Maternal Treatment Outcomes of Antiretroviral Therapy Initiation before and during Pregnancy and associated factors at Jimma University Specialized Hospital, Southwest Ethiopia

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Abstract

Background: Treatment outcome of Human immunodeficiency virus infected individual can be evaluated using virological, immunological or clinical criteria. The immunological and clinical outcomes to Highly Active Antiretroviral Therapy among Human immunodeficiency virus infected pregnant women vary according to timing of Highly Active Antiretroviral Therapy initiation.

Objective: To assess maternal treatment outcomes of antiretroviral therapy initiated before and during pregnancy and associated factors at Jimma University specialized Hospital.

Method: Hospital based retrospective cohort study was conducted from March 3 to 29, 2013 by reviewing patients' follow up cards from January 2008 to December 2012.Data were collected using data collection format prepared after review of similar literatures. The data were processed using SPSS version 16. Association between dependent and independent variables was determined using Chi-square tests and odds ratio. Independent predictors of maternal treatment outcome were identified by using logistic regression analysis. A p-value of < 0.05 was considered statistically significant.

Result: A total of 202 Human immunodeficiency virus positive pregnant women with regular follow up from January 2008 – 2012 were included in the study. Of 202 Human immunodeficiency virus positive pregnant women, 115 (56.9%) started Highly Active Antiretroviral Therapy before pregnancy and 87 (43.1%) started Highly Active Antiretroviral Therapy during pregnancy. Among the study participants, 169(83.6%) and 142(70.3%) had good immunological and clinical outcome respectively. In adjusted logistic regression, unknown Human immunodeficiency virus status prior to pregnancy was 0.15 times more likely to have poor immunological outcome compared to known Human immunodeficiency virus status prior to pregnancy (AOR = 0.158, 95% CI = (0.041 – 0.602), P = 0.007). Baseline CD4 count < 200 was 0.02 times more likely to have poor immunological outcome compared to CD4 count ≥ 200 (AOR = 0.023, 95% CI = (0.003 – 0.190), P = 0.000). Women who started HAART treatment before pregnancy had good clinical outcome (AOR = 0.349, 95% CI = (0.157 – 0.776), P= 0.010). In adjusted logistic regression, baseline WHO clinical stage III was 7.673 times more likely to have poor clinical outcome compared to baseline WHO clinical stage I (AOR = 7.673, 95 % CI = 1.640 – 35.892, P= 0.010). Highly Active Antiretroviral Therapy initiation initiated during pregnancy was 0.3 times more likely to have poor clinical outcome compared to Highly Active Antiretroviral Therapy initiation initiated before pregnancy (AOR = 0.349, 95% CI = 0.157 – 0.776, P= 0.010).Total duration of treatment, 13 - 18 months was 0.193 times more likely to have poor clinical outcome compared to total duration of treatment > 18 months (AOR = 0.193, 95% CI =0.056 – 0.669, P= 0.010)

Conclusions and recommendations: The independent predictors of maternal immunological outcome were Human immunodeficiency virus status prior to pregnancy and baseline CD4 lymphocyte count. Women that started Highly Active Antiretroviral Therapy treatment before pregnancy had good clinical outcome. The independent predictors of maternal clinical outcome were baseline WHO clinical stage, time of Highly Active Antiretroviral Therapy initiation and total treatment duration. Women in the reproductive age group should be encouraged to know their Human immunodeficiency virus status before pregnancy.

Key words: Treatment outcomes, Antiretroviral Therapy, Pregnancy, Southwest Ethiopia

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Acronyms and Abbreviations

AIDS: Acquired Immunodeficiency Syndrome

ADE: Aids Defining Event

ART: Antiretroviral Therapy

ARV: Antiretroviral

CS: Caesarean section

EDHS: Ethiopian Demographic Health Survey

FHAPCO: Federal HIV/AIDS Prevention and Control Office

HAART: Highly Active Antiretroviral Therapy

HIV: Human Immunodeficiency Virus

JUSH: Jimma University Specialized Hospital

MOH: Ministry Of Health

MTCT: Mother to Child Transmission

NGO: Nongovernmental Organization

OIs: Opportunistic Infections

PEP: Post Exposure Prophylaxis

SVD: Spontaneous Vertex Delivery

UNAIDS: Joint United Nations Program on HIV/AIDS

UNDP: United Nations Development Program

WHO: World Health Organization

1. Introduction

1.1 Background

The emergence of the HIV epidemic is one of the biggest public health challenges the world has ever seen in recent history. In 2011, there were 34 million people living with HIV. Among these, Sub-Saharan Africa accounts for 69% of all people living with HIV. Women account for 58% of people living with HIV in sub-Saharan Africa. In the same year, 2.5 million people became newly infected with HIV; among these 330,000 were children and 1.7 million people died from AIDS-related causes worldwide (1).

In Ethiopia, among women age 15-49 HIV prevalence is 1.9 % (2). According to the 2012 world AIDS day report, 790, 000 Ethiopians were living with HIV/AIDS, 13,000 children were newly HIV infected and there were 53,831 HIV related deaths in Ethiopia (1). During 2011, a total of 10,302 HIV positive pregnant women received ARV prophylaxis for PMTCT. However, overall coverage of PMTCT still remains as low as 24% of the expected eligible population. MTCT of HIV was 17% at six weeks and 30% including breast feeding (3)

Treatment outcome of HIV infected individuals can be evaluated using virological, immunological or clinical criteria. The earliest indicator is virological followed by immunological treatment success or failure; usually clinical treatment failure becomes apparent much later (4).

The immunological and clinical outcomes to HAART among HIV infected pregnant women vary according to timing of HAART initiation (5). Longer duration antenatal ARV prophylaxis is more effective than shorter duration ARV prophylaxis. In research done in 10 European countries, the risk of mother-to-child transmission was lower among those who initiated HAART before pregnancy than among women who initiated HAART during pregnancy, 0.25% (1 of 397) vs. 1.92% (10 of 52) respectively. The 11 women who have transmitted HIV to their children had relatively advanced HIV disease, with a median maternal CD4 cell count of 209 cells/ mm^3 (64–468 cells/ mm^3) (6). In the study done in Johannesburg, South Africa, MTCT in women who

started HAART before pregnancy was 0.7% (1 of 143) and 5.7% (42 of 730) in those who started HAART during pregnancy (7).

Combination regimens are more effective than single-drug regimens in reducing perinatal transmission. A study done in Abidjan, Cote d'Ivoire reported a significantly lower transmission rate among infants with maternal HAART (2.3%), compared to single-dose nevirapine (16.1%)(8). In kesho Bora study, maternal median CD4 cell counts were higher in the triple antiretroviral group than the zidovudine and single-dose nevirapine group. At enrollment the CD4 cell counts were 336 cells/mm^3 versus 339cells/ mm^3, at delivery 463 /cellsmm^3 versus 416cells/ mm^3, and at 6 months 479 cells/ mm^3 versus 374 cells/ mm^3 and 12 months 401cells/ mm^3 versus 378 cells/ mm^3) in the triple antiretroviral group and the zidovudine and single-dose nevirapine group respectively. The cumulative rate of HIV transmission at 6 weeks was 3.3% in the triple antiretroviral group compared with 5.0% in the zidovudine and single-dose nevirapine group (9).

Maternal plasma HIV RNA level is the best individual predictor of MTCT risk. Other risk factors include vaginal delivery, prolonged rupture of the membranes, prematurity, low CD_4^+ cell count, maternal symptomatic HIV disease, viral subtype, breastfeeding and host genetic factors (10).

Challenges and gaps against prevention of MTCT HIV infection include: drug resistance, drug safety, adverse effects associated with HAART, infant feeding of HIV-infected mothers, limited donor funding support, the fact that many women in resource limited settings deliver at home, many women may not seek antenatal services at health institutions lack of male involvement in HIV testing, issues of disclosure by women of their HIV status that may prevent HIV-infected women from receiving appropriate antiretroviral interventions for both PMTCT and their own treatment and lack of comprehensive contraceptive services for HIV-infected women (11,12).

1.2 Statement of the Problem

The CD4 cell count was significantly lower at delivery when HAART was initiated after week 14 of gestation than when it was initiated before week 14 (mean 420 cells/ mm^3 vs. 484 cells/ mm^3; $P<0.05$) in the study conducted in Denmark (13).

In the study done in Cape Town, South Africa, advanced immunodeficiency at presentation and duration of HAART before birth were significantly associated with transmission of HIV from infected pregnant mother to her infant. All of the mothers who gave birth to HIV-positive infants had less than 8 weeks' HAART prior to delivery. There were no HIV transmissions among women who received at least 8 weeks of therapy before delivery. The MTCT of HIV rate was 5.1% (11/217) for infants whose HIV status was known in mothers who had less than eight weeks HAART prior to delivery (14).

The risk of HIV transmission among persons with low CD4+ cell counts appears to be substantially higher than the risk among persons with higher CD4+ cell counts (15). In the study conducted in Cameroon, Yaoundé duration of ARV regimens more than four weeks was very important for a better reduction of MTCT risk, through increase in CD4 counts. Mothers with CD4 counts below 350cells/ mm^3 had a fourfold risk of MTCT of HIV (16).

In a pooled analysis of randomized trials from sub-Saharan Africa, children born to mothers in the advanced stages of HIV infection were at considerably higher risk of death when compared to those of mothers who were at a less advanced stage of the disease (irrespective of the child's HIV infection status), and this association was even stronger for uninfected children (17).

Mortality was estimated in sub-Saharan countries for HIV-infected children by timing of transmission; initial time was the estimated date of acquisition of HIV-infection. Overall, 12 months post-acquisition of infection, an estimated 52% of children with peripartum infection and 26% of those with postnatal infection died (18).

Advanced disease stage and low CD4 cell counts have been shown to be associated with a higher frequency of zidovudine resistance in the study done in Thailand (19). In research done in

Tanzania, women carrying virus variants with zidovudine selected mutations at delivery displayed a 10 fold higher median viral load compared to women without zidovudine resistance mutation at delivery (p=0.021). Nevirapine resistance was 18% and lamivudine resistance was 8%. The overall HIV transmission rate in this study cohort of 50 mother infant pairs 4–6 weeks after delivery was 14.3% and thus unexpectedly high (20).

Different measures have been taken to improve immunological and clinical responses of HIV-infected mothers to prevent mother to child transmission. Antiretroviral therapy is the main backbone strategy. The WHO updates its guidance in 2010, and recommends ART for PMTCT from 14 weeks of gestation in pregnant mothers whose HIV status is known during pregnancy to ensure maximize uptake, especially in the second trimester, and to reduce the risk of intrauterine transmission. To enhance antiretroviral therapy initiation ANC and PMTCT have integrated. HIV-infected women already receiving HAART are recommended to continue therapy. In addition, correction of risk factors (e.g. cigarette smoking, IUD),optimizing obstetric practice (e.g. limiting duration of membrane rupture, elective cesarean section), avoiding breast feeding and exclusive breast feeding are some among measures undertaken to improve immunological & clinical responses of HIV- infected mothers to prevent mother to child transmission (14,21,22).

But, time of initiation of antiretroviral therapy varies from individual to individual. Some HIV – infected pregnant mothers start before pregnancy, others start during pregnancy at different gestational age.

To my knowledge no studies regarding maternal treatment outcomes of antiretroviral therapy initiation before and during pregnancy has been conducted at Jimma University Specialized Hospital. This study is, therefore, aimed at assessing, maternal treatment outcomes of initiation of antiretroviral therapy before and during pregnancy and associated factors at Jimma University specialized Hospital.

2. Literature Review

I. Maternal socio – demographic and clinical characteristics

Maternal age at delivery for 210 HIV- infected women in Denmark ranged from 17 to 45 years (mean age 31 years). In eleven of 200 pregnancies (5.5%) the women had been diagnosed with an AIDS-related illness. In 30 out of 195 pregnancies (15.4%) the mother smoked. The median gestational age was 38 weeks (range 25–42 weeks); 32 of 188 deliveries (17.0%) were premature (<37 weeks), and eight of 188 (4.3%) were very premature (<32 weeks) (13).

In the study done in United kingdom and Ireland, among women on HAART, 24.1% (1075/4469) started it before pregnancy, and the median gestational age at initiation for those starting in pregnancy was 25.9 weeks (interquartile range (IQR): 22.4–28.9 weeks)(23).

In the study done in Johannesburg, South Africa, the mean age of participant women was 30.2 years (SD = 5.0). The majority of women (84.8%, n=968) were started on HAART during pregnancy with the remainder (15.2%, n=174) conceiving while on therapy. The median baseline CD4 cell count for 875 women in whom this was available was 161.0 cells per cubic millimeter with 76.0% of women in the cohort below 200 cells per cubic millimeter. Syphilis was the only sexually transmitted infection routinely screened in this cohort, with 3.1% testing positive. The mean duration of therapy before child birth was 10.7 weeks and 93.4 weeks among those who started HAART during pregnancy and among those who became pregnant on HAART, respectively (7).

In the study done at the Gugulethu Community Health Centre in Nyanga, Cape Town South Africa, between 2002 and 2008, mothers participated in the study had median age was 27.5 years (range 15 - 44); median gestational age 28 weeks (inter quartile range (IQR) 24 - 32), baseline WHO clinical stage I & II, III and IV account 179 (79 %), 78 (34%) and 8 (3%) respectively and the median baseline CD4 cell count 134/µl(84 – 168) (IQR 88 - 179) (14).

In Cameroon Yaoundé between October 2004 and March 2008, 443 mother-infant pairs were received at ‘‘Caisse Nationale de Prevoyance Sociale (CNPS)’’ hospital. The median age of mothers was 27 years. More than 74% (310/418) of them had at least secondary school level

education, 68% were experiencing their first pregnancy or had only one previous delivery. The median CD4 count was 380cells/mm3 (IQR 310–450cells/mm3). Thirty-six women (8.6%, n=418) delivered through caesarean section. Among the 418 live births, 11.2% were born to mothers who had a premature rupture of membranes (16).

In the study done in Angola 55 (52.9%) women were not diagnosed with HIV before pregnancy. The median CD4 at first in pregnancy was 359 cells/mm3 (IQR 224–486 cells/mm3) .The most common antiretroviral regimen in pregnancy was lamivudine plus zidovudine plus nevirapine (62/68, 91.2%). All regimens included a backbone of two nucleosides (zidovudine-lamivudine: 64, stavudine-lamivudine: 3, tenofovir-lamivudine: 1), plus nevirapine (n: 64), efavirenz (n: 3) or lopinavir/ritonavir (n: 1). Only a few treatment changes occurred during pregnancy (n: 7, 10.3%), because of drug intolerance (n:2) and lack of therapeutic response (n: 5, defined by a CD4 count drop .25%, a viral load increase .30%, or development of opportunistic infections) (24).

II. Immunological outcome to timing of ART initiation

The study done in Nashville, Tennessee, showed immunological outcome was similar among women who started HAART before and during pregnancy (5). Pregnant women who started HAART before pregnancy have more CD_4+ lymphocyte count than those who started HAART during pregnancy, 187.7cells/mm3 versus 155.5cells/mm3 respectively. Advanced immunosuppressant contributes to the high rate of MTCT in cohort study as compared with rates reported from women on HAART in which the majorities have CD4 counts > 200 cells per cubic millimeter in the study conducted in Johannesburg, South Africa (7). The study done in Umlazi, South Africa, among 371 HIV exposed infants 9 (2.4%) had HIV positive status at birth. Eight of the 9 (88.9%) infants were born to women with CD4 count ranging between 13 and 41 (25).

III. HIV disease progression

A lower proportion of women progressed to ADE or death among women starting first HAART during pregnancy compared to those starting HAART before or after pregnancy: 3 (25%), 3 (4%), and 5 (17%) for women who started HAART before, during, and after pregnancy,

respectively (P=0.01). In Kaplan-Meier analysis, the differences in HIV disease progression were not statistically significant (log-rank test, P=0.10) in the study conducted in Nashville, Tennessee (5).

IV. Factors determining immunological and clinical responses

The independent predictors of immunological outcome in the study done in Nashville, Tennessee, were time of HAART initiation, baseline CD4, CD4 lymphocyte count, age at first HAART start, black race, prior ADE , prior non – HAART use, HAART type and prior pregnancies .The independent predictors of clinical outcome were not determined in this study, because the study had low power to detect differences in clinical outcomes between pregnancy groups and HAART initiation during pregnancy had different indications(5).

V. MTCT of HIV to timing of ART initiation

MTCT of HIV in women who become pregnant on HAART was 0.3% (1 of 397) versus 1.9% (10 of 521) among women who started HAART during pregnancy in the European Collaborative study (6).

In pregnant women who initiated HAART before pregnancy vertical HIV transmission was 0.7% (1 of 143). In pregnant women who initiated HAART during pregnancy vertical HIV transmission varies according to the duration on HAART. In pregnant women who initiated HAART > 16 – 32 weeks, 4 - 16 weeks and < 4 weeks, vertical HIV transmission during pregnancy was 3.2% (5 of 157), 5.5% (23 of 422), and 9.3% (14 of 151) respectively. Among those who received single dose NVP vertical HIV transmission were 7.9% (121 of 1534). In general, vertical HIV transmission in pregnant women who initiated HAART before pregnancy is less than in pregnant women who initiated HAART during pregnancy in the study done 28 clinics in Johannesburg city and the surrounding sub urban of South Africa (7).

Findings reported from the United Kingdom and Ireland confirmed being on HAART at conception and starting HAART earlier in pregnancy were associated with a lower risk of transmission after adjusting for viral load. The reason could be due to an increased risk of in-uterus transmission before initiation of treatment. A single transmission occurred in women on

HAART before pregnancy (0.1%, 1 of 928) versus 1.3% (39 of 2967) among those who started during pregnancy (23).

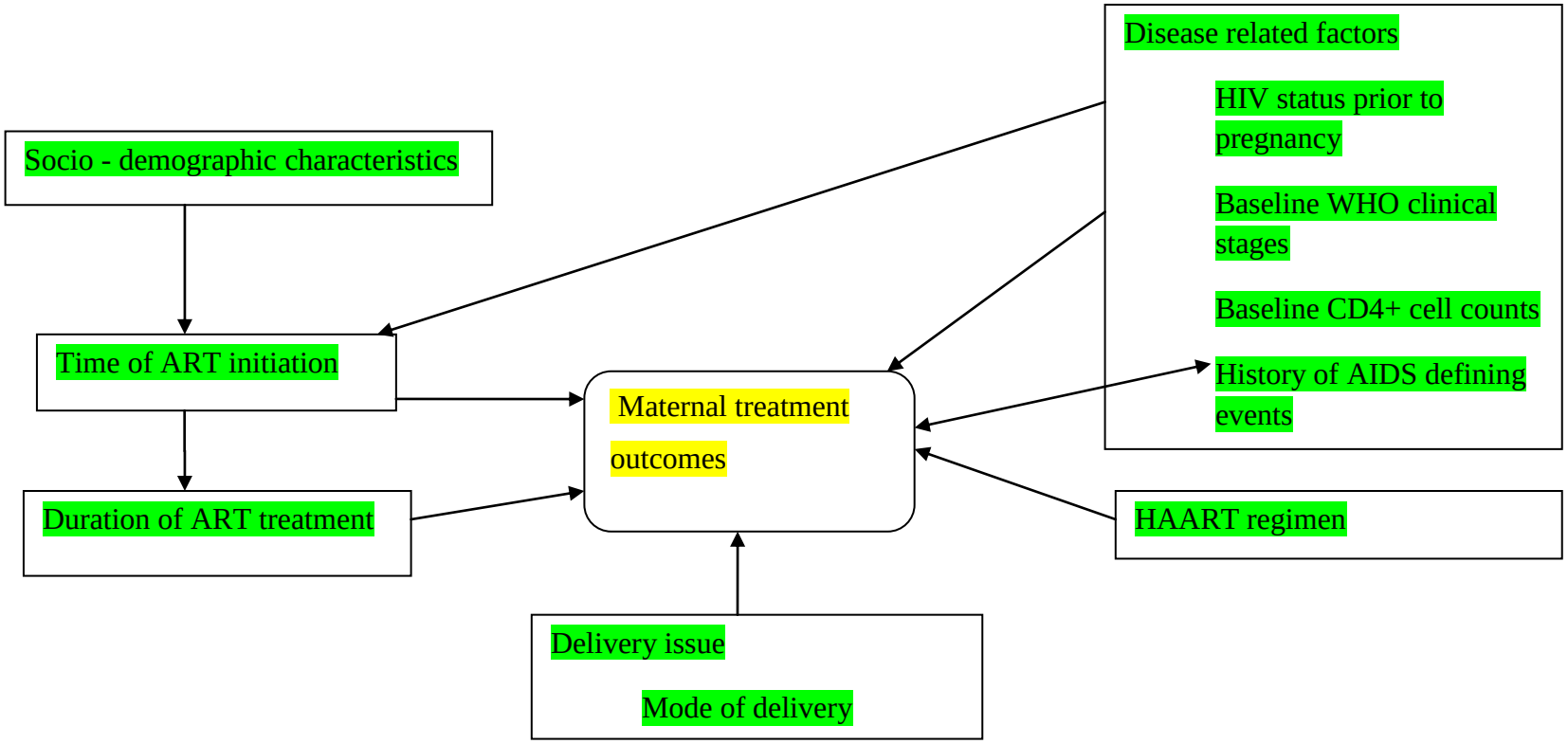
2. 1 Significance of the Study

The burden of HIV disease among women and children worldwide is staggering. MTCT of HIV is responsible for the vast majority of HIV pediatric cases, and represents a substantial source of pediatric mortality in countries with high HIV prevalence. To overcome the challenge of HIV/AIDS, prevention of mother to child transmission is one among the others. The risk of HIV transmission from mother-to-child can be reduced by using antiretroviral drugs. Increased number of the CD4+ count through HAART plays its own vital role in the field of battle against HIV/AIDS transmission. The clinical response to HAART in pregnant mothers also contributes a lot. Thus, PMTCT is a highly effective intervention and has huge potential to improve both maternal and child health by reducing mortality rate among children less than five years by two thirds, maternal mortality by three quarters and halt and begin to reverse the spread of HIV/AIDS to be met by 2015 (26).

In the study done in Johannesburg, South Africa, pregnant women who started HAART during pregnancy had less CD4 lymphocyte count than those who started before pregnancy. In the study done in sub-Saharan Africa, there was large number of children death, born to mothers in the advanced stages of HIV infection (7, 17).

Therefore, the main aim of this study was exploring the correlation of ART initiation time and the treatment outcomes of mothers, and identifying factors affecting maternal treatment outcomes. Besides, the result of this study will help to expedite the timing of initiation of HAART and also serve as base line information for further studies in large scale at regional and/or national levels. It encourages women in the reproductive age group to know their HIV status before they become pregnant. It also helps the government and non-governmental organizations in their endeavor to combat HIV/AIDS by strengthening the effort that is made to encourage early diagnosis of HIV in pregnant mothers and initiate ART at appropriate time.

2.2 Conceptual Frame Work



3. Objectives

3.1 General objective

To assess maternal treatment outcomes of antiretroviral therapy initiated before and during pregnancy and associated factors at Jimma University specialized Hospital.

3.2 Specific objectives

- To assess the effect of timing of HAART initiation on immunological outcome of pregnant women.
- To assess the effect of timing of HAART initiation on clinical outcome of pregnant women.
- To identify factors determining maternal treatment outcomes.

4. Method and Participants

4.1 Study Area and Study Period

The study was conducted at Jimma University specialized hospital (JUSH). Jimma University Specialized Hospital (JUSH) is one of the oldest public hospitals in the country. It was established in 1930 E.C by Italian invaders for the service of their soldiers. Geographically, it is located in Jimma city 352 km southwest of Addis Ababa. It provides service for approximately 9000 inpatient and 80,000 outpatient attendances a year coming to this hospital from the catchment population of about 15,000 million people (27).

Jimma University specialized hospital is the only referral hospital in South West Ethiopia. The services provided by JUSH are classified as clinical services (Adult OPD medical service, OPD surgical service, pediatric OPD service, MCH Services, medical referral & follow-up services, surgical referral & follow-up services, dental care and treatment services, dermatological and venereal disease care and treatment services, Ophthalmology services, delivery services, Psychiatry services, TB and HIV care and treatment services, Physiotherapy services, orthothic and prosthetic services, inpatient services for medical, surgical and trauma patients), Laboratory and pathology services (Parasitology, Hematology, Clinical chemistry, Serology, Pathology, Urine analysis , TB culture, Microbiology laboratory), Pharmacy services (inpatient Pharmacy service, outpatient pharmacy service, Drug information services …), Radiology services (X-ray, ultrasound service and special radiological tests) and others (laundry services, food services and central utility services) (27).

In JUSH ART service was started in 1995 E.C with fee. After two years, in 1997 antiretroviral therapy started to be dispensed freely. Now the enrolled number of HIV infected person in JUSH is 6841, among these 3828 are on HAART. PMTCT of HIV service was started in 1998 E.C. It was integrated with ANC in 2002 E.C. The study was conducted from March 3 /2012 to March 29/2012.

4.2 Study Design

Hospital based retrospective general cohort study was conducted.

4.3 Population

4.3.1 Source Population

All HIV infected women who were at reproductive age group and on ART with regular follow up at JUSH from January 2008 - December 2012.

4.3.2 Study Population

All HIV infected pregnant women who started ART before and during pregnancy with regular follow up at JUSH from January 2008 - December 2012.

4.3.3 Sampling techniques and sample size

There was not any sampling technique and sample size calculation, because all HIV infected pregnant women who fulfilled the inclusion criteria were included in the study.

4.4 Inclusion criteria

- Women who started ART before or during pregnancy:
  - ✓ whose baseline and current CD4+ cell counts were known
  - ✓ whose baseline and current clinical stage were known
  - ✓ whose record card were legible and complete

4.5 Exclusion criteria

- HIV infected women without complete CD4+ cell counts
- HIV infected women who were on non - HAART
- HIV infected women who were only on OIs prophylaxis

4.6 Variables

4.6.1 Independent variables

- Socio–demographics
- Clinical characteristics
- HIV status prior to pregnancy
- HAART initiation time
- Duration on HAART
- Baseline CD4+ lymphocyte count
- Baseline WHO clinical stage
- History of AIDS defining events
- Mode of delivery
- Number of pregnancy

4.6.2 Dependent variables

- Maternal treatment outcomes

4.7 Data Collection Instrument and data collectors

Data were collected using data collection tool adapted from previously done researches. The data collection tool includes socio-demographic characteristics and clinical characteristics. Data collection was done by three BSc degree holder nurses. Supervision was carried out by one BSc degree holder nurse and the principal investigator.

4.8 Data Processing and Analysis

Data were checked, coded, entered, and analyzed using SPSS for windows version 16.0 statistical software package. For descriptive statistics, results were expressed in terms of percentages in tables and figures. Association between dependent and independent variables was determined using Chi-square tests and odds ratio. Binary logistic regression analysis was performed to see the relationship of each factor with maternal clinical and immunological outcomes. Independent predictors of maternal treatment outcome were identified by using logistic regression analysis. A p-value of < 0.05 was considered statistically significant.

4.9 Data Quality Control

To ensure data quality, training was given by principal investigator for data collectors and supervisor to have common understanding of the objectives of the study and data collection tool. Pre-test of data collection tool was done on ten HIV infected pregnant women record cards before the actual data collection. The test was done on HIV infected pregnant women record cards not included in the actual study. During the actual data collection, the data was revised for completeness, clarity, and consistency by the supervisor and the principal investigator. Anything which was unclear or ambiguous was corrected on the next day. During analysis the data was also cleared.

4.10 Ethical Consideration

The research proposal was approved by the Jimma University research and ethics board. A formal letter for permission and support was written to the respective hospital administration. An official permission was obtained from the responsible authorities of the hospital administration. Patients' names were not written on the data collection tool for keeping the confidentiality of the

information obtained. The data obtained from the record cards were used only for research purpose. The patient record cards were returned back to the record office. Professional recommendation was provided to the responsible bodies about documentation.

4.11 Dissemination Plan

The findings of the study will be disseminated to relevant stake holders. The findings of the study will be presented on professional associations. Publication on peer reviewed reputable journal will be done.

4.12 Operational Definitions

Good Immunological outcome: change in CD4+ lymphocyte count from start date of HAART to delivery. If there is an increase in CD4+ lymphocyte count; it is termed as good immunological outcome. But, if there is a decrease in CD4+ lymphocyte count; it is termed as poor immunological outcome.

Good clinical outcome: is considered when the baseline WHO clinical stage is changed from higher stages to the lower stage (e.g. from WHO clinical stage III to WHO clinical stage I). Unless and otherwise, if it remains on the first recorded WHO clinical stage or if the WHO clinical stage declines, that means if the baseline WHO clinical stage is changed from lower stages to the higher stage (e.g. from WHO clinical stage II to IV) it is categorized as poor clinical outcome.

HAART initiation time: starting HAART before or during pregnancy

Maternal treatment outcome: it is assessed using maternal clinical outcome and maternal immunological outcome. Both maternal clinical outcome and immunological outcome were grouped as good or poor.

5. Result

5.1 Socio – demographic characteristics

A total of 202 HIV positive pregnant women with regular follow up at JUSH ART clinic/ PMTCT from January 2008 – December 2012 were included in the study. The median age of the pregnant women was 25 years and the mean age was 25.47 years (SD ± 3.6). Two third of the study participants (65.3%) were married, followed by single (16.3%). About half of the study participants (51.5%) were Orthodox, followed by 34.7% Muslim. Regarding their educational status, 81 (38.6%) were at primary level and only 9 (4.5%) of them were at tertiary level. Unemployed study participants were 66.8 % (Table 1).

5.2 Clinical characteristics

Among the 202 study participants, 60 (29.7%) had unknown HIV status prior to pregnancy. About 37.6 % of them had baseline WHO clinical stage II. About two third of the study participants (65.3%) had current WHO clinical stage I, followed by current WHO clinical stage II (31.7%). Of 202 study participants, 97 (48.0%) had baseline CD4 count < 200. The median baseline CD4 was 210cells/mm^3 (IQR 111.75 – 324.75). Eighty seven (43.1%) study participants started HAART during pregnancy. Women starting HAART before pregnancy had lower median CD4+ lymphocyte count (157cells/$mm^{3,}$ IQR 91 - 294) than women who started HAART during pregnancy (257cells/$mm^{3,}$ IQR 153 – 337). The current mean CD4+ count was 440 cells/mm^3 and 386.54 cells/mm^3 for women started HAART before and during pregnancy. One hundred eight (53.5%) women started d4t/3TC/NVP HAART regimen, where as 34 (16.8%) women started d4t/3TC/EFV HAART regimen. In 113 (55.9%) women HAART regimen was changed. With respect to duration of treatment, 82 (40.6%) women had ≤ 6 months duration of treatment. Of these 82 women, 76 (92.7%) of them started treatment during pregnancy. The mean total duration was 32.03 months (SD = 18.4) and 4.07 (SD =3.9) months for those who started HAART before and during pregnancies respectively. Of the total study participants included in the study, 33 (16.3%) had history of ADE. Most of the women (92.6%) gave birth by spontaneous vaginal delivery. About 94.6 % women had one pregnancy during the study period (Table 2).

Table 1: Socio – demographic characteristics of HIV positive pregnant women at Jimma University Specialized Hospital, South West Ethiopia, January 2008 – December 2012

Variables	Frequency	Percentage
Age		
15 – 19	5	2.5
20 – 24	79	39.1
25 – 29	84	41.6
≥ 30	34	16.8
Marital status		
Single	33	16.3
Married	132	65.3
Divorced	25	12.4
Widowed	12	5.9
Religion		
Muslim	70	34.7
Orthodox	104	51.5
Protestant	28	13.9
Educational status		
Illiterate	50	24.8
Primary	78	38.6
Secondary	65	32.2
Tertiary	9	4.5
Occupational status		
Employed	67	33.2
Unemployed	135	66.8

Table 2: Clinical characteristics of HIV positive pregnant women at Jimma University Specialized Hospital, South West Ethiopia, January 2008 – December 2012

HIV status prior to pregnancy		
Known	142	70.3
Unknown	60	29.7
Baseline WHO clinical stage		
I	32	15.8
II	76	37.6
III	65	32.2
IV	29	14.4
Current WHO clinical stage		
I	132	65.3
II	64	31.7
III	6	3.0
Baseline CD4 count category		
≥ 200	105	52.0
< 200	97	48.0
Current CD4 count category		
≥ 200	192	95.0
< 200	10	5.0
Time of ART initiation		
Before pregnancy	115	56.9
During pregnancy	87	43.1
HAART regimen started		
d4t/3TC/NVP	108	53.5
AZT/3TC/NVP	29	14.4
TDF/3TC/EFV	31	15.3
d4t/3TC/EFV	34	16.8
HAART regimen changed		
No	89	44.1
d4t/3TC/NVP	7	3.5
d4t/3TC/EFV	27	13.4
AZT/3TC/NVP	27	13.4
TDF/3TC/NVP	44	21.8
TDF/3TC/EFV	8	4.0
History of AIDS defining events		
No	169	83.7
Yes	33	16.3

Table 2: Clinical characteristics of HIV positive pregnant women … cont'd

Total duration of treatment		
≤ 6 months	82	40.6
7 – 12 months	16	7.9
13 – 18 months	29	14.4
> 18 months	75	37.1
Mode of delivery		
SVD	187	92.6
CS	15	7.4
Number of pregnancy		
One	191	94.6
Two	11	5.4

5.3 Factors affecting maternal immunological outcome

Among 202 pregnant women 33 (16.3 %) had poor immunological outcome (Fig 1). The immunological outcome was associated with unknown HIV status prior to pregnancy (COR = 0.196, 95% CI= 0.057 – 0.672, P = 0.009), and baseline CD4 lymphocyte count < 200 cells/ mm^3 (COR = 0.024, 95% CI = 0.003 – 0.178, P = 0.001) in binary logistic regression (Table 3).

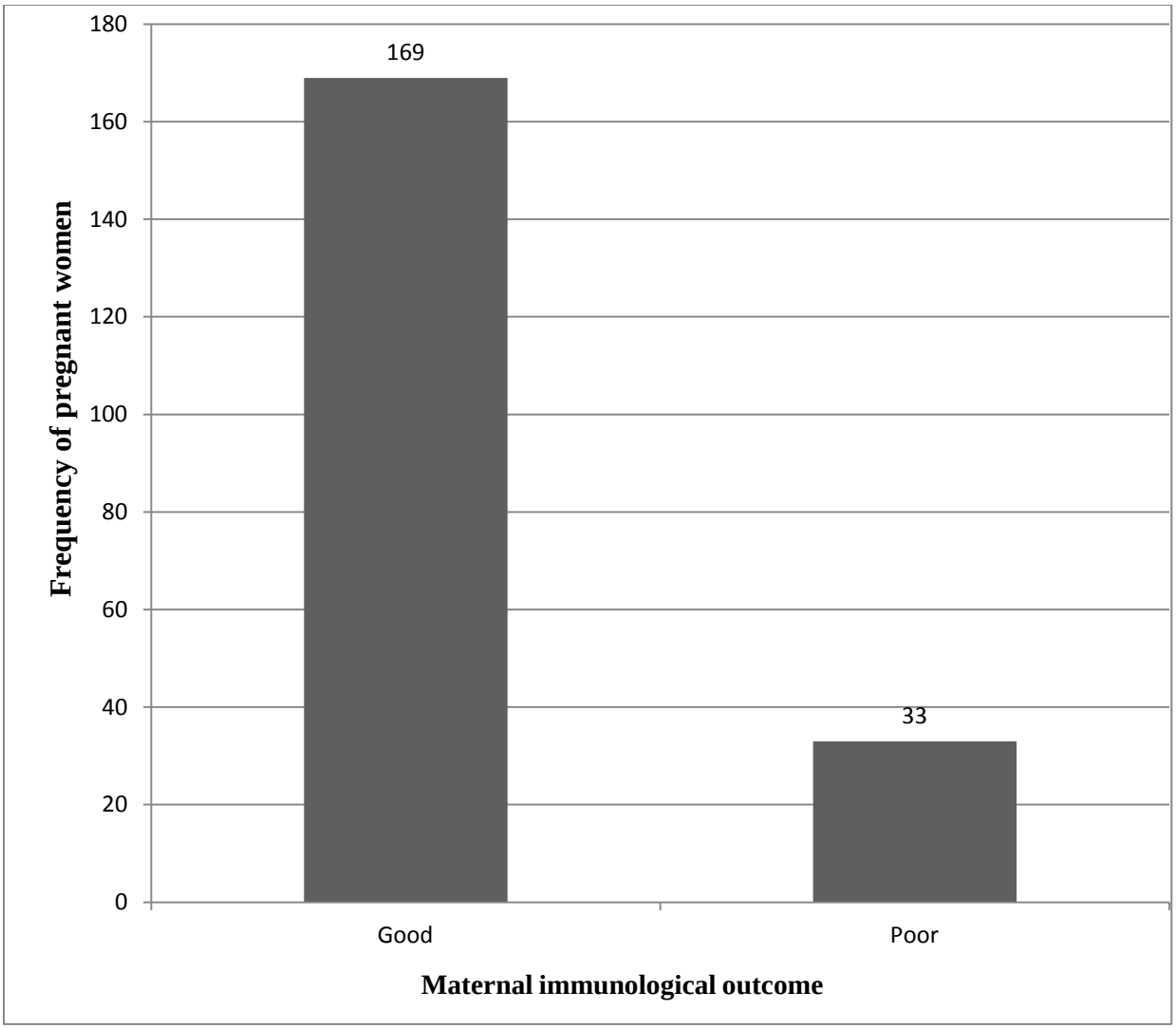


Figure 1: Frequency of maternal immunological outcome of HIV positive pregnant women at Jimma University Specialized Hospital, South West Ethiopia, January 2008 – December 2012

Table 3: Binary logistic regression analysis of factors affecting maternal Immunological outcome at Jimma University Specialized Hospital, South West Ethiopia, January 2008 – December 2012

Variables	Maternal immunological outcome		COR (95% CI)	P – value
	Good n(%), N= 169	Poor N(%), N=33		
Age				
15 – 19	4 (2.4)	1 (3.0)	0.964 (0.093 – 10.047)	0.557
20 – 24	64 (37.9)	15 (45.5)	0.904 (0.331 – 2.466)	0.976
25 – 29	74 (43.8)	10 (30.3)	0.521 (0.180 – 0.180)	0.844
≥ 30	27 (16.0)	7 (21.2)	1	
Marital status				
Single	27 (16.0)	6 (18.2)	1.111 (0.192 – 6.440)	0.709
Married	109 (64.5)	23 (69.7)	1.055 (0.217 – 5.140)	0.906
Divorced	23 (13.6)	2 (6.1)	0.435 (0.053 – 3.536)	0.947
Widowed	10 (5.9)	2 (6.1)	1	
Religion				
Muslim	57(33.7)	13 (39.4)	1.901 (0.497 – 7.262)	0.642
Orthodox	87 (51.5)	17 (51.5)	1.628 (0.441 – 6.008)	0.348
Protestant	25 (14.8)	3 (9.1)	1	
Educational status				
Illiterate	41 (24.3)	9 (27.3)	0.768 (0.136 – 4.330)	0.314
Primary	62 (36.7)	16 (48.5)	0.903 (0.171 – 4.773)	0.765
Secondary	59 (34.9)	6 (18.2)	0.356 (0.060 – 2.114)	0.905
Tertiary	7 (4.1)	2 (6.1)	1	
Occupational status				
Employed	54 (32.0)	13 (39.4)	1	
Unemployed	115 (68.0)	20 (60.6)	0.722 (0.335 – 1.559)	0.408
HIV status prior to pregnancy				
Known	112 (66.3)	30 (90.9)	1	
Unknown	57 (33.7)	3 (9.1)	0.196 (0.057 – 0.672)	0.009
Baseline WHO clinical stage				
I	25 (14.8)	7 (21.2)	1	
II	55 (32.5)	21 (63.6)	2.322 (0.943 – 5.719)	0.067
III	62 (36.7)	3 (9.1)	0.253 (0.065 – 0.989.)	0.048
IV	27 (16.0)	2 (6.1)	0.362 (0.073 – 1.803)	0.215

Table 3: Binary logistic regression analysis of factors affecting maternal … cont'd

Current WHO clinical stage				
I	113 (66.9)	19 (57.6)	1	
II & III	56 (33.1)	14 (42.4)	0.673 (0.314 – 1.440)	0.347
Baseline CD4 count category				
≥ 200	73 (43.2)	32 (97.0)	1	
< 200	96 (56.8)	1 (3.0)	0.024 (0.003 – 0.178)	0.001
Current CD4 count category				
≥ 200	161 (95.3)	31 (93.9)	1	
< 200	8 (4.7)	2 (6.1)	1.298 (0.263 – 6.408)	0.749
Time of ART initiation				
Before pregnancy	100 (59.2)	15 (45.5)	1	
During pregnancy	69 (40.8)	18 (54.5)	1.739 (0.821 – 3.684)	0.149
HAART regimen started				
d4t/3TC/NVP	93 (55.0)	15 (45.5)	1	
AZT/3TC/NVP	25 (14.8)	4 (12.1)	0.992 (0.302 – 3.254)	0.989
TDF/3TC/EFV	23 (13.6)	8 (24.2)	2.157 (0.816 - 5.700)	0.121
d4t/3TC/EFV	28 (16.6)	6 (18.2)	1.329 (0.471 – 3.747)	0.591
HAART regimen changed				
No	72 (42.6)	17 (51.5)	1	
d4t/3TC/NVP	5(3.0)	2 (6.1)	1.694 (0.302 – 9.488)	0.549
d4t/3TC/EFV	22 (13.0)	5 (15.2)	0.963 (0.319 – 2.908)	0.946
AZT/3TC/NVP	24 (14.2)	3 (9.1)	0.529 (0.143 – 1.965)	0.342
TDF/3TC/NVP	46 (27.2)	6 (18.2)	0.522 (0.203 – 1.504)	0.246
History of ADE				
No	139 (82.2)	30 (90.9)	1	
Yes	30 (17.8)	3 (9.1)	0.463 (0.133 – 1.618)	0.228

Table 3: Binary logistic regression analysis of factors affecting maternal … cont'd

Total duration of treatment				
≤ 6 months	66 (39.1)	16 (48.5)	2.030 (0.814 – 5.065)	0.368
7 – 12 months	12 (7.1)	4 (12.1)	2.792 (0.725 – 10.751)	0.129
13 – 18 months	10 (5.9)	2 (6.1)	1.745 (0.520 – 5.855)	0.136
> 18 months	81 (47.9)	11 (33.3)	1	
Mode of delivery				
SVD	156 (92.3)	31 (93.9)	1	
CS	13 (7.7)	2 (6.1)	0.774 (0.166 – 3.603)	0.744
Number of pregnancy				
One	159 (94.1)	32(97.0)	1	
Two	10 (5.9)	1 (3.0)	0.497 (0.061 – 4.019)	0.512

In adjusted multivariable logistic regression, unknown HIV status prior to pregnancy was 0.15 times more likely to have poor immunological outcome compared to known HIV status prior to pregnancy (AOR = 0.158, 95% CI = (0.041 – 0.602), P = 0.007). Baseline CD4 count < 200 was 0.02 times more likely to have poor immunological outcome compared to CD4 count ≥ 200 (AOR = 0.023, 95% CI = (0.003 – 0.190), P = 0.000) (Table 4).

Table 4: Multivariable logistic regression analysis of factors predicting maternal immunological outcome at Jimma University Specialized Hospital, South West Ethiopia, January 2008 – December 2012

+Variable	Maternal immunological outcome		AOR (95% CI)	P-value
	Good N(%), N=169	Poor N(%), N=33		
HIV status prior to pregnancy				
Known	112 (66.3)	30 (90.9)	1	
Unknown	57 (33.7)	3 (9.1)	0.158 (0.041 – 0.602)	0.007
Baseline CD4 count category				
≥ 200	73 (43.2)	32 (97.0)	1	
< 200	96 (56.8)	1 (3.0)	0.023 (0.003 – 0.190)	0.000

5.4 Factors affecting maternal clinical outcome

Of 202 HIV positive pregnant women 60 (29.7 %) had poor clinical outcome (Figure 2). In unadjusted logistic regression, unknown HIV status prior to pregnancy (COR = 3.350, 95% CI=1.759 – 6.379, P = 0.000), baseline WHO clinical stage III (COR = 14.538, , 95% CI = 3.293 – 64.192, P = 0.000), current WHO clinical stage II & III (COR = 0.260, 95% CI = 0.138 – 0.490, P = 0.001), current WHO clinical stage III (COR = 6.769, 95% CI = 1.173- 39.066, P = 0.001), baseline CD4 count < 200 (COR = 0.422, 95% CI = 0.225 – 0.793, P = 0.007), starting HAART before pregnancy (COR = 6.331, 95% CI =3.224 – 12.434, P = 0.000), total duration of treatment ≤ 6 months(COR = 7.700, 95% CI = 3.391 – 17.484, P = 0.000) and total duration of treatment 7 – 12 months (COR = 1.692, 955 CI = 0.403 – 7.112. P = 0.000) showed association with maternal clinical outcome (Table 5).

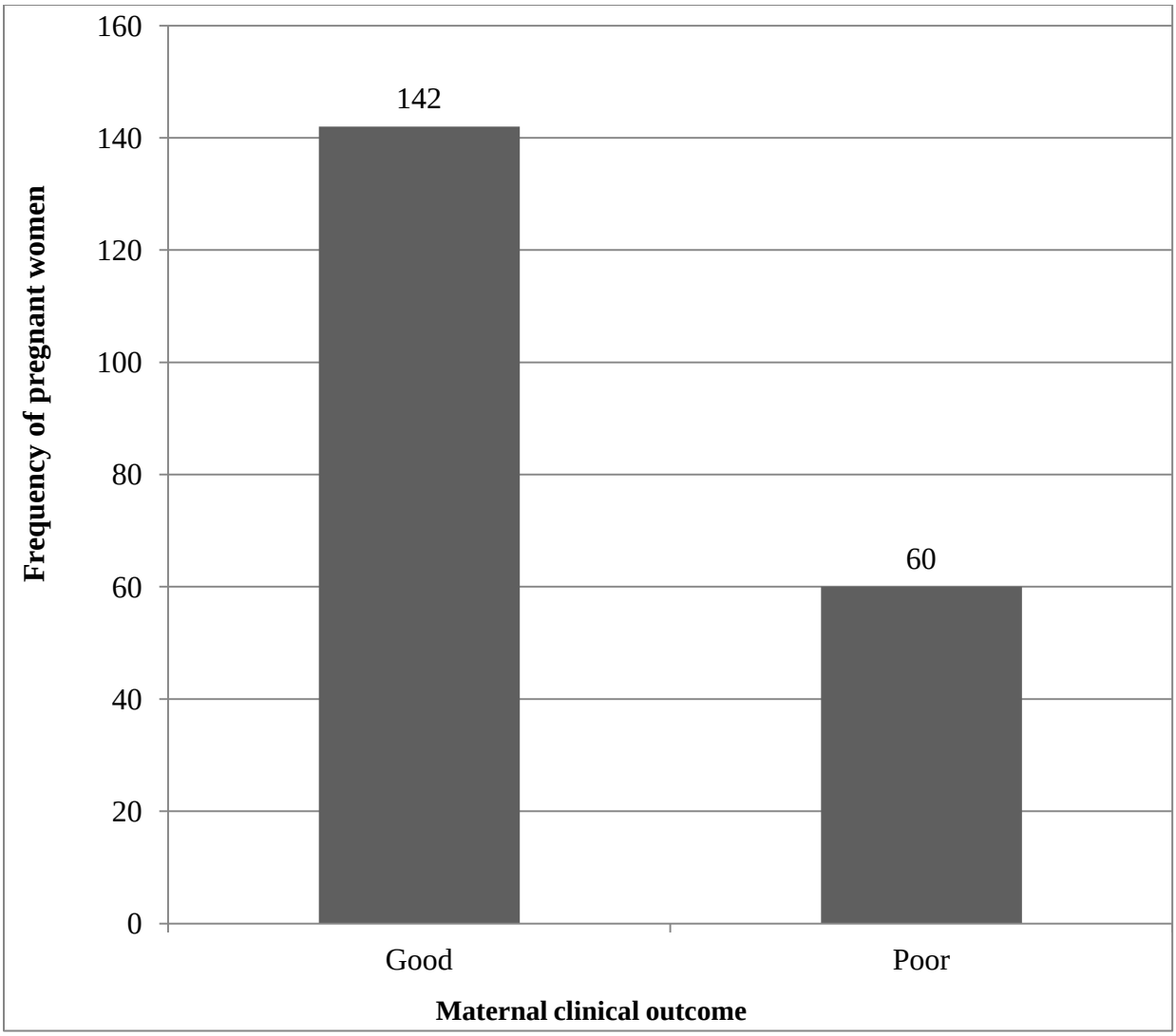


Figure 2: Frequency of maternal clinical outcome of HIV positive pregnant women at Jimma University Specialized Hospital, South West Ethiopia, January 2008 – December 2012

Table 5: Binary logistic regression analysis of factors affecting maternal clinical outcome at Jimma University Specialized Hospital, South West Ethiopia, January 2008 – December 2012

Variables	Maternal clinical outcome		COR (95% CI)	P – value
	Good n (%), N=142	Poor N(%),N= 60		
Age				
15 – 19	4 (2.8)	1 (1.7)	0.523 (0.052 – 5.246)	0.875
20 – 24	54 (38.0)	25 (41.7)	0.968 (0.409 – 2.289)	0.581
25 – 29	61(43.0)	23 (38.3)	0.788 (0.332 – 1.870)	0.941
≥ 30	23 (16.2)	11 (18.3)	1	
Marital status				
Single	23 (16.2)	10 (16.7)	0.870 (0.212 – 3.566)	0.921
Married	92 (64.8)	40 (66.7)	0.870 (0.248 – 3.054)	0.846
Divorced	19 (13.4)	6 (10.0)	0.632 (0.139 – 2.862)	0.827
Widowed	8 (5.6)	4 (6.7)	1	
Religion				
Muslim	42 (29.6)	28 (46.7)	2.444 (.880 – 6.789)	0.065
Orthodox	78 (54.9)	26 (43.3)	1.222(0.447 – 3.342)	0.086
Protestant	22 (15.5)	6 (10.0)	1	
Educational status				
Illiterate	38 (26.8)	12 (20.0)	0.395 (0.091 – 1.710)	0.514
Primary	56 (39.4)	22 (36.7)	0.491 (0.121 – 2.000)	0.214
Secondary	43(30.3)	22 (36.7)	0.640 (0.156 – 2.624)	0.321
Tertiary	5 (3.5)	4 (6.7)	1	
Occupational status				
Employed	46 (32.4)	21 (35.0)	1	
Unemployed	96 (67.6)	39 (65.0)	0.890 (0.471 – 1.682)	0.719
HIV status prior to pregnancy				
Known	111 (78.2)	31 (51.7)	1	
Unknown	31 (21.8)	29 (48.3)	3.350 (1.759 – 6.379)	0.000
Baseline WHO clinical stage				
I & II	52(36.6)	56 (93.3)	1	
III	63(44.4)	2 (3.3)	14.538 (3.293 – 64.192)	0.000
IV	27(19.0)	2 (3.3)	0.429 (0.005 – 0.101)	0.409

Table 5: Binary logistic regression analysis of factors affecting maternal … cont'd

Current WHO clinical stage				
I	106 (74.6)	26 (43.3)	1	
II & III	36 (23.9)	34(50.0)	0.260 (0.138 – 0.490)	0.001
Baseline CD4 count category				
≥ 200	65 (45.8)	40 (66.7)	1	
< 200	77 (54.2)	20 (33.3)	0.422 (0.225 – 0.793)	0.007
Current CD4 count category				
≥ 200	137 (96.5)	55 (91.7)	1	
< 200	5 (3.5)	5 (8.3)	2.491 (0.694 - 8.945)	0.162
Time of ART initiation				
Before pregnancy	99 (69.0)	16 (26.7)	1	
During pregnancy	43 (31.0)	44 (73.3)	6.331 (3.224 – 12.434)	0.000
HAART regimen started				
d4t/3TC/NVP	75 (52.8)	33 (55.0)	1	
AZT/3TC/NVP	21 (14.8)	8 (13.3)	0.816 (0.348 – 2.154)	0..757
TDF/3TC/EFV	24 (16.9)	7 (11.7)	0.663 (0.260 – 1.691)	0.389
d4t/3TC/EFV	22 (15.5)	12(20.0)	1.240 (0.549 – 2.797)	0.605
HAART regimen changed				
No	54 (38.0)	35 (58.3)	1	1
d4t/3TC/NVP	5 (3.5)	2 (3.3)	0.067 (0.113 – 3.358)	0.577
d4t/3TC/EFV	22(15.5)	5 (8.3)	0.351 (0.121 -1.012)	0.053
AZT/3TC/NVP	20 (14.1)	7 (11.7)	0.540 (0.207 – 1.410)	0.208
TDF/3TC/NVP	34 (23.9)	10 (16.7)	0.454 (0.199 – 1.034)	0.060
TDF/3TC/EFV	7 (4.9)	1 91.7)	0.220 (0.026 – 1.870)	0.166
History of ADE				
No	114 (80.3)	55 (91.7)	1	
Yes	28 (19.7)	5 (8.3)	0.370 (0.136 – 1.011)	0.052

Table 5: Binary logistic regression analysis of factors affecting maternal … cont'd

Total duration of treatment				
≤ 6 months	40 (28.2)	42 (70.0)	7.700 (3.391 – 17.484)	0.000
7 – 12 months	13 (9.2)	3 (5.0)	1.692 (0.403 – 7.112)	0.000
13 – 18 months	23 (16.2)	6 (10.0)	1.913 (0.614 – 5.962)	0.473
> 18 months	66(46.5)	9(15.0)	1	
Mode of delivery				
SVD	131 (92.3)	56 (96.7)	1	
CS	11 (7.7)	4 (6.7)	0.851 (0.260 – 2.786)	0.789
Number of pregnancy				
One	135 (95.1)	56(93.3)	1	
Two	7 (4.9)	4 (6.7)	1.378 (0.388 – 4.892)	0.620

In adjusted logistic regression, baseline WHO clinical stage III was 7.673 times more likely to have poor clinical outcome compared to baseline WHO clinical stage I (AOR = 7.673, 95 % CI = 1.640 – 35.892, P= 0.010). HAART initiated during pregnancy was 0.3 times more likely to have poor clinical outcome compared to HAART initiated before pregnancy (AOR = 0.349, 95% CI = 0.157 – 0.776, P= 0.010).Total duration of treatment 13 - 18 months was 0.193 times more likely to have poor clinical outcome compared to Total duration of treatment > 18 months (AOR = 0.193, 95% CI =0.056 – 0.669, P= 0.010) (Table 6).

Table 6: Multivariable logistic regression analysis of factors predicting maternal clinical outcome at Jimma University Specialized Hospital, South West Ethiopia, January 2008 – December 2012

Variables	Maternal clinical outcome		AOR (95% CI)	P-value
	Good n(%), N=142	Poor n(%), N=60		
Baseline WHO clinical stage				
I & II	52(36.6)	56 (93.3)	1	
III	63(44.4)	2 (3.3)	7.673(1.640 – 35.892)	0.010
IV	27(19.0)	2 (3.3)	0.247 (0.031 – 1.953)	0.185
Time of ART initiation				
Before	99 (69.0)	16 (26.7)	1	
During	43 (31.0)	44 (73.3)	0.349 (0.157 – 0.776)	0.010
Total duration of treatment				
≤ 6 months	40 (28.2)	42 (70.0)	0.321(0.061 -1.697	0.181
7 – 12 months	13 (9.2)	3 (5.0)	0.352(0.098 – 1.266)	0.110
13 – 18 months	23 (16.2)	6 (10.0)	0.193(0.056 – 0.669)	0.010
> 18 months	66(46.5)	9(15.0)	1	

6. Discussion

Maternal treatment outcomes can be affected by various factors. This study, tried to assess different factors which can influence the improvement of both clinical and immunological outcomes among HIV positive pregnant women. Among 202 study participants the median age was 25 where as the mean age was 25.47. The median age of study participants in this study is comparable with study done in Cameroon, South Africa and Côte d'Ivoire which were 27, 27.5 and 28 respectively. The mean age is also comparable with the study done in Denmark (31) in 2010 G.C. and another study done in South Africa (30.2) in 2010 G.C. In the study done in Cameroon by year 2010 G.C., more than 74% HIV positive pregnant women had secondary school level education, which is by far greater than the findings of this study (32.2%). The possible reason for this difference can be socio – economic difference between the countries (7, 13, 14, 16).

In this study, the baseline WHO clinical stages I & II, account 108 (53.5%), III and IV account 65 (32.2%) and 29 (14.45%) respectively. This finding is comparable with the study done in Cape Town, South Africa in 2010 G.C., baseline WHO clinical stage III which accounts 78 (34%) but different with baseline WHO clinical stage I and II that account 179 (79%) and WHO clinical stage IV which accounts 8 (3%). The possible reason can be difference in time of visiting health institutions, which in turn influenced by fear of stigma and discrimination (14).

The median baseline CD4 in this study, 210 cells/ mm3 was greater than the median baseline CD4 count in the study done in 2010 G.C. in Johannesburg, South Africa (160 cells/ mm3) and in the study done in 2010 G.C. in Cape Town, South Africa (134 cells/ mm3). The possible reasons for these differences can be in Johannesburg, South Africa most of the pregnant women had baseline CD4 count <200 (76 %) and in Cape Town, South Africa the CD4 count was between the range 84 and 168. But, in Cameroon Yaoundé the median baseline CD4 (368 cells/ mm3) was greater than this study finding. The possible reason can be the IQR 310–450cells/mm3 that is greater than the IQR 111.75 – 324.75 of this study (7, 14, 16).

Of 202 study participants, 115 (56.9%) started ART before pregnancy and 87 (43.1%) started ART during pregnancy. Among 87 pregnant women, who started ART during pregnancy 44 (73.3%) and 18 (54.5%) had poor clinical and immunological outcome respectively.

Unknown HIV status prior to pregnancy which accounts 60 (29.7%) is less than the study done in Angola, 55 (52.9%) in 2012 G.C. The possible reason can be difference in the sample size. In this study, 87 (43.6%) pregnant women started ART during pregnancy but majority of women (85.2%) started ART during pregnancy in Johannesburg, South Africa. The possible reason for the difference can be most of the study participant in Johannesburg (76 %), South Africa had CD4 count less than 200 cells/mm3. Time of ART in Denmark is, 77.4% and 22.6 before and during pregnancy respectively. The difference can be due to prior pregnancy HIV status screening behavior in Denmark. Pregnant women delivered through CS account 11(7.4%) which is comparable with the study done in Cameroon Yaoundé 36 (8.6%). The mean total duration of treatment in those who initiated ART during pregnancy was 4.07 months and 32.03 months for those who initiated ART before pregnancy. This is greater than 10.7 weeks and 93.4 weeks of total ART duration during and before pregnancy respectively, in Johannesburg, South Africa. The possible reason for this difference can be time of first visit of health institution (7, 16, 24).

In this study, unknown HIV status prior to pregnancy had association (P = 0.009) with maternal immunological outcome. It was also independent predictors of immunological outcome (AOR = 0.158, 95% CI = 0.041 – 0.546, P = 0.007). This finding was not similar with the study done in Nashville, Tennessee in 2009 G.C. (5). The possible reason can be, HIV status prior to pregnancy was not assessed in the study done in Nashville, Tennessee. Knowing HIV status can have impact on effective HAART utilization, which results in increasing survival, better support for childbearing provided to HIV-infected women and early identification and testing, women at high risk of infection (13).

About half of (48%) of the study participants had baseline CD4 lymphocyte count <200 cells/$mm^{3.}$ The CD4 lymphocyte count had association with maternal immunological outcome and it was the independent predictor of maternal immunological outcome (AOR = 0.023, 95% CI = 0.003 – 0.190, P = 0.000). This finding is similar with the study done in Nashville, Tennessee (5).

HIV status prior to pregnancy, baseline WHO clinical stage, baseline CD4 lymphocyte count, time of HAART initiation and total duration of treatment were factors having association with maternal clinical outcome in binary logistic regression analysis ($p < 0.05$). Whereas, socio –

demographic characteristics, HAART regimen started or changed, history of ADE, mode of delivery and number of subsequent pregnancies had not association with maternal clinical outcome.

The independent predictors of clinical treatment outcome were: Time of ART initiation, baseline WHO clinical stage and total duration of treatment.

HAART initiation during pregnancy is 0.3 times more likely to have poor clinical outcome compared to HAART initiation before pregnancy (AOR = 0.349, 95% CI = (0.157 – 0.776), P= 0.010). Time of HAART initiation has impact in mother to child transmission of HIV. Different studies done in Johannesburg, South Africa, United Kingdom and in Europe showed risk of MTCT of HIV increases markedly in those women who started HAART during pregnancy. Even though, it was not the objective of this study there was MTCT of HIV in women who started HAART during pregnancy (2.3%). The total treatment duration was one month in those women who transmitted HIV to their infants. But, there was not MTCT of HIV in women who started before pregnancy. The possible reason could be due to an increased risk of in-uterus transmission before initiation of treatment. Of course, timing of HAART is not the only factor exhibiting MTCT of HIV (6, 7, 24).

Baseline WHO clinical stage III was 7.673 times more likely to have poor clinical outcome compared to baseline WHO clinical stage I (AOR = 7.673, 95 % CI = 1.640 – 35.892, P= 0.010). Total duration of treatment 13 - 18 months was 0.193 times more likely to have poor clinical outcome compared to Total duration of treatment > 18 months (AOR = 0.193, 95% CI =0.056 – 0.669, P= 0.010).

The independent predictors of maternal clinical outcome were different from the study done in Nashville, Tennessee (5). The possible reason can be sample size difference.

Even though effort has been made to achieve the objectives there were certain limitations. Limitations of the study include; the sample size was low and this limited the precision of estimates, adherence is an important predictor of treatment response, but it was not analyzed in this study, the lack of maternal viral load is an important limitation of this study, socio – economic status of the study participant was not assessed, co morbidities were not included in the study, poor documentations of patient profile and being retrospective study.

7. Conclusion

In conclusion, Women who started HAART before pregnancy had good clinical outcome compared to those who started during pregnancy.

The independent predictors of maternal immunological outcome were HIV status prior to pregnancy and baseline CD4 count.

The independent predictors of maternal clinical outcome were time of ART initiation, baseline WHO clinical stage and total duration of treatment.

8. Recommendations

Based on the result and the conclusions, the following recommendations are forwarded:

Health Professionals

- Women in the reproductive age group should be encouraged to know their HIV status before pregnancy.
- Health information on WHO clinical stages of HIV/AIDS and CD4 lymphocyte counts should be given to HIV positive pregnant women as it affects maternal treatment outcome.
- HIV positive pregnant women should be encouraged to start HAART early if they fulfill the eligibility criteria.

FMOH

- Awareness creation, which addresses, HAART initiation before pregnancy result in better maternal clinical outcome than HAART initiation during pregnancy should be carried out.

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Annex I Patient Information Sheet

Jimma University

College of Public Health and Medical Sciences

Department of Pharmacy

Name of the principal investigator: Girma Mamo Ijigu

Name of study area: JUSH, PMTCT, ART clinic

Research budget covered by: Jimma University

Research objective: To assess maternal treatment outcomes of antiretroviral therapy initiation before and during pregnancy and associated factors at Jimma University specialized Hospital.

Significance of the study: The importance of the study was exploring the correlation of ART initiation time and the immunological and clinical outcomes of women, and identifying independent predictors of the immunological and clinical outcomes of women. Besides, the result of this study will help to expedite the timing of initiation of HAART, and also serve as base line information for further studies in large scale at regional and/or national levels. It encourages women in the reproductive age group to know their HIV status before they become pregnant. It also helps the government and non-governmental organizations in their endeavor to combat HIV/AIDS by strengthening the effort that is made to encourage early diagnosis of HIV in pregnant mothers and initiate ART at appropriate time.

Study procedure: The data collectors extracted socio-demographic characteristics; clinical characteristics from HIV infected pregnant women's record cards.

Risks: No risk.

Beneficial: The study is beneficial for patient's immunological and clinical outcomes improvement, for PMTCT after ART initiation.

Confidentialities: The study result didn't include patient's name and address.

Whom to contact: If there is any inconvenience or doubt about the study, please contact: Girma Mamo: Cell Phone No: 0917805608, e-mail address: girma.mamo2004@gmail.com

Annex II Data Collection Tool

1. Socio-demographic characteristics of HIV positive pregnant mothers at JUSH, Southwest Ethiopia January 2008 up to December 2012.

S. N	Card No	Age	Marital status	Religion	Educational Status	Occupational status	Remark
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

2. Maternal clinical characteristics of HIV positive pregnant women at JUSH, Southwest Ethiopia January 2008 up to December 2012.

Serial. No.	Card No	HIV status prior to pregnancy: (known/unknown)	Time of maternal HIV Diagnosis: before/during pregnancy	Baseline WHO clinical stage	Baseline CD4+	Time of ART Initiation: before/ during pregnancy	Date of HAART start	HAART regimen started	HAART regimen changed
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									

Serial No	Card number	History of ADE	Date of delivery	Total duration of Treatment: from ART start date to Delivery date	CD4+ count at delivery or after delivery	WHO clinical stage	Mode of delivery	Number of subsequent pregnancies during the study period	Remark
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Data collector's Name_____ Supervisor's name_____ Date_____

Data collector's sign_____ Supervisor's sign _____ Date_____