan countries. The rate has generally dropped to under 1% in developed nations using combination of interventions most importantly by antiretroviral therapy (2, 3) Hetero-sexual transmission is the major route of HIV transmission in sub-Saharan Africa where average HIV sero-prevalence is about 8.4% compared to 0.6% in North America and where economic, social and cultural factors contribute to the disparity of new HIV/AIDS cases between men and women (4).

One of the tragic consequences of the HIV/AIDS pandemic is mother-to-child transmission (MTCT) of HIV. MTCT has also become a critical child health problem in Africa, contributing to severe child morbidity and significant child mortality. It is undermining the impact of programs that have significantly reduced child mortality in previous decades in sub-Saharan African countries (5).

MTCT is when an HIV positive woman passes the virus to her baby. It can occur during pregnancy, during labor and delivery, and after birth through breastfeeding. Approximately 15-40% of children born to HIV positive mothers become infected. Without treatment, around 15-30% of babies born to HIV-positive women will become infected with HIV during pregnancy and delivery. A further 10-20% will become infected through breastfeeding (6, 7). Current evidence suggests that most of maternal-infant HIV transmission occurs late in pregnancy or during labor and delivery (8).

Disease progression in children who acquire HIV infection from their mothers is more rapid in Africa than in developed countries, probably since African children are exposed to early and multiple infections, have high rates of malnutrition and micronutrient deficiencies and have limited access to health care (9). A number of factors influence the risk of infection, particularly the viral load of the mother at birth: the higher the load, the higher the risk, which makes provision of ARV therapy very important in order to reduce the viral load in those mothers and in the long run minimize the chances of MTCT of HIV. Vaginal delivery has been found to be associated with increased chance of transmission of HIV from the

mother to the child. Elective caesarian sections have proved to be protective against MTCT of HIV. Poor obstetric practices such as early rupture of membranes, frequent vaginal examinations are also thought to increase the chances of MTCT of HIV. Breastfeeding is associated with a 10-20% chance of transmission of HIV from the mother to the infant. Mixed feeding may also increase the risk of HIV infection. Indirect evidence suggests that keeping the period of transition from exclusive breastfeeding to alternative feeding as short as possible may reduce that risk (10).

To prevent MTCT of HIV, WHO recommends four-fold strategies: *Prevention of HIV among prospective parents* which is to prevent HIV infection among women of reproductive age through economic empowerment of women, education of the girl child, premarital HIV counseling and testing and creating awareness through health education programs; *Prevention of unwanted pregnancies among HIV-positive women* through voluntary counseling and testing services where women could be able to know their HIV status before becoming pregnant. Family planning services are needed to prevent unwanted pregnancies in HIV sero positive women; *The care and treatment of HIV-positive pregnant women* through effective voluntary testing and counseling, access to antiretroviral therapy; *preservation of Mother to Child Transmission in infants with HIV positive mothers*, through access to improved and comprehensive ANC services, safe delivery practices, widespread availability and safe use of breast-milk substitutes and access to short course prophylactic Antiretroviral therapy(11).

There are a number of large-scale international initiatives to prevent MTCT of HIV. These include: President Bush's International Mother and Child HIV Prevention Initiative, now included in President's Emergency Plan for AIDS Relief (PEPFAR); The Elizabeth Glaser Pediatrics AIDS Foundation: Call to Action Project 22; The UN Interagency Task Team on MTCT; and MTCT-Plus (11).

Since 1985, the Ethiopian Ministry of Health and various non-governmental and governmental organizations have been implementing HIV/AIDS prevention and control measures in different parts of the country. These include awareness creation through IEC/BCC, condom promotion and distribution, care and support for PLWHA, surveillance, PMTCT (since 2002), voluntary counseling and blood testing for HIV, and ART since recent years. After 2001, following development of the National Strategic Framework, MOH through HAPCO is putting effort to build local capacities and integrate HIV prevention and control programs with reproductive health service at all level (12,13,15).

It is known that through concerted efforts by Ethiopian Government and various NGOs and donor agencies the availability of HIV/AIDS control and prevention facilities

(their absence was found to be a barrier during earlier stages of HIV/AIDS epidemics against taking HIV test (21)) including PMTCT services and their access to those facilities by all citizens and pregnant mothers is increasing and even improving quality wise from time to time (12, 13, 15). Different studies also show that awareness of MTCT of HIV among women is increasing (29, 34).

Despite increasing availability of PMTCT services and grave psychological, social and economic consequences that MTCT of HIV poses at family, community and national levels, PMTCT service based information to assess trends in PMTCT service utilization by pregnant mothers, its accompanied HIV sero prevalence and socio demographic and maternal factors affecting both service utilization and sero-prevalence are limited at regional level such as Addis Ababa.

Moreover, though it is known that the ANC sentinel site based HIV/AIDS data currently being used to estimate national HIV/AIDS prevalence is resource intensive and lacks representativeness at national level, little effort was exerted to evaluate and use such data available from PMTCT program for the purpose of estimating National HIV/AIDS prevalence.

Therefore, the main purpose of this study was to assess trends in voluntary HIV testing and its accompanied sero prevalence among ANC attendees in Addis Ababa using 5 years retrospective PMTCT program data since 2002 available at government owned health centers in Addis Ababa. Socio-demographic and maternal factors affecting PMTCT service utilization and HIV sero prevalence and applicability of PMTCT data for estimation of national HIV/AIDS prevalence were assessed and conclusions and recommendations for further service improvement based on results were also made.

1.2 Literature Review

Global HIV/AIDS surveillance system

AIDS reporting in the United States is relatively complete; an estimated 70% to 90% of all HIV related deaths are captured by the present surveillance system (16). In most of these countries both AIDS and HIV infection are notifiable conditions within 7 days. In Japan for instance, the surveillance of HIV/AIDS was started in 1984 and was legalized through the implementation of the Act of AIDS prevention in 1989 (18).

Estimation of HIV prevalence is essential to monitor epidemiological patterns and scope of HIV/AIDS pandemic and to predict the future number of HIV related diseases. Based on available HIV/AIDS surveillance data, several industrialized countries such as North America and Europe have shown declining trend in new AIDS cases (16). Using surveillance data, from 1983 through 1997, Hashimoto et al demonstrated increasing trend in HIV infection and declining AIDS cases in 1996 and 1997 among Japanese compared to non-Japanese residing in Japan (17). Further, this surveillance information besides providing measures of the trends of the epidemic has enabled evaluation of efficacy of various interventions and control activities and allowed for social economic and human cost of the epidemic to be quantified (18).

In a study conducted in United States of America, New York, an ABC Network review of medical records in seven counties in the Rochester area indicated that the proportion of pregnant women who received a prenatal HIV test increased from 52% of 438 charts during January 1998--July 1999 to 83% of 112 charts during August--December 1999 after New York required that newborn HIV testing results be made available within 48 hours of specimen collection (19). Pregnancy Risk Assessment Monitoring System (PRAMS) data for 1999 indicated that the proportion of women statewide who reported having received an HIV test during pregnancy increased from 69% of 758 women during January--July to 93% of 502 during August--December (19). In separate, statewide analyses of prenatal testing reported on newborn metabolic screening forms from all live-born infants, New York reported prenatal HIV-testing rates of 89% in 2000 and 93% in 2001 (New York State Department of Health, personal communication, 2002). In Connecticut, an ABC Network review of 668 charts indicated a testing rate of 31% during January 1998--September 1999, compared to 81% of 93 charts reviewed during October--December 1999 after enactment of the mandatory newborn testing law (19).

Because of lack of facilities to diagnose HIV infection and AIDS, limited access of large segment of the population to health facilities and lack of health personnel, AIDS case reports are incomplete in Africa. It is estimated that 10% or fewer of all AIDS cases especially pediatric AIDS cases in Africa have been reported to WHO (20).

Regional HIV/AIDS surveillance system

AIDS surveillance in Africa was begun in 1982 when the US center for Disease Control and prevention (CDC) developed an AIDS case definition for reporting purpose (20).

Serologic confirmation of HIV infection is difficult in many part of Africa, because of lack of trained personnel to carry out the testing, limited health service coverage and budget constraints to purchase diagnostic tests. For this reason AIDS in Africa are diagnosed on clinical criteria developed by WHO, in October 1985, which defines clinical AIDS in African adult as having two major and one minor criteria (22). Before 1989 the most widely available epidemiological data on HIV/AIDS in most large urban areas of central and East Africa was serologic survey data among selected groups of prostitutes, blood donors and pregnant women (21). However, since 1989 HIV data from sentinel surveillance system among ANC attendees were used to estimate HIV prevalence, determine the scope of HIV/AIDS epidemic, monitor trends and predict future number of HIV related diseases, in many central, West, East and Southern African countries (22). Sentinel Surveillance involves screening of a population sample on annual basis, based on anonymous unlinked blood sample testing, ensuring sufficient sites, representing geographical, ethnic and socio economic groups in order to make national estimate of HIV prevalence (14).

The South Africa epidemic has developed later than those afflicting other sub-Saharan countries. In these countries sentinel surveillance conducted among women attending state antenatal clinic nationwide, revealed a progressively increasing trend in sero prevalence. In 1991 only 2% of women attending ANC clinics were HIV positive. In 1999 the sero prevalence rate reached 22.4% (24).

There are only few studies in Africa showing trends in voluntary HIV test and accompanied sero prevalence rates among regular ANC attendees utilizing PMTCT services using either prospective or retrospective data from routine health service records are limited if not none at regional or national level. In countries with generalized HIV epidemics, where the prevalence of HIV is consistently >1% in the general adult population, these estimates are obtained primarily from data collected from antenatal (ANC) clinic sentinel surveys. These

surveys, conducted anonymously and unlinked at regular intervals annually on left-over blood drawn from ANC attendees for syphilis serology are often the only reliable data source to estimate HIV prevalence in the general adult population (14).

However, surveillance experts (such as in Kenya) have explored whether other data sources (such as like the one from PMTCT programs), could be used to obtain reliable national estimates of HIV prevalence, since ANC sentinel surveys require significant resources and because the HIV test results cannot be returned and there are always unresolved issues of getting accurate and geographically representative number of sentinel ANC clinics for reliable estimates. The Kenyan study conducted in 2003, to assess if there was difference in HIV prevalence based on ANC surveillance data and on PMTCT data, has shown the difference to be smaller when HIV testing uptake at PMTCT sites were higher (>60%), and recommended increasing service up take and improving the quality of PMTCT data before it can be used for estimation of HIV prevalence (26). In this study among 2,239 women who were offered HIV testing 1,258 (56%) accepted; the median PMTCT based HIV prevalence was 14.4% (range, 7.0%–27.2%) in PMTCT clinics, while it was 12.8% (range, 8.1%–36.3%) for sites included in sentinel surveillance. HIV testing acceptance for PMTCT ranged from 48% to 69% across clinics, and was more likely among primigravidae than multigravidae.

Other studies in Botswana 2004, have also shown that service-related factors, including the use of an “opt-in” strategy (individual pre-test counseling with patients actively choosing whether to be tested) or an “opt-out” strategy (HIV testing routine, noncompulsory and provider initiated), the organization of services, human resources training, staff attitude, and availability of anti-retroviral medication at each facility to have a strong influence on HIV testing uptake (27). The opt-out strategy, for example, has proven to result in a better HIV testing uptake than the opt-in strategy. The advantage of opt-out strategy was strengthened by another study conducted in Kenya at Kisumu clinic, which showed, significantly increasing HIV test acceptance rate with a switch from an opt-in to an opt-out approach in 2002 (26). In 2003, a study conducted in Uganda showed that the lack of antiretroviral drugs was a barrier to participation in PMTCT (28).

In another study conducted in Abidjan, Cote d’Ivoire in 1998-99, to measure the overall acceptability and performance of HIV counseling and testing procedures under conventional antenatal care setting have shown well acceptance of the program by pregnant mothers. In this study, out of 4309 pregnant women who visited ANC units, 3756 (87.2) women received

counseling, 3452 agreed to undergo HIV test (91.9%) (21). The overall HIV prevalence was 12.89%. Of the women who were tested, 2384 (69.1%) returned for their results. Of the 2998 HIV negative women 2116 (71%) returned as did 268 of the 445 HIV positive women (60%). The main reason for failure to return among those who didn't return for results was that, their sero status could be discovered by relatives or neighbors through a breach in confidentiality by health care workers and fear to risk of stigmatization. Recently in the Botswana MTCT program Mazhani et al. (2000) reported that up take of VCT by pregnant mothers was fewer than 50%; key factor was low involvement of men (30).

According to a report issued during the 4th Annual AIDS conference in Kampala Uganda, knowledge/awareness of the existence of PMTCT was high but uptake was low. Constraints include, distance and capacity of facilities to deliver these services promptly. Personal characteristics of individuals such as level of education, marital status (married or divorced) were major determinants of PMTCT uptake. Male partners are always absent from PMTCT services (31).

National HIV/AIDS surveillance system.

Since the reporting of the Ethiopian first HIV (1984) and AIDS cases (1986), its HIV epidemic has evolved in to generalized epidemic and AIDS is now the leading cause of mortality and morbidity among adults in Ethiopia (12,13).

The main source of HIV surveillance data in Ethiopia is the antenatal clinic (ANC) based HIV sentinel surveillance system which was established in 1989. It relies on unlinked anonymous tests of left over blood in selected sentinel ANC sites, following World Health Organization WHO/joint United Nation program on AIDS (UNAIDS) guideline (14). Other sources of surveillance data include case reporting (AIDS, Sexually transmitted diseases) and infrequent surveys of general population or high-risk groups. It is believed that antenatal clinic data most closely approximates prevalence level in adult population in Africa. (1:1 male to female ratio of HIV infection in Africa (21,23) and prevalence among age group 16-24 represents recent infection, which makes it useful data for estimation of HIV incidence at both local and national levels.

Trend analysis based on ANC sentinel site data from 1989 through 2003 at national level showed a declining trend in sero prevalence between 2001 and 2003 in Ethiopia. Modeled data suggested a rise in prevalence of HIV in rural areas (2.6%) and in all Ethiopia (4.4%) (15).

Among few studies, a study conducted in four hundred and eighty four mothers attending ANC service at Arba Minch Hospital and Arba Minch Health Centre in 2003, where the majority of the mothers (97%) were married and aged between 20-30 yrs (61.2%), revealed that 80% of all mothers were aware of the prenatal transmission of HIV infection and of those 213 (55%) thought that there is a 100% risk of transmission of HIV at every conception (29). Out of all the mothers interviewed, 424 (91%) agreed that HIV is not transmitted by mother-to-child by physical contact, and 419 (86.5%) have the knowledge that HIV is transmitted through breastfeeding. However, in this study it was shown that the use of ARV drugs in PMTCT was not known to 386(80%) of the mothers. Four hundred and forty four (92.3%) of the mothers did not know their HIV sero status, even though 360(74.4%) of the pregnant mothers volunteered for HIV blood test during the time of the study. This study recommended the importance of integrating counseling and testing in ANC setting and the need for educating mothers on the role of ARV prophylaxis in PMTCT.

Another study, conducted among 285 pregnant women attending ANC service assessed uptake rates and barriers of voluntary counseling and testing among antenatal care attendees

in Southwest Ethiopia, in 2004 (32). This study showed lower acceptance (27%) of VCT with, but significantly higher acceptance rate among 16-20 years old women and among women who were single. About eighty percent have received their test results which was lower according to the study for which unwillingness by the women to know their HIV status was identified as a main reason. More over, factors such as lack of decision making autonomy among women and fear of partner's reaction were the main barriers. The study recommended that to increase VCT uptake at ANC settings, such service related factors as improving quality of service, provision of result on the same day and individual concerns should be addressed.

However, there is no reliable data on mother-to-child-transmission rate available to evaluate the effectiveness/impact of the current or future PMTCT programs in Ethiopia. Unavailability of antiretroviral drugs for most pregnant women and nearly universal breast-feeding by Ethiopian mothers contribute to mother-to-child transmission (35).

Since, 1985 the Ethiopian Ministry of Health and various non-governmental and governmental organizations have been implementing HIV/AIDS prevention and control measures in different parts of the country. These include awareness creation through IEC/BCC condom promotion and distribution, care and support for PLWHA, surveillance, PMTCT, voluntary counseling and blood testing for HIV, and ART since recent years. After 2001, following development of the National Strategic Frame Work MOH through HAPCO is putting effort to build local capacities and integrate HIV prevention and control programs with reproductive health service at all level.(12,13)

1.3 Statement of the problem

Before availability of support networks such as community support, prophylactic drugs and treatment for opportunistic infections, antiretroviral therapy and pre and post test counseling services, health professionals had little incentives to recommend HIV tests to clients and patients. Patients and clients were also reluctant to undergo HIV tests and know their sero status as they have no coping support mechanism with infection. Hence, most HIV tests were done anonymously with out counseling and getting consent of the patients. Results were not discussed openly strengthening silence and stigma about HIV/AIDS. HIV test was also costly and there was a considerable delay in getting results (21).

Maternal HIV infection and MTCT of HIV pose huge social and economic problems at all levels. However, with recent improvement in availability of treatment, care and support facilities, relatively cheap and rapid HIV-tests and counseling service, and progressively increasing awareness about MTCT (12, 13, 32, 34, and 35) and its preventive methods, utilization pattern of the available services both by pregnant mothers and their male partners based on serial data from PMTCT services are limited.

Moreover, only few studies are available to show the effect of availability in comparison to absence of PMTCT services on trends in HIV-test and its accompanied sero prevalence, among pregnant women at global, regional and national levels. Studies to understand the effect of such socio- demographic factors such as age, and pregnancy related factors as gestational age, parity and gravidity on utilization of post counseling HIV test and accompanying sero prevalence among pregnant women are also limit

Hence, the main purpose of this study was to establish trends in HIV test and sero prevalence among pregnant mothers attending ANC services in government owned health centers, by reviewing available retrospective PMTCT data of the last five years since 2002. This study may also serve as a baseline study by other investigators interested in this area, as studies on voluntary HIV test and sero prevalence, based on data from voluntary counseling and testing centers/programs such as PMTCT are limited

2. Objectives of the Study

2.1 Main Objective

The main objective of this study was to assess trends in HIV tests and sero prevalence, among ANC attendees, who have attended ANC service in government health centers in Addis Ababa from 2002-2006.

2.2 Specific Objectives

2.2.1. To measure the magnitude of annual HIV tests among ANC attendees.

2.2.2. To measure the annual HIV sero prevalence rate among ANC attendees.

2.2.3. To assess the annual changes in VCT utilization and sero prevalence in relation with demographic and maternal factors among ANC attendees.

2.4.4. To assess availability of counseling, treatment, care and support services for reduction of MTCT of HIV.

3. Methods

3.1 Study design

A retrospective record review was conducted among randomly selected pregnant women who attended antenatal care services in Addis Ababa government health institutions since 2002. Because of time, logistic and budget constraints, and since most ANC services are provided by government health institutions, private care facilities were excluded from this study.

Before the year 2001, most HIV/AIDS activities were focused on awareness creation, activities, surveillance and condom promotion etc, and most health institutions didn't have capacities to provide VCT services and AIDS patient care services such as ART. However, in the year 2001 and subsequently and following the development of Strategic Frame work for National Response, donors' initiatives and higher level leadership commitment, many efforts have been put to expand VCT services in health institutions, strengthen surveillance activities and integrate HIV/AIDS prevention and control activities with the general health service.

Therefore, the year 2001 was used as a landmark to establish trends in voluntary HIV tests and sero prevalence.

3.2 Study Area

Addis Ababa City was the study area. It is the capital City of Ethiopia with an area of more than 530 km² and a total population of 3 Million. It has 10 sub cities. The health service coverage of Addis Ababa is 71%. There are 5 Hospitals, 24 government owned Health centers, 32 health posts and more than 500 private health institutions providing health services including ANC. The ANC coverage of the City is estimated at 86%. All government health centers in the City have been providing integrated ANC and PMTCT programs since 2004 with the assistance of various NGOs and donor agencies, though government is the main provider. However, there were only 5 health centers which started PMTCT program as pilot project in Addis Ababa in 2001. It was the Nigat Project (owning data for the years 2002 and 2003) which started PMTCT program for the first time in Ethiopia, targeting ANC attendees in Health centers and Hospitals in Addis Ababa among which, Addis Ketema, Kolfe, Lideta and TekleHaymanot health centers were found. It was a collaborative research program

between Addis Ababa University and John Hopkins University of USA which was started in 2001. Therefore, the 4 health centre out of 5 (one health centre i.e Kaliti was excluded because of irregularities in the availability of data for all 5 years) were purposely included in this study for readily accessibility of data base since 2002. Formal PMTCT program was started in other government health institutions in Addis Ababa in 2004.

3.3 Source population

All pregnant mothers who have attended the antenatal care service and have documented records at a given health center during the specified period of time were source population of the study.

3.4 Study Population

Among the source population, all pregnant mothers who have attended HIV/AIDS counseling service at a given health center and have documented records at a given health institution during the specified period of time were included in the study. About 86% of pregnant mothers in Addis Ababa were expected to attend ANC services. However, only those mothers who were given counseling services on HIV/AIDS and PMTCT and registered in the PMTCT log books were included in the study, out of which sample was taken for this study.

3.5 Sample size

Because of time, budget and logistic constraints it was not possible to analyze 5 years data from 4 health centers. Hence, representative sample of client's records from each health center was taken by first determining the sample size using the following formula.

$$\text{Sample Size} = Z^2 \alpha / 2P(1-P) / d^2$$

Where $Z^2 \alpha / 2$ is a precision to an acceptable approximation of the population and that is taken to be 95% ($Z^2 \alpha / 2 = 1.96$)

P is the proportion of ANC attendees who utilizes VCT service. Available data from 27 government health institutions in Addis Ababa in 1998 E.C showed this proportion to be 48% in 11 months. (Addis Ababa Regional Health Bureau).

D is the absolute precision and is taken as 0.05%

Hence the sample size required in this study for one year

$= (1.96)^2 (0.48) (0.52) / (.05)^2 = 383$ +10% to account for lost or misplaced documents) =421 records

Total required sample size for 5 years = 421x5= 2105.

However, the actual size of data collected was 2402. This difference was because, fraction number that arises in systematic random sampling method i.e. when dividing the total case load at each health center by total sample size required was not rounded off to the nearest whole number.

3.6 Sampling procedure.

In the four health centers, all mothers counseled for PMTC service were registered in a log book prepared for this purpose. Both counseling and HIV testing were conducted by trained health professionals on voluntary basis after counseling and obtaining full consent of mothers. All counseled pregnant mothers were serially registered in the log books with specific identification /code numbers attached to each counseled mothers sequentially without having any breaks/changes in the order of sequences even when there were changes in calendar years. In order to keep anonymity of records, no individual identifiers, such as client's names or official ID numbers were used in the registration process.

After having determined the case loads and checked for completeness and uniformity of record keeping for each year at each health center, a fraction of the total sample size proportional to total case load seen by each health center during the given year was allocated to each health center. Then, a systematic random sampling method was employed to identify all individual client records that were included in the study. Once study subjects were identified all available data sources including maternal ANC follow up cards (though not completely filled), ANC and PMTCT log books were consulted (as all required data were not found completely recorded at one source) to collect all available data related to maternal VCT and key socio demographic variables. However, for data obtained from Nigat project (2002-2003) PMTCT program log book, still not complete especially with regard to certain demographic data such as marital status, maternal occupation etc (these variables were not routinely collected) were used to collect information as it was the only available data source.

3.7 Data Collection Procedure

Data were collected using pre prepared data collection formats containing all necessary demographic, HIV test result and health service variables.

Five data collectors having adequate educational background (Data collectors were all grade 12th complete and the supervisor was diploma holder) and one supervisor were recruited and trained for two days prior to questionnaire pre-testing and subsequent data collection.

Before data collection, 10% of the questionnaires were pre tested in one health institution which was among the study (Addis Ketema health center). After pre-testing, certain changes with regard to re-formatting data collection and summary formats with exclusion of some variables which were not available in any form (as they were not routinely collected/recorded) and inclusion of available and yet important variables were made. Accordingly, such variables as maternal educational status, income, ethnicity and religion were excluded from data collection and summary formats. On the other hand, some variables of particular relevance to this study which were readily available, such as partner HIV testing status, number of times HIV testing was made by pregnant mothers during the course of pregnancy, receiving test results by the client and gravidity were included. Data collected during the pre-test were taken as part of the main study data after making the necessary adjustment based on the changes made.

Then, after having the necessary permission from the concerned health authorities those client records pre identified during sampling procedure were secured. Then, all necessary data in the client's record were carefully transferred in to the questionnaire using trained enumerators. However, not all data in every category of variables were completely available. (See result part) The process of data collection took 26 working days. Data checking for completeness, coding, summary and entry were started simultaneously the same day with data collection.

3.8 Data Analysis Procedure.

Before data entry, the completeness of the records was checked. Missing values and outliers were also noted. Then, data were fed into EPI-INFO version 3.2.2 April, 2004 computer software program after assigning codes to variables in every category except for patient identification, and year of VCT. Before doing analysis, decision was made to exclude missing values in each category of variables from analysis and not to analyze a variable if the rate of missed data for that variable exceeds 10% of the total sample size required. Hence marital status and occupation variables were excluded from analysis. Magnitude of VCT utilization, HIV test and sero prevalence among pregnant mothers were described by year and socio demographic variables. Prevalence rate of HIV-tests and sero prevalence and *chai-*

square for trend were calculated by year. Tables and graphs showing distributions and trends were also constructed. Statistical tests such as calculation of odds ratio were done to see associations between observed VCT utilization prevalence, sero- prevalence and socio demographic and maternal characteristics respectively.

The observed trend in sero prevalence were compared with prevalence rates produced using other data sources (ANC sentinel site data in Addis Ababa.) and test of statistical significance for presence of any difference were done using chi-square test, odds ratios, corresponding p-values and confidence intervals for each year of VCT. Changes in socio demographic characteristics of VCT utilization in each year were assessed and presence of changes in utilization rates from the reference level in 2002, for each category of socio demographic variables were tested calculating chi-square corresponding P-value, odds ratio and confidence intervals for significance. Finally, availability of counseling, treatment, care and support services at each health center were described by year in tables

Variables: dependent variables are voluntary HIV test and sero prevalence.

Independent variables are year of VCT and all socio demographic variables

3.9 Data Quality Assurance

100% of the data were entered by principal investigator. This is believed to improve the data quality as the principal investigator was believed to exercise more attention and care to the data entry process compared to hired data clerk.

3.10 Ethical Consideration

Before starting the conduct of this study letter of ethical clearance was secured from ethical clearance committee of Department of Community Health Addis Ababa University. Letter of support to all health centers included in the study was also secured from Addis Ababa City Administration Health Bureau before the start of data collection. Anonymity of records was maintained by using client ANC registration number and unique code numbers used by service providers at each health center, during the process of study subject selection and data collection.

3.11 Dissemination of Results

The findings of this study will be published on relevant public health journals for dissemination and use. Further, the final report will be submitted to relevant health authorities at Regional level in Addis Ababa and at FMOH after its approval for successful completion. Discussion sessions will be held especially with the Regional Health Bureau head, Health program heads and sub city Health Office heads to highlight the main findings and recommendations of this study and influence policy decisions for their implementation.

4. Results

4.1 Availability, quality and limitation of PMTCT data

Access to general ANC logbooks, PMTCT counseling logbooks and ANC follow up cards was limited since they were misplaced or being used by ANC staff at the time of data collection. Data varied in quality (handwriting was not always clear). The variables recorded in the logbooks of PMTCT were not complete. For example, gravidity, parity, occupation, and marital status data were missing in PMTCT counseling log books. Some of the variables such as parity and gravidity were only available from general ANC logbooks which were not easily accessed as they were either misplaced or lost. The worst was with individual ANC follow up cards which were the only data sources for such variables as marital status, occupation and other socio economic variables. Large number of those cards was completely lost at all visited health centers. At times when those cards were available for review, the required data were not available as they were not consistently recorded across all cards, except in some cases. However, great effort was exerted by the data collecting team to collect as much complete data as possible by consulting all available data sources. Hence, as a limitation of this study, analysis of variables in certain categories such as gestational age, parity, and gravidity were carried out not based on 100% availability of data, though in all cases of analyzed variables, the unavailability rate did not exceed 10% of the total actual sample size required for the analysis.

4.2 HIV/AIDS counseling and testing uptake and Sero- prevalence.

4.2.1 VCT utilization among all pregnant mothers.

The total number of potential ANC clients under the catchment area served/ covered by the four health centers during the period of 5 years (2002-2006) was 31,190 (taking 86%ANC coverage for the City). Among these 27,479 (86.6%) visited those health centers for ANC services in 5 years, out of which 13,190 (48%) accepted counseling services they were offered and 12,213 (92.6%) were voluntarily tested for HIV subsequently, giving over all VCT acceptance/utilization rate among counseled mothers of 92.6%. However, that rate was only (39.2%), when we use total pregnant mothers that could exist in five years period in the catchment areas as a denominator.

4.2.2 HIV test uptake among counseled ANC attendees.

As shown in Table 1, a total of 2399 (HIV testing status was missing for 3 records) individual records of PMTCT counseled ANC attendees who visited the respective health centers from 2002-2006 were retrospectively reviewed. Among the total mothers who were counseled during the 5 years period, 2221 (92.6%) were tested for HIV. Among the total of 2399 ANC attendees whose residence were known 2388 (99.5%) permanently lived in Addis Ababa, while only 11(0.5%) lived out of Addis Ababa. Majority of the mothers 1493 (62.3%) who accepted HIV testing were aged between 15 to 24 years. One thousand and two hundred and eighty nine (54.5%) had gestational age at first HIV counseling and testing of 0-28 weeks. primigravida and primiparous mothers were 949 (39.5%) and 1049 (43.7%) respectively. Almost all HIV tested ANC attendees took their HIV test result the same day they were tested though it was not known whether they shared the information with their partners or not. However, 94.6% (2269) of mothers who had undergone HIV test were tested only once with out having repeat test during the course of pregnancy, though, there is a wide possibility of acquiring HIV during pregnancy. Moreover only 2.5% (57) of the mothers who were PMTCT counseled got their partner tested.

Table 1: Distribution of Maternal Socio-demographic and HIV –test related Characteristics among counseled ANC attendees in Addis Ababa, 2002-2000.

Variable		Number	Percent
Maternal Age	16-24	1493	62.3
	>24	902	37.7
Gravidity	Primigravida	949	50.6
	2-5	876	46.9
	>5	48	2.5
Parity	Primipara	1049	56.2
	1-5	791	42.4
	>5	25	1.4
Gestational age at first VCT	0-28wks	1289	60.9
	29-36wks	700	33.1
	37-42wks	126	6
Place of residence	Addis Ababa	2388	99.5
	Out side Addis Ababa	11	0.5
Maternal HIV testing	Tested	2221	92.6
	Not tested	178	7.4
Frequency of HIV testing	tested once only	2204	99.2
	Had repeat test	17	0.8
Receiving test result	Received	2091	94.6
	Not Received	130	5.4

Partner testing	Mothers with tested partner	57	2.4
	Mothers with out tested partner	2338	97.6

As shown in Table 2, Voluntary HIV test acceptance rates for the years 2002,2003 2004,,2005 and 2006, among counseled ANC attendees in Addis Ababa were 90 %, 87%, 95%, 93% and 96% respectively giving the median and average VCT acceptances rate of 92.8% and 92.6%,respectively.

Table 2, HIV testing frequency, among PMTCT counseled ANC Attendees in Addis Ababa by year of VCT

Year of, HIV testing	Tested n= 2221		Not tested n=178	
	Number	Percent	Number	Percent
2002, N=455	409	90%	46	10%
2003, N=382	332	87%	50	13%
2004, N=454	432	95%	22	5%
2005, N=554	514	92.8%	40	7.2%
2006, N=554	534	96%	20	4%
Total N= 2399	2221	92.6%	178	7.4%

As shown in Table 3, there is significantly increasing trend ($X^2_{\text{for trend}} = 4.490$, p-value=0.0337) in VCT/HIV test acceptance rate among counseled ANC attendees in Addis Ababa since 2002.

Table 3, Trends in HIV testing practices, among PMTCT counseled ANC attendees in Addis Ababa by year of VCT.

Year of VCT	Tested		Not tested		X^2	p-value	Odds ratio
	Number	Percent	Number	Percent			
2002	409	90%	46	10%	4.490	0.0337	1.00
2003	332	87%	50	13%			0.74
2004	432	95%	22	5%			2.11
2005	514	92.8%	40	7.2%			1.48
2006	534	96%	20	4%			2.67
Total	2221	92.6%	178	7.4%			

As shown in Table 4, majority of the mothers, 1493 (62.3%) who had visited VCT services were aged between 15-24 years, among which 1382 (92.6%) were tested for HIV. On the other hand ANC attendees who had ages above 24 years at first VCT visit were 902(37.7%) among which 829 (92.0%) were tested for HIV. The VCT acceptance rates among the two age groups were identical.

Table 4, Distribution of HIV testing acceptance status among PMTCT counseled ANC attendees in Addis Ababa, by Maternal Age at first VCT and year of VCT

Age group and year of VCT	Tested N (%)	Not tested N (%)	Total N (%)
15-19 years			
2002	84 (88.9)	11 (11.1)	95
2003	97 (91.6)	9 (8.4)	106
2004	86 (98)	2(2)	88
2005	137 (93.4)	10(6.6)	147
2006	148(97)	5 (3)	153
Sub Total	552 (93.7)	37 (6.3)	589 (24.6)
20-24 years			
2002	165(91.3)	16(8.7)	181
2003	114(83.6)	22(16.4)	136
2004	204 (94.2)	13(5.8)	217
2005	167 (92.1)	14(7.8)	181
2006	180(95.5)	9 (4.5)	189
Sub Total	830 (91.8)	74 (8.2)	904 (37.8)
25-29 0years			
2002	122 (90.1)	13(9.9)	135
2003	83 (87)	12(13)	97
2004	98(94.8)	5 (5.2)	103
2005	145 (90.3)	10 (9.7)	161
2006	143(96.5)	5 (3.5)	148
Sub Total	591 (91.7)	53 (8.3)	644 (27.0)
30-34 years			
2002	23(85)	4 (15)	27
2003	29(84)	6 (16)	35
2004	25(94.4)	1(5.6)	26
2005	37(93.1)	3 (6.9)	40
2006	54(97.4)	1 (2.6)	55
Sub Total	168 (91.8)	15(8.1)	183(7.6)
35-39 years			
2002	14(84.6)	2(15.4)	16
2003	6 (100)	0(0)	6
2004	13(90.9)	1 (9.1)	14
2005	15(85.7)	2(14.3)	17
2006	11(100)	0(0)	11
Sub Total	59 (92.1)	5 (8.9)	64(2.6)
40-44 years			
2002	3 (0)	0 (0)	3
2003	3 (0)	0(0)	3
2004	3(100)	0 (0)	3
2005	0 (0)	0(0)	0
2006	2(100)	0(0)	2
Sub Total	11 (100)	0(0)	11 (0.4)
Total	2218 (92.6)	177(7.4)	2395(100)

As shown in Table 5, statistically significant increasing trend in VCT acceptance was observed among mothers of age groups 15-19 years ($X^2_{\text{for trend}}=4.959$, p-value < 0.05) and

Table 5, Trends of HIV testing practices, among PMTCT counseled

ANC attendees in Addis Ababa by Maternal Age and year of VCT.

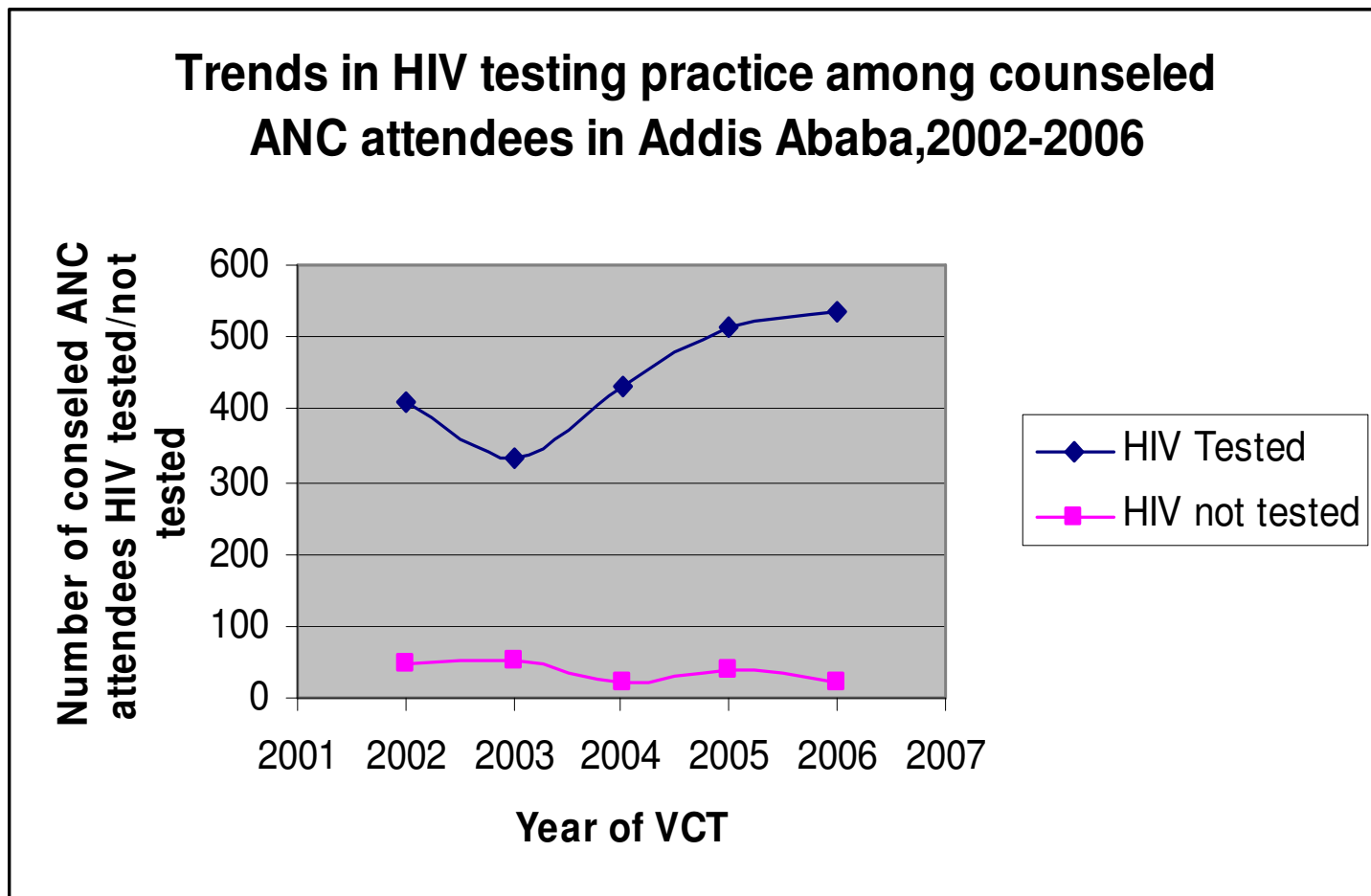
Age group and year of VCT	Tested N (%)	Not tested N (%)	X ²	p-value	Odds ratio
15-19 years					
2002	84 (88.9)	11 (11.1)	4.959	0.02593	1.00
2003	97 (91.6)	9 (8.4)			1.42
2004	86 (98)	2(2)			6.06
2005	137 (93.4)	10(6.6)			1.64
2006	148(97)	5 (3)			4.08
Sub Total	552 (93.7)	37 (6.3)			
20-24 years					
2002	165(91.3)	16(8.7)	3.183	0.0744	1.00
2003	114(83.6)	22(16.4)			0.52
2004	204 (94.2)	13(5.8)			1.55
2005	167 (92.1)	14(7.8)			1.14
2006	180(95.5)	9 (4.5)			1.88
Sub Total	830 (91.8)	74 (8.2)			
25-29 0years					
2002	122 (90.1)	13(9.9)	2.918	0.08758	1.00
2003	83 (87)	12(13)			0.74
2004	98(94.8)	5 (5.2)			2.11
2005	145 (90.3)	10 (9.7)			1.00
2006	143(96.5)	5 (3.5)			2.07
Sub Total	591 (91.7)	53 (8.3)			
30-34 years					
2002	23(85)	4 (15)	12.8	0.00035	1.00
2003	29(84)	6 (16)			0.93
2004	25(94.4)	1(5.6)			2.76
2005	37(93.1)	3 (6.9)			0.34
2006	54(97.4)	1 (2.6)			5.71
Sub Total	168 (91.8)	15(8.1)			
35-39 years					
2002	14(84.6)	2(15.4)	3.638	0.05647	1.00
2003	6 (100)	0(0)			N/A
2004	13(90.9)	1 (9.1)			1.78
2005	15(85.7)	2(14.3)			1.08
2006	11(100)	0(0)			N/A
Sub Total	59 (92.1)	5 (8.9)			
40-44 years					
2002	3 (0)	0 (0)			
2003	3 (0)	0(0)			
2004	3(100)	0 (0)			
2005	0 (0)	0(0)			
2006	2(100)	0(0)			
Sub Total	11 (100)	0(0)			
Total	2218 (92.6)	177(7.4)			

N/A=Not available

among mothers of age groups 30-34 (X² for trend =12.8, p- value < 0.001). Among other age groups one can still see increasing trend in maternal VCT acceptance (p-value > 0.05) though they lacked statistical significance

Figure 1, shows increasing trend in HIV testing practice and decreasing refusal of HIV testing among counseled ANC attendees in Addis Ababa from 2002-2006. The figure shows steeply increase in trends of HIV testing especially since 2003 after some decline from 2002 to the end of 2003.

Figure1: Trends in HIV testing practice among ANC attendees in Addis Ababa, 2002-2006



As shown in Table 6, among a total of 2115 mothers who had visited VCT services, 1289 (60.9%) of mother had gestational age of 0-28 weeks among which 1178(91.4%) were tested for HIV. ANC attendees having gestational age above 28 weeks were 826 (39.1%), among which 773 (93.6) were tested for HIV. This difference in overall acceptance of VCT between early trimester pregnant mothers and those above 28 weeks gestational age has however lacked statistical significance (odds ratio 0.76, and 95% CI, 0.54, 1.09).

Table 6, Distribution of HIV testing acceptance status among PMTCT counseled ANC attendees in Addis Ababa, by Gestational Age at first VCT and year of VCT .

Gestational Age	Tested N (%)	Not tested N (%)	Total N (%)
0-28 weeks			
2002	225 (97.8)	30 (2.2)	255
2003	171 (85.1)	30 (14.9)	201
2004	185 (94)	12 (6)	197
2005	319 (91.7)	29 (8.3)	348
2006	278 (98.6)	10 (1.4)	288
Sub Total	1178 (91.7)	111 (8.3)	1289 (60.9)
29-36 weeks			
2002	136 (90.1)	15 (9.9)	151
2003	116 (90.6)	12 (9.4)	128
2004	182 (95.8)	8 (4.2)	190
2005	118 (96.7)	4 (3.3)	122
2006	105 (93)	4 (7)	109
Sub Total	657 (93.9)	43 (6.1)	700 (33.1)
37-42 weeks			
2002	37 (97.4)	1(2.6)	38
2003	27 (84.4)	5 (5.6)	32
2004	21 (100)	0 (0)	21
2005	13 (100)	3 (0)	16
2006	18 (100)	1(0)	19
Sub Total	116 (94.7)	10(5.3)	126 (6)
Total	1951(92.2)	164(7.8)	2115 (100)

More over, no statistically significant increase in trends of maternal VCT acceptance (p-value > 0.05) was demonstrated based on maternal gestational age (Table 7).

Table 7, Trends in voluntary HIV testing practices, among PMTCT counseled ANC attendees in Addis Ababa by Gestational Age and year of VCT.

Gestational Age	Tested N (%)	Not tested N (%)	X ²	p-value	Odds ratio
0-28 weeks, n=1289					
2002	225 (97.8)	30 (2.2)	1.349	0.24537	1.00
2003	171 (85.1)	30 (14.9)			0.12
2004	185 (94)	12 (6)			0.32
2005	319 (91.7)	29 (8.3)			0.23
2006	278 (98.6)	10 (1.4)			2.02
Total	1178(91.7)	111 (8.3)			
29-36 weeks, n= 700					
2002	136 (90.1)	15 (9.9)	1.849	0.17394	1.00
2003	116 (90.6)	12 (9.4)			1.12
2004	182 (95.8)	8 (4.2)			2.07
2005	118 (96.7)	4 (3.3)			2.93
2006	105 (93)	4 (7)			1.48
Total	657 (93.9)	43 (6.1)			
37-42 weeks, n= 126					
2002	37 (97.4)	1(2.6)	3.491	0.06170	1.00
2003	27 (84.4)	5 (5.6)			0.16
2004	21 (100)	0 (0)			N/A
2005	13 (100)	3 (0)			N/A
2006	18 (100)	1(0)			N/A
Total	116 (94.7)	10 (5.3)			

N/A= Not available

As shown in Table 8, among the total of 1873 mothers who visited VCT services, 949 (50.6%) were primigravida among which 829 (87.4%) were tested for HIV. ANC attendees having more than one gravidity were 924(49.3%) among which 846 (91.5%) were tested for HIV. However, there is no statistically significant difference in VCT acceptance rates between primigravida and multigravida (Odds ratio 0.95, and 95% CI 0.72, 1.26).

Among total of 1865 who visited VCT services 1049 (56.2%) were primipara among which, 927 (88.4%) were tested for HIV. ANC attendees with more than one parity were 816 (43.8%) among which 785 (96.2%) were tested for HIV. In this case too there was no significantly difference (p value < 0.05 Odds ratio, 3.27 95% CI, 0.93, 12.54) in overall VCT acceptance rate among primiparous mothers compared with mothers having more than one parity in their life time.

Table 8, Distribution of HIV testing acceptance status among counseled ANC attendees in Addis Ababa, by Gravidity Parity and year of VCT.

Gravidity	Tested N (%)	Not tested N (%)	Total N (%)
2-5			

2002	203 (96.7)	7 (3.3)	210
2003	181 (99.5)	1 (0.5)	182
2004	107 (94.7)	6 (5.3)	113
2005	198 (94.3)	12 (5.7)	210
2006	157(97.5)	4 (2.5)	161
Sub Total	846 (96.6)	30 (3.4)	876 (46.8)
primigravida			
2002	191(83.4)	38(16.6)	229
2003	137(73.7)	49 (26.3)	186
2004	104 (97.2)	3 (2.8)	107
2005	214 (92.2)	18 (7.8)	232
2006	183(93.8)	12 (6.2)	195
Sub Total	829 (87.4)	120 (12.6)	949 (50.6)
Multi gravid (>5)			
2002	15 (93.8)	1(6.2)	16
2003	11 (100)	0 (0)	11
2004	8 (100)	0 (0)	8
2005	5 (100)	2 (0)	7
2006	6 (100)	0 (0)	6
Sub Total	45 (97.8)	3 (2.2)	48 (2.5)
Total	1720 (91.8)	153 (8.2)	1873 (100)
Parity			
Primipara			
2002	232 (85.6)	39 (14.4)	271
2003	163 (76.9)	49 (23.1)	212
2004	115 (96.6)	4 (3.4)	119
2005	226 (92.6)	18 (7.4)	244
2006	191 (94.1)	12 (5.9)	203
Sub Total	927(88.4)	122 (11.6)	1049 (56.2)
1-5			
2002	173 (96.4)	6 (3.6)	179
2003	155 (99.4)	1 (0.6)	156
2004	95 (95)	5 (5)	100
2005	186 (93)	14 (7)	200
2006	152 (97.4)	4 (2.6)	156
Sub Total	761 (96.2)	30 (3.8)	791(42.4)
Grande multipara			
2002	3 (75)	1(25)	4
2003	6 (100)	0 (0)	6
2004	5 (100)	0 (0)	5
2005	5 (100)	0 (0)	5
2006	5 (100)	0 (0)	5
Sub Total	24 (96)	1(4)	25 (1.4)
Total	1712 (91.8)	153 (8.2)	1865 (100)

On the other hand, as shown in Table 9, there was significantly increasing trend in VCT uptake) among primigravida (X^2 for trend = 15.121, p- value < 0.001) and primiparouse mothers (X^2 for trend =10.784, p -value<0.001) in VCT acceptance respectively, when compared with baseline VCT acceptance rate of 83.4% in 2002

Table 9, Trends in voluntary HIV testing practices, among PMTCT counseled ANC attendees in Addis Ababa by gravidity, parity and year of VCT.

Gravidity	Tested N (%)	Not tested N (%)	X²	p-value	Odds ratio
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2-5 n=876					
2002	203 (96.7)	7 (3.3)	0.535	0.46455	1.0
2003	181 (99.5)	1 (0.5)			3.41
2004	107 (94.7)	6 (5.3)			0.66
2005	198 (94.3)	12 (5.7)			0.54
2006	157(97.5)	4 (2.5)			1.11
Total	846 (96.6)	30 (3.4)			
primigravida, n=949					
2002	191(83.4)	38(16.6)	15.121	0.0010	1.00
2003	137(73.7)	49 (26.3)			0.58
2004	104 (97.2)	3 (2.8)			6.62
2005	214 (92.2)	18 (7.8)			2.36
2006	183(93.8)	12 (6.2)			3.21
Total	829 (87.4)	120 (12.6)			
Multi Gravid (> 5) , n= 48					
2002	15 (93.8)	1(6.2)	12.12	0.0058	1.00
2003	11 (100)	0 (0)			N/A
2004	8 (100)	0 (0)			N/A
2005	5 (100)	2 (0)			N/A
2006	6 (100)	0 (0)			N/A
Total	45 (97.8)	3 (2.2)			
Parity					
Primipara, n=1049					
2002	232 (85.6)	39 (14.4)	10.784	0.00102	1.00
2003	163 (76.9)	49 (23.1)			0.54
2004	115 (96.6)	4 (3.4)			5.26
2005	226 (92.6)	18 (7.4)			2.16
2006	191 (94.1)	12 (5.9)			2.55
Total	927(88.4)	122 (11.6)			
1-5, n=791					
2002	173 (96.4)	6 (3.6)	0.416	0.51902	1.00
2003	155 (99.4)	1 (0.6)			4.13
2004	95 (95)	5 (5)			0.79
2005	186 (93)	14 (7)			0.55
2006	152 (97.4)	4 (2.6)			1.35
Total	761 (96.2)	30 (3.8)			
Grande multipara, n=25					
2002	3 (75)	1(25)	52.526	0.00000	1.00
2003	6 (100)	0 (0)			N/A
2004	5 (100)	0 (0)			N/A
2005	5 (100)	0 (0)			N/A
2006	5 (100)	0 (0)			N/A
Total	24 (96)	1(4)			

N/A==not available

4.2.3 HIV, Sero prevalence.

As shown in Table10, among a total of 2399 PMTCT counseled mothers from 2002-2006, 2221 (92.6%), were tested for HIV among which 211(9.5%) were HIV positive, giving overall HIV prevalence rate of 9.5% for the five years period. HIV sero prevalence for the years 2002,2003, 2004, 2005 and 2006 were 11.7%, 8.1%,13.2%, 9.1% and 6%, respectively with median prevalence level of 9.1%. HIV sero prevalence among pregnant mothers attending ANC service declined from 11.7% in 2002 to 6% in 2005, though mixed patterns was observed during intervening years.

Table 10, Distribution of HIV Sero prevalence, among HIV tested ANC attendees in Addis Ababa, by year of VCT

Year of VCT	HIV positive n=211		HIV Negative n=2010	
	Number	Percent	Number	Percent
2002, N=409	48	11.7%	361	88.3%
2003, N=332	27	8.1%	305	91.9%
2004, N= 432	57	13.2%	375	86.8%
2005, N=514	47	9.1%	467	90.0%
2006, N=534	32	6%	502	94%
Total N,= 2221	211	9.5%	2010	90.5%

As shown in Table 11, no statistically significant declining trend in HIV sero prevalence was observed (X^2 for trend =1.391, p-value >0.05) from 2002-2006, when compared with HIV prevalence level of 11.7% in the year 2002 in this study. However as shown in Table 11, no significantly declining trend in sero prevalence among mothers attending ANC service in government owned health centers was observed (X^2 for trend = 1.391, p-value >0.05) from 2002-2006 when the base line HIV sero prevalence rate of 11.7% for Addis Ababa in 2002 was taken for comparison.

Table 11, Trends in HIV Sero prevalence, among HIV tested ANC attendees in Addis Ababa, by year of VCT.

Year of VCT	Positive		Negative		P-Value	X^2	Odds ratio
	Number	Percent	Number	Percent			
2002	48	11.7%	361	88.3%	0.23816	1.391	1.00
2003	27	8.1%	305	91.9%			0.64
2004	57	13.2%	375	86.8%			1.10
2005	47	9.1%	467	90.9%			0.73
2006	32	6%	502	94%			0.47
Total	211	9.5%	2010	90.5%			

However, as shown in Table 12, one can observe statistically significant decline (X^2 for trend= 4.364, p-value<0.05) in HIV sero prevalence among ANC attendees in Addis Ababa taking base line HIV sero prevalence rate of 15.6% (MOH, Ethiopia) for Addis Ababa in 2001 in Addis Ababa.

Table 12, Trends in HIV sero prevalence among ANC attendees in Addis Ababa, in comparison with 2001 HIV sero prevalence Among ANC attendees in Addis Ababa

Year of VCT	HIV Positive (%)	HIV Negative (%)	X ²	p-.value	Odds ratio
2001	16	84			1.00
2002	12	88	4.364	0.037	0.72
2003	8	92			0.46
2004	13	87			0.78
2005	9	91			0.52
2006	6	94			0.34

As shown in Table 13, among a total of 2218 ANC attendees who were tested for HIV from 2002-2006, 1386 (62.5%) were aged between 15 and 24 years, among which 128 (9.2%) were HIV positive. The total number of mothers who were above age 24 was 832 (37.5%), among which 72(8.7%) were HIV positive. However, there was no significant difference in HIV prevalence when we compare over all HIV prevalence among 15-24 age group with those having age group more than 24 years (p-value >0.05, Odds ratio=1.12,95%,CI, 0.48,3.18).

Table 13, Distribution of HIV sero status among ANC attendees in Addis Ababa, by Maternal Age and year of VCT.

Age group and	Positive	Negative	Total
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year of VCT	N (%)	N (%)	N (%)
15-19 years			
2002	7 (7.3)	82 (92.7)	88
2003	8 (8.3)	92 (91.7)	100
2004	7 (8.1)	82 (91.9)	89
2005	8(5.8)	131 (94.2)	139
2006	4 (3.1)	136 (96.9)	140
Sub Total	33 (5.9)	523 (94.1)	556 (25.1)
20-24 years			
2002	24 (15)	134 (85)	158
2003	4 (3.4)	112 (96.6)	116
2004	34 (16)	174 (84)	208
2005	20 (12.1)	146 (87.9)	166
2006	113 (7.4)	169 (92.6)	182
Sub Total	95 (11.4)	735 (88.6)	830(37.4)
25-29 years			
2002	16 (12.7)	109 (87.3)	125
2003	4 (15)	79 (95)	83
2004	14 (14.3)	81 (85.7)	95
2005	15 (10.4)	134 (89.6)	149
2006	8 (5.8)	136 (94.2)	144
Sub Total	57 (9.6)	539 (90.4)	596 (27.0)
30-34 years			
2002	1 (5.9)	23 (94.1)	24
2003	3 (9.5)	27 (90.0)	30
2004	3 (11.8)	21 (88.2)	24
2005	1 (3.7)	38 (96.3)	39
2006	6 (10.8)	46 (89.2)	52
Sub Total	14 (8.3)	155 (91.7)	169 (7.6)
35-39 years, n=46			
2002	0 (0)	14 (100)	14
2003	0 (0)	6 (100)	6
2004	0 (0)	13 (100)	13
2005	1 (8.3)	14 (91.7)	15
2006	0 (0)	10 (100)	10
Sub Total	1 (1.7)	57 (98.3)	58 (2.5)
40-44 years, n=4			
2002	0 (0)	2 (100)	2
2003	0 (0)	2 (100)	2
2004	0 (0)	2 (100)	2
2005	0 (0)	0 (0)	0
2006	0 (0)	13(100)	3
Sub Total	0(0)	9 (100)	9(0.4)
Total	210 (9.5)	2008 (90.5)	2218 (100)

Moreover, overall HIV prevalence among age 15-24 is not significantly different from overall HIV sero prevalence among all age group 15-44 (9.2% Vs 9.5%, p value >0.05, Odds ratio, 0.80, 95% CI, 0.29, 2.20). (Table 14)

Table 14, HIV Sero status among ANC attendees aged 15-24 Vs ANC attendees of age group 15 -44, in Addis Ababa by year of VCT.

Year of VCT	Age group 15-24		Age group 15-44	
	HIV positive	HIV Negative	HIV positive	HIV Negative
2002	30 (12.2%)	216(87.8%)	48 (11.7%)	362 (88.3%)
2003	12 (5.6%)	204 (94.4%)	27 ((8.1%)	306 (91.9%)
2004	41 (13.0 %)	256 (87.0%)	57 (13.2%)	374 (86.8%)
2005	28 (9.2%)	277 (90.8%)	47 (9.2%)	465 (90.8%)
2006	17 (5.3%)	305 (94.7%)	31 (5.8%)	501 (94.2%)
Total	128 (9.2%)	1258 (90.8%)	210 (9.5%)	2008 (90.5%)

Looking at trends in HIV sero-prevalence among age groups 15-24 and all age groups no statistically significant decline in HIV sero prevalence was observed in both age groups. (Table 15)

Table15: Trends in HIV sero- status among ANC attendees in Addis Ababa aged 15-24 Vs those aged 15-44, by year of VCT

Year of VCT	Age group 15-24					Age group 15-44				
	HIV positive (%)	HIV negative (%)	X ²	p-value	Odds ratio	HIV positive (%)	HIV negative (%)	X ²	p-value	Odds ratio
2002	12.2	87.8	1.446	0.22924	1.00	11.7	88.3	1.391	0.23816	1.00
2003	5.6	94.2			0.47	8.1	91.9			0.64
2004	13.0	87.0			1.19	13.2	86.8			1.10
2005	9.2	90.8			0.73	9.2	90.8			0.73
2006	5.3	94.7			0.39	5.8	94.2			0.47

As shown in Table 16, over all HIV sero prevalence increases with gestational age. Among a total of 1951 mother who were tested 1178 (60.4%) had gestational age of 0-28 weeks at their first VCT. Among those 103 (8.7%) were HIV positive. Mothers with gestational age of 29-36 and 37-42 weeks at their first VCT constitute 657 (33.7%) and 116 (5.9%) respectively. However, the over all HIV sero prevalence was found to be 12% and 14.5% among mothers with gestational age of 29-36 and 37-42 weeks respectively. However, this difference in sero prevalence between early and late pregnancy were not statistically significant (p>0.05).

Table 16, Distribution of HIV sero status by maternal gestational age at first VCT and year of VCT, among ANC attendees in Addis Ababa

Gestational Age	Positive N (%)	Negative N (%)	Total N (%)
0-28 week			
2002	23 (10.2)	202 (89.8)	225
2003	14 (8.2)	157 (91.8)	171
2004	22 (11.9)	163 (88.1)	185
2005	29 (9.1)	290 (90.9)	319
2006	15 (5.4)	263 (94.6)	278
Sub Total	103 (8.7)	1075(91.3)	1178(60.4)
29-36 weeks			
2002	14 (10.3)	122 (89.7)	136
2003	9 (7.8)	107 (92.2)	116
2004	27 (14.8)	155 (85.2)	182
2005	12 (10.1)	106 (89.5)	118
2006	6 (5.7)	99 (94.3)	105
Sub Total	68 (12)	589 (88)	657(33.7)
37-42 weeks			
2002	9 (24.3)	28 (75.7)	37
2003	2 (7.4)	25 (92.6)	27
2004	3 (14.3)	18 (85.7)	21
2005	2 (15.4)	11 (84.6)	13
2006	1 (5.6)	17 (94.4)	18
Sub Total	17 (14.5)	99 (85.5)	116 (5.9)
Total	188 (9.6)	1763 (90.4)	1951(100)

Looking at a trend (Table 17) in HIV soro- prevalence among mothers having different gestational age during different years, statistically significant declining (X^2 for trend =6.829, p-value < 0.001) trend in HIV sero prevalence was observed only among mothers having gestational age of 37-42.

Table 17, Trends in Sero status, among HIV tested ANC attendees in Addis Ababa, by Gestational Age and year of VCT

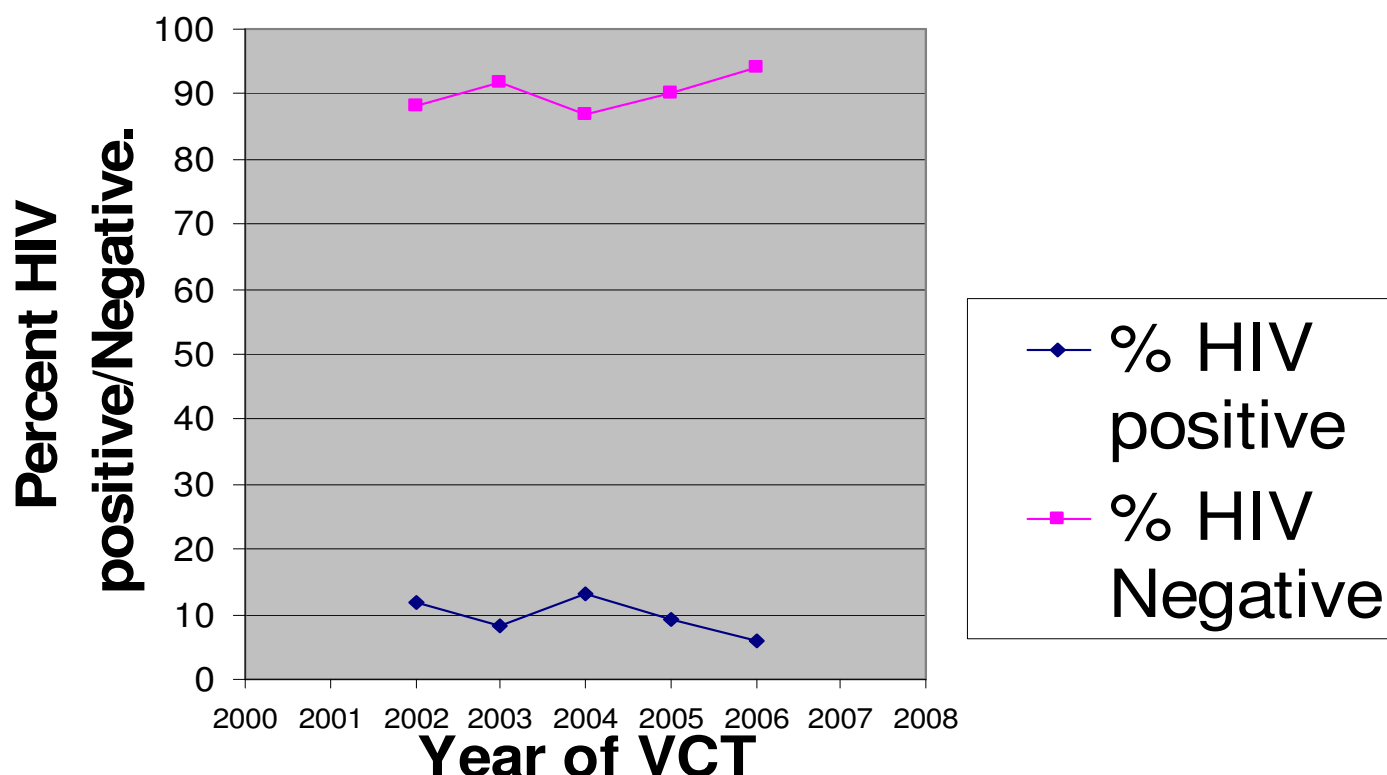
Gestational Age	Positive N (%)	Negative N (%)	X²	p-value	Odds ratio
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0-28 weeks, n=1178					
2002	23 (10.2)	202 (89.8)	1.007	0.31556	1.00
2003	14 (8.2)	157 (91.8)			0.78
2004	22 (11.9)	163 (88.1)			1.23
2005	29 (9.1)	290 (90.9)			0.99
2006	15 (5.4)	263 (94.6)			0.47
Total	103 (8.7)	1075(91.3)			
29-36 weeks, n=657					
2002	14 (10.3)	122 (89.7)	0.406	0.52378	1.00
2003	9 (7.8)	107 (92.2)			0.78
2004	27 (14.8)	155 (85.2)			1.59
2005	12 (10.1)	106 (89.5)			1.00
2006	6 (5.7)	99 (94.3)			0.57
Total	68 (12)	589 (88)			
37-42 weeks, n= 116					
2002	9 (24.3)	28 (75.7)	6.829	0.00897	1.00
2003	2 (7.4)	25 (92.6)			0.24
2004	3 (14.3)	18 (85.7)			0.52
2005	2 (15.4)	11 (84.6)			0.56
2006	1 (5.6)	17 (94.4)			0.20
Total	17 (14.5)	99 (85.5)			

Figure 2 below, shows trend in HIV sero status among ANC attendees in Addis Ababa from 2002-2006. It shows decreasing trend in HIV sero positivity among ANC attendees in Addis Ababa from 2002-2006 and increasing trend in HIV sero negativity among the same ANC attendees. As it is shown in the figure the decline in sero positivity is however not smooth. It rather shows mixed pattern of decline and increase in HIV sero status prevalence from 2002 to 2006.

Figure 2: Trends in HIV Sero-prevalence among HIV tested ANC attendees in Addis Ababa, 2002-2006

Trends in HIV sero prevalence among ANC attendees in Addis Ababa, 2002-2006.



As shown in Table 18, among the total 1720 mothers who were tested for HIV 829(48.2%) were primigravida and the rest 891 (51.8%) were multigravida (gravidity >1). Out of 829 primigravida and 891 multigravida mothers who were tested for HIV, 49 (5.9%) and 104 (13.2%) were HIV positive respectively. This difference is statistically significant ($P<0.0001$). Similarly as shown in Table 19, among a total of 1712 mothers who were tested for HIV, 927 (54.1%) were primiparous mothers, while 785 (45.9%) were multiparouse. Among 927 primiparous mothers who were tested for HIV in 5 years only 64 (7.4%) were HIV positive whereas, among 785 multiparous mothers 87 (11.1%) were found to be positive for HIV. Over all HIV sero prevalence was found to be significantly higher among multiparouse mothers ($p<0.01$) compared with primiparous mothers.

Table 18, Distribution of HIV sero status among ANC attendees in Addis Ababa by gravidity, parity and year of VCT.

Gravidity	Positive N (%)	Negative N (%)	Total N (%)
Primigravida			
2002	15 (7.9)	176 (92.1)	191
2003	5 (3.6)	132 (96.3)	137
2004	8 (7.7)	96 (92.3)	104
2005	15 (7)	199 (93)	214
2006	6 (3.3)	177 (96.7)	183
Sub Total	49 (5.9)	780 (94.1)	829 (48.2)
2-5,			
2002	31(15.2)	172 (84.8)	203
2003	21 (11.6)	160 (88.4)	181
2004	18 (16.5)	89 (84.5)	107
2005	22 (11.1)	176 (88.9)	198
2006	9 (5.7)	148 (94.3)	157
Sub Total	101 (11.9)	745 (88.1)	846 (49.2)
Multi Gravid (> 5)			
2002	2 (13.3)	13 (86.7)	15
2003	1 (9.1)	10 (90.9)	11
2004	0 (0)	8 (100)	8
2005	0 (0)	5 (100)	5
2006	0 (0)	6 (100)	6
Sub Total	3 (6.7)	42 (93.3)	45 (2.6)
Total	153 (8.9)	1567(91.1)	1720 (100)
Parity			
Primipara			
2002	25 (10.8)	207 (89.2)	232
2003	8 (4.9)	155 (95.1)	163
2004	8 (7)	107 (93)	115
2005	17 (7.5)	209 (92.5)	226
2006	6 (3.1)	185 (96.9)	191
Sub Total	64 (7.4)	863 (92.6)	927(54.1)
1-5			
2002	23 (13.3)	150 (86.7)	173
2003	16 (10.3)	139 (89.7)	155
2004	17 (18)	78 (82)	95
2005	19 (10.2)	167 (89.8)	186
2006	9 (5.9)	143 (94.1)	152
Sub Total	84 (11)	677 (89)	761(44.5)
Grande multipara			
2002	0 (0)	3 (100)	3
2003	3 (50)	3 (50)	6
2004	0 (0)	5 (100)	5
2005	0 (0)	5 (100)	5
2006	0 (0)	5 (100)	5
Sub Total	3 (12.5)	21 (87.5)	24(1.4)
Total	151(8.8)	1561(91.2)	1712 (100)

Looking at the trend (Table19) in HIV sero prevalence among mothers with different gravidity during different years statistically significant declining trend ($X^2_{\text{for trend}} = 29.864$, p-value < 0.0001) was observed among ANC attendees having more than 5 gravidity, from 2002-2006. (Table19) On the other hand, statistically significant decline in sero prevalence

was not however demonstrated among ANC attendees based on maternal parity status from 2002-2006 though figures show one of declining.

Table 19, Trends in HIV Sero status among HIV tested ANC attendees by gravidity, parity and year of VCT

Gravidity	Positive N (%)	Negative N (%)	X ²	p-value	Odds ratio
Primigravida					
2002	15 (7.9)	176 (92.1)	0.867	0.35177	1.00
2003	5 (3.6)	132 (96.4)			0.48
2004	8 (7.7)	96 (92.3)			1.00
2005	15 (7)	199 (93)			0.87
2006	6 (3.3)	177 (96.7)			0.36
Total	49 (5.9)	780 (94.1)			
2-5,					
2002	31(15.2)	172 (84.8)	3.363	0.06666	1.00
2003	21 (11.6)	160 (88.4)			0.77
2004	18 (16.5)	89 (83.5)			1.16
2005	22 (11.1)	176 (88.9)			0.78
2006	9 (5.7)	148 (94.3)			0.36
Total	101 (11.9)	745 (88.1)			
Multi Gravid (> 5)					
2002	2 (13.3)	13 (86.7)	29.864	0.000000	1.00
2003	1 (9.1)	10 (90.9)			0.66
2004	0 (0)	8 (100)			0.00
2005	0 (0)	5 (100)			0.00
2006	0 (0)	6 (100)			0.00
Total	3 (6.7)	42 (93.3)			
Parity					
Primipara					
2002	25 (10.8)	207 (89.2)	2.661	0.10283	1.00
2003	8 (4.9)	155 (95.1)			0.43
2004	8 (7)	107 (93)			0.61
2005	17 (7.5)	209 (92.5)			0.70
2006	6 (3.1)	185 (96.9)			0.25
Total	64 (7.4)	863 (92.6)			
1-5					
2002	23 (13.3)	150 (86.7)	2.220	0.13625	1.00
2003	16 (10.3)	139 (89.7)			0.71
2004	17 (18)	78 (82)			1.40
2005	19 (10.2)	167 (89.8)			0.71
2006	9 (5.9)	143 (94.1)			0.41
Total	84 (11)	677 (89)			
Grande multipara					
2002	0 (0)	3 (100)	27.722	N/A	N/A
2003	3 (50)	3 (50)			N/A
2004	0 (0)	5 (100)			N/A
2005	0 (0)	5 (100)			N/A
2006	0 (0)	5 (100)			N/A
Sub Total	3 (12.5)	21 (87.5)			

N/A= Not available, because it has zero Odds ratio denominator.

4.2.4 Service availability

In all visited health centers there are PMTCT trained counselors though the number is variable (Table 20), providing PMTCT services. They initiate all ANC attendees to undergo counseling and HIV testing (opt-out strategy) though the final decision to accept or not is in

the hands of clients. Those ANC attendees who volunteer to accept VCT services are offered the service and are registered in PMTCT log books. Subsequently they are provided with counseling services on MTCT of HIV. Following effective counseling, clients are sent to VCT laboratories where there are 2-3 laboratory technicians trained on HIV testing procedures. However not all ANC clients accepting/receiving counseling are volunteer to under go HIV testing. At all health centers rapid HIV testing methods are used to test their clients which is done only once during the first visit though repeat tests may be practiced in some health centers using ELISA or Western blot tests to confirm results in HIV Positive clients.

Table 20, Availability of personnel trained on PMTCT and related areas in visited government owned health centers in Addis Ababa.

Health centers	PMTCT	VCT	ART	HIV test lab.	Total
Kolfe	2	3	3	3	11
Addis Ketema	3	6	3	4	16
Lideta	5	6	4	3	18
T/haimanot	3	5	3	4	15
Total	13	20	13	14	60

Before 2003 the Nigat project was the only PMTCT program available in Addis Ababa/Ethiopia. It was a collaborative research program between Addis Ababa University and John Hopkins University which was started in 2001.

Post test counseling are provided to all tested clients after the patient has received their test results the same day they have undergone HIV testing. However, the kind of advice/education given during post counseling sessions may vary depending on individual client's test results. HIV negative clients are advised to maintain their negative sero status by advising them on safe sex and encouraging them to get their partner tested. HIV positive mothers are tested using ELISA or western blot tests to confirm positive results. However decisions to put HIV positive pregnant mothers on ART or decide delivery routes are determined after determining maternal blood viral load or CD4 count which is done after referring clients to Gandhi, St. Paul and Black Lion Hospitals in Addis Ababa. These are centers where HIV positive pregnant mothers from all health centers and hospitals in Addis Ababa are referred to and followed up to the time of delivery and for two years (including follow up of babies born from HIV positive mothers) post delivery and where they are given

advises and education on safe child feeding practices, family planning method to prevent possible future pregnancies and encouraged for positive living with HIV/AIDS and get their partners tested. So far more than 20,000 pregnant mothers and 800 children were provided PMTCT of HIV services.

ART is available at all visited health centers for use by all HIV positive VCT clients regardless of sex or pregnancy. Though MOH is the main provider of ART such organizations as RPM-Plus (Rational Pharmaceutical Management-Plus) from the donations they obtain from different donor Agencies are also important suppliers of ART for both PMTCT and non-PMTCT programs. No ART drug supply shortage was complained by all visited health centers in Addis.

As shown in Table 21 there are several Non-Governmental (NGOs) in Addis Ababa, providing various care and support to HIV positive mothers and their babies and PMTCT program support activities though, each of them have got varied or overlapping areas of interests. For instance Intra Health (the former Hareg project) is interested in establishment and rehabilitation of PMTC program facilities including building and expansion of delivery (maternity) and HIV/AIDS laboratory facilities with complete supply of materials and consumables. Through its Mother to Mother Project it is also involved in psychological social and economic (for some selected mothers) rehabilitations of mothers living with HIV/AIDS. However, many of these organizations provide their services or support on irregular basis making continuity or sustainability of these services questionable on their absence.

Table 21 Availability of organizations (NGOs) providing care and support for mothers living with HIV/AIDS and support for PMTCT program in Addis Ababa

Name of the NGO	Areas of interest or involvement			
	Facility building/Maintenance	Care & Social support	Training of health personnel	Supply of drug and consumables.
Intra-Health	√	√	√	√
Tikdem		√		
Medihin		√		
Hiwot HIV/AIDS		√		
Marry Joy		√		
AMREF		√		√
RPM-Plus				√

5. Discussion

The quality of PMTCT data available at each service centers was generally very poor. PMTCT counseling logbooks and ANC follow up cards were not properly managed with regard to ease of accessibility, consistency of variables recorded, their completeness and uniformity of formats used across different health centers. A study done in Kenya (26) to

explore whether data from PMTCT could be used to obtain reliable national estimate had shown presence of the same problem with PMTCT data and recommended improvement in quality of PMTCT data and increase PMTCT service coverage among ANC attendees, before such data were used to estimate national HIV/AIDS prevalence.

The main contributory factors for poor quality PMTCT data in Addis Ababa could be due to duplication of registration books, shortage of trained and responsible man power especially on record keeping and data management and lack of resources to computerize PMTCT data.

The overall PMTCT utilization rate, when measured in terms of HIV testing among PMTCT counseled ANC attendee is generally high (92.6%). However this rate is low (39.2%), when we use total pregnant mothers that could exist in five years period in the catchments area as a denominator. This VCT acceptance rate was identical (no significant difference) with VCT acceptance rate of 91.9% among ANC attendees in Cote d'Ivoire in 1999(21). This 39.2% VCT acceptance rate among pregnant mothers in Addis Ababa is identical with VCT uptake report of < 50% by Mazhani et al. in Botswana in 2002, where low involvement of men in PMTCT services were cited as a key factor(30). In Addis Ababa the same factor may be the major factor for low uptake of VCT among pregnant mothers as only < 3% of ANC attendees got their partners tested.

The overall voluntary HIV testing rates among PMTCT counseled is high compared with VCT up take rate of 74.4 % achieved among ANC attendees in Arbaminch in 2003 (29), 56% for Kenya in 2003(26) and identical with 93% HIV testing acceptance rate in 2001 in USA (19). The trends in VCT up take rate among counseled ANC attendees has also significantly increased from 90% in 2002 to 96% in 2006. This is because all visited health centers in Addis Ababa pursue an opt-out strategy where health service providers provide counseling on MTCT of HIV to all ANC attendees and actively initiate/pursued them to test for HIV, though the client has the right to refuse, unlike the opt-in strategy where the initiation/request for HIV testing purely comes from the client side. Studies in Kenya in 2002, have shown that the use of an "opt-out" strategy (HIV testing routine, noncompulsory and provider initiated) to have a strong influence on HIV testing uptake (26). In this study the advantage of opt-out strategy was evaluated among ANC attendees at Kisumu clinic which showed, significantly increasing HIV test acceptance rate with a switch from an opt-in to an opt-out approach in 2002.

Great majority of HIV tested pregnant mothers receive their test results the same day they under went testing. This rate was higher, when compared with 61.9% of return for test

results reported by a study in Abidjan, Cote d'Ivoire, in 1999 (21). This difference may be due to the fact that in Addis Ababa test results are given the same day mothers are tested, unlike the case in Abidjan where mothers receive test results with appointment. However, little is known about sharing received test results with their partner among ANC attendees in Addis Ababa. Moreover, almost all ANC attendees volunteered for HIV testing had undergone HIV testing only once in the course of their pregnancy, though there was a chance of acquiring HIV at all stages of pregnancy, which means that a mother who was free of HIV at first VCT visit or early trimester can turn HIV positive and transmit the virus to her new born resulting in futility of all previous efforts.

The over all VCT uptake rate of 92.6% among age group 15-24 was higher compared to Kenyan study in 2003, which have reported 58.6% acceptance rate of VCT among age group less than 25 years (26) and this difference in VCT acceptance rate was statistically significance ($p\text{-value}=0.0000$, Odds ratio =0.11 and 95% CI=0.04,0.27) . Significant increasing trend in VCT utilization was also observed among maternal age group 15-19 which was identical with the study conducted in South East Ethiopia that had reported significantly higher rate among the same age group. This may be because young pregnant mothers are curious for their health as well as the health of their new born, want longer healthy life and easily influenced by new information as they have relatively better access to health information compared to older age groups (32). The higher VCT acceptance rate among age groups 30-34 may be the effect of maturity and over time accumulated knowledge and experience from reality in life.

The over all VCT acceptance/utilization rate doesn't depend on gestational age according to this study. VCT acceptance rate of 91.4% among ANC attendees with early gestational age is not significantly different from VCT acceptance rate of 93.6% among ANC attendees with more than 28weeks of gestation. Moreover, when we look at trends in VCT utilization rate, by maternal gestational age at first VCT, no statistically significant increasing trend was observed. This may be because VCT utilization is independent of maternal gestational age. As studies showing trends in voluntary HIV test among mothers with different gestational ages are limited, it was not possible to compare different VCT acceptance trends based on maternal gestational age among ANC attendees.

The over all VCT acceptance rates of 87.4% among primigravida ANC attendees is not statistically different from 91.5% acceptance rate among multi gravid ANC attendees in this study. However, both acceptance rates are found to be higher when compared to similar study in Kenya in 2003, which reported 71.5% acceptance rate of VCT among primigravida,

compared with multi gravid mothers who had only 63.4 % acceptance rate (26) and the difference was statistically significant. On the other hand, increasing trend in VCT utilization was observed among primigravide ANC attendees in this study. This is partially because, mother who become pregnant for the first time wishes to be healthy and have healthy baby and partially because of the influence of the availability of PMTCT services and mass media in Addis Ababa.

Similarly, VCT acceptance rate was also shown to be identical among mothers experiencing birth of only one child in their life time and multiparous mothers in this study. The over all VCT acceptance rate of 88.4% among primipara ANC attendees is not significantly different from the over all VCT acceptance rate of among multiparouse ANC attendees. However, increasing trend in VCT utilization was observed (X^2 for trend =10.784, p -value<0.001) among primiparouse ANC attendees in this study. This can be the effect of continuously increasing trend in HIV testing practice by primigravide mothers. However in this case too studies are limited for comparison purpose.

The over all HIV sero prevalence rate of 9.5% among ANC attendees in Addis Ababa was significantly lower (p value < 0.001) when compared with sero prevalence level of 15.6% among ANC attendees in Addis Ababa in 2001(MOH Ethiopia.) and 22.4% among ANC attendees for S. Africa in 1999(24). However, looking at trends in sero-prevalence among ANC attendees in Addis Ababa by year of VCT in this study, one can see no significantly decreasing trend in sero prevalence among ANC attendees in Addis Ababa, especially when we compare HIV sero prevalence in each year with base line sero prevalence level of 11.7% among ANC attendees in 2002 in this study, though mixed pattern of HIV sero prevalence was observed.. However, statistically significant decline (X^2 for trend = 4.364 p -value <0.05)) was observed, when HIV sero-prevalence rate of each year in this study was compared with base line sero prevalence rate of 15.6% among ANC attendees in Addis Ababa in 2001. Similar picture of heterogeneous transmission in HIV was demonstrated among ANC attendees in Addis Ababa from 2001 to 2003 by Hladik et al. (35)

The mixed pattern of HIV sero-prevalence or lack of significant decline in HIV sero-prevalence in this study can be explained by combined effect of increasing availability of HIV/AIDS preventive services including awareness creation campaigns, PMTCT and ART services etc, on one hand and lack of significant involvement of men in PMTCT services on the other.

Among total ANC attendees who were tested for HIV from 2002-2006, 9.2% of HIV positive ANC attendees in Addis Ababa were aged between 15-24 years compared with HIV

sero positivity of 8.6% among ANC attendees aged above 24 years. However, there was no significant difference in HIV prevalence when we compare overall HIV prevalence among 15-24 age groups with overall HIV prevalence among age 15-44. There was also no statistically significant declining trend was observed by maternal age in both age categories though similar mixed pattern can be observed, suggesting that incidence of HIV infection(new infection) is not significantly declining.

The overall HIV sero prevalence increases with gestational age. Among total ANC attendees 8.7% of HIV positive mothers had gestational age between 0-28 weeks at their first VCT. Among mothers with gestational age of 29-36 and 37-42 weeks at their first VCT, HIV positivity rate is 12% and 14.5% respectively. However, this difference in sero prevalence between early and late pregnancy were not statistically significant. Statistically significant declining trend in HIV sero prevalence was observed only among mothers having gestational age of 37-42. Increasing HIV sero prevalence with increasing gestational age may suggest existence of risk of HIV infection during the course of pregnancy suggesting the need for several repeat maternal HIV tests in the course of pregnancy. The declining trend in HIV sero prevalence may be the effect of increasing awareness about MTCT of HIV among mothers in Addis Ababa. However studies on trend in HIV sero prevalence based on gestational age are generally limited to make comparisons.

The over all HIV sero prevalence has also been shown to increase with gravidity and parity in this study. Of 829 primigravida and 891 multigravida mothers who were tested for HIV, 49 (5.9%) and 104 (11.6%) were HIV positive respectively. This difference is not however statistically significant ($P>0.05$). Looking at the trend in HIV sero prevalence among mothers with different gravidity during different years there were statistically significant declining trends in HIV sero prevalence among ANC attendees having more than 5 gravidity from 2002-2006.

Similarly, of 927 primipara and 785 multiparouse ANC attendees who were tested for HIV, 64 (7.4%) and 87 (11.1%) were found to be positive for HIV respectively though, this difference lacks statistical significance ($p\text{-value} > 0.05$). Moreover, no statistically significant decline in sero prevalence was demonstrated based on maternal parity status among ANC attendees in Addis Ababa from 2002-2006. The overall increase in HIV sero-prevalence with increasing gravidity and parity is reflection of increasing risk of HIV infection from increased risky sexual contacts that resulted in frequent pregnancies and child birth. Declining trend in HIV sero prevalence among mothers having more than 5 gravidity in this study may be the effect of increased awareness about HIV/AIDS and care with increasing age among older

women in Addis Ababa and decreasing risky sexual contacts with increasing age. However studies on HIV sero prevalence based on gravidity and parity are also limited to make comparisons.

The availability of PMTCT services to prevent MTCT of HIV is generally good in government owned health centers in Addis Ababa. This might be partially because of presence of large number of NGOs working on HIV/AIDS, concentrated in Addis Ababa and partially because of relatively more attention given to mothers living in the capital by the government. However utilization rate of these services among all pregnant mothers is very low relative to its presence. The reasons for such low service utilization may be fear of stigmatization, prevailing denial of HIV/AIDS in the community and resistance on the part of male partner against HIV testing.

6. Strengths and Limitations of the study

6.1. Strengths

This study design which is retrospective record review study has got certain advantages compared to other cross-sectional/descriptive study designs. For instance such problems as non response, selection biases, recall bias etc which are main problems in other study designs were overcome because of this study design as there was no chance of physical contacts/conduct interview between data collectors and respondents. Moreover, representativeness of the sample was easily assured as random selection of records from PMTCT log books in which all counseled ANC attendees were found registered serially and exhaustively making the task of sampling procedures feasible. This study design was also

found to be cost effective, compared to if the same study was conducted using prospective studies involving 5 years time.

6.2. Limitations of the study

As the design of this study was retrospective record review, access to available data sources and availability of all required variables from those sources had been limited. Available data also varied in quality and completeness. For instance, the variables recorded in the logbooks of PMTCT such as, gravidity, parity, occupation, and marital status data were not complete and considerable number of clients records bearing such variables (such as ANC follow up cards.) were missing. Hence, as a limitation of this study, analysis of variables in certain categories such as gestational age, parity, and gravidity were carried out not based on 100% availability of data, though in all cases of analyzed variables, the unavailability rate did not exceed 10% of the total actual sample size required for the analysis. However, it has been the weakness of this study being based on retrospective records whose availability and completeness is not always guaranteed and this can more or less reduce the quality of this study.

7. Conclusion and Recommendation

7.1. Conclusions

Trends in HIV testes among ANC attendees in Addis Ababa are increasing mainly because of an opt-out strategy that all PMTCT service providers in government owned health institutions pursue, in order to get their clients HIV tested. So the opt-out strategy can be strengthened and widely applied as effective means of increasing acceptability of PMTCT services and other HIV/AIDS prevention and control programs.

HIV sero prevalence among ANC attendees in Addis Ababa has not shown any significant declines among ANC attendees in Addis Ababa since 2002, though figures show mixed pattern of increase and decline among this group of mothers. The lack of significant decline in HIV sero prevalence despite availability HIV/AIDS preventive health services

including PMTCT, and increasing awareness suggests presence of other important barrier such as poor involvement of male counter part in PMTCT programs (as also suggested by other studies else where and in this study too) against making all programmed HIV/AIDS preventive activities less effective.

Maternal factors such as primigravidity and primiparity were found to be strongly associated with increasing trend in voluntary HIV testing after counseling. Only maternal ages 15-19 and 30-34 at first VCT were associated with increasing trend in voluntary HIV testing all showing increased awareness about MTCT of HIV and better acceptability of VCT among relatively younger mothers which according this study is encouraging. Late gestational age and more than, 5 gravidity were associated with declining trend in HIV-sero-prevalence, whereas maternal age in general was not found to affect trends in HIV sero-prevalence among ANC attendees in Addis Ababa.

There is no significantly declining trend in HIV sero prevalence among the young (15-24 age) ANC attendees in Addis Ababa which means that rates of new HIV infections are not significantly decreasing necessitating more intensive but focused efforts, to effectively control the epidemics.

Despite increasing availability of PMTCT services and other HIV/AIDS preventive health service activities in Addis Ababa and increasing awareness about MTCT of HIV (from other studies) among women in Addis Ababa its utilization rate is generally low among pregnant mothers. This might suggest prevalence of other non health service related factors such as psychological, social or economic factors hindering utilization of available health services, implying that preventive program services should take in to account of presence of those factors for effective control of the epidemic.

In this study it has also be shown that the percentage of ANC attendees who have got their partners HIV tested are extremely low. More over little is known whether HIV positive mothers share their test results with their male partner. This factor by itself can hinder the effectiveness of the PMTCT program and can also make the impact evaluation of this program very difficult.

Almost all ANC attendees volunteered for HIV testing had undergone HIV testing only once in the course of their pregnancy though there is a chance of acquiring HIV at all stages of pregnancy, which means that a mother who was free of HIV at first VCT visit or early trimester can turn HIV positive and transmit the virus to her new born resulting in futility of all previous efforts.

In this study it has been found that over all HIV sero-prevalence increases with increasing gestational age, while majority of the mothers are tested at early gestational age further strengthening the need for repeat HIV test in the later stage of pregnancy to all mothers visiting PMTCT centers.

As it was also found by related studies in Kenya, the currently available PMTCT data quality in Addis Ababa health institutions is very poor to be used for making estimation of national HIV/AIDS prevalence. However, it can complement data from ANC sentinel sites for making better estimation of HIV prevalence both at national and regional levels.

7.2. Recommendations

- 1. To significantly decrease HIV sero prevalence and curb the incidence of HIV infection among pregnant mothers the PMTCT program currently under way in almost all government health facilities needs to be further strengthened in both quantitative and qualitative terms and also try to adequately address psychological problems such as denial of HIV infection, fear of stigmatization, etc social (improving women's status ,fighting against male dominance etc) and economic (education and economic empowerment) problems in the community for effective utilization of services and better control of the epidemic.**

- 2. The poor PMTCT data quality observed at all visited health centers needs to be improved. To utilize this data set for estimation of national HIV/AIDS prevalence and use them in tracking trends, PMTCT program registration formats need to be standardized in terms of variables to be recorded and all data should be entered in to a computer to facilitate access to and use of this data. More over there should be trained responsible personnel in charge to manage PMTCT service data. Computerization of data and training and assigning personnel may be costly; however this should be the strategy to achieve the goal of having good quality data in the long run, while improving record keeping and archiving system in the mean time to be able to use this data in the near future for at least supplementing the process of estimating regional HIV/AIDS prevalence.**
- 3. New education and service delivery strategies such as new/innovative ways of awareness creation methods appropriate for pregnant mothers should be developed since the conventional health education methods may not be appropriate for pregnant mothers, besides organizing out reach programs in order to reach pregnant mothers who do not visit modern health services at their home etc, in addition to minimizing missed opportunities among those attending ANC services.**
- 4. Opt- out VCT strategy currently being used in all government health institutions should be strengthened and improved as it has been found to increase VCT acceptability rate among counseled ANC attendees. However the proportion of PMTCT counseled ANC attendees should also increase to 100% for the opt-out strategy to be effective. Hence once again all efforts have to be put to keep missed opportunities at minimum.**
- 5. It is necessary to do 2-3 repeat HIV tests during the course of pregnancy even if there is no evident risk factor on risk assessment. This is because most of ANC attendees got tested in the first trimester and yet HIV sero-prevalence increased with gestational age according to this study. Hence repeat HIV test detects those ANC attendees who might get HIV infected in the course of pregnancy and benefited from PMTCT program.**

6. Further researches have to be conducted to identify important factors responsible for low men involvement in PMTCT program and come up with better preventive strategies.
7. To maintain the current increasing trend in voluntary HIV testing practice among primigravida and primipara ANC attendees, awareness creation campaigns on PMTCT of HIV and available services have to be further strengthened and expanded to secondary schools and other youth centers.
8. To avoid duplication of effort and increase effectiveness and efficiency with regard to program delivery all parties working on PMTCT including government should integrate their activities and improve coordination.

Annex 1

Retrospective record review study to assess trends in voluntary HIV test and Sero - prevalence among pregnant mothers who have attended ANC service in government health centers in AA since 2002.

Part I General

1. Name of the health institution _____
2. Year and month of VCT _____

Part II Maternal characteristics

1. Client identification Number (code) _____

2. Place of residence _____
3. Maternal Age _____
4. Gestational age at VCT _____
5. Parity _____
6. Marital status _____
7. Occupational Status _____

Part III VCT

1. Is it first or repeat VCT visit? _____
First ☐
Repeat ☐
2. Did the mother undergo HIV test? _____(use codes)
3. If yes what was the result _____ (use codes)
4. Did the mother receive post test result? _____

Part IV availability of PMTC service

1. Did the mother receive post test counseling? _____
2. If the mother is HIV-Positive what service did she receive?
 - 2.1 Referred to ART service _____ (use codes)
 - 2.2 Counseled about infant feeding_____ (use code)
 - 2.3 Referred for care and support. _____ (use code)
 - 2.4 Counseled for Postpartum family Planning (FP) _____ (use code)

Part V Partner testing

1. Mother brought partner for testing _____
2. Partner received counseling _____
3. Partner received blood testing _____(use code)
4. Partners blood test result _____ (use code)

Annex 2

Data summary format

Name of health institution _____

Year of VCT_____

[illegible]

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