Adherence to PMTCT antiretroviral therapy among HIV infected pregnant women in Area W Clinic, Francistown Botswana

by

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Declaration

By submitting this assignment electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Date: March 2013

Abstract

The purpose of this research was to determine the level of adherence among HIV infected pregnant women on prevention of mother to child transmission (PMTCT) antiretroviral therapy, and to establish the factors that contribute to poor adherence and their relative importance, in order to suggest intervention strategies that will improve treatment adherence among this population.

The study was conducted in Area W Clinic, Francistown Botswana, and was a prospective cross sectional study using semi-structured questionnaire, and data collection form. In total, 61 pregnant women participated in the study and were all within three to nine months gestation, and had been enrolled into the PMTCT program at least more than one month previously. The following were their characteristics: 75% were within the ages of 26 to 42 years old, 90% were single, 81% had attained secondary school education, and 60% were unemployed. Adherence was considered optimum if greater than or equal to 95%.

The participants demonstrated a good knowledge of the importance of PMTCT treatment adherence. Reported optimum adherence levels were 84% by virtual analogue assessment, and 82% by pill count. Ninety eight percent of participants reported they did not miss any dose during the last three days before the interview. The most important factors influencing adherence from the study were pregnancy related illnesses, medication side effects, and month of pregnancy of the patient as participants tended to adhere less as they got closer to delivery. It is therefore important for care-givers to carefully monitor patients for these effects, and to carry out continuous adherence counselling with special attention given to those approaching delivery in order to improve or maintain overall adherence to PMTCT therapy.

In conclusion, adherence levels to PMTCT therapy among the population sampled was high but can be further enhanced with interventions designed to cover and improve the highlighted areas in the implementation of the preventive therapy.

Opsomming

Altesaam 61 swanger vroue het deelgeneem aan hierdie studie, wat daarop uit was om getrouheid in antiretrovirale behandeling vir die voorkoming van moeder-na-kind-oordrag (PMTCT) van MIV te bepaal, vas te stel watter faktore tot swak behandelingsgetrouheid bydra sowel as watter relatiewe gewig aan elke faktor geheg kan word. Die einddoel was om intervensiestrategieë aan te beveel wat behandelingsgetrouheid onder die populasie van die kliniek in area W, Francistown, Botswana, sal verbeter.

Dit blyk dat die deelnemers die belang van behandelingsgetrouheid verstaan: ’n Totaal van 84% het optimale getrouheidsvlakke van ≥95% deur middel van virtuele analoogassessering aangemeld, en 82% deur middel van ’n piltelling. Daarbenewens het 98% bevestig dat hulle in die drie dae voor die onderhoud geen medisynedosisse oorgeslaan het nie. Die beduidendste faktore wat behandelingsgetrouheid beïnvloed, is swangerskapsverwante siekte, newe-effekte van die medisyne sowel as die maand van swangerskap, aangesien getrouheid oënskynlik afneem namate die swangerskap vorder. Dus is dit belangrik om pasiënte deeglik hiervoor dop te hou en voortdurend berading met betrekking tot behandelingsgetrouheid te voorsien, met ’n bepaalde klem op diegene wie se bevalling nader kom, ten einde algehele PMTCT-behandelingsgetrouheid te verbeter of te handhaaf.

Acknowledgment

With special thanks and appreciation, I wish to acknowledge my supervisor, Dr. Greg Munro for his help, guidance, and mentoring which made it possible for this research to become a success.

I wish to thank Ms. Keletso Othusitse for all her efforts and assistance in the data collection process. I also wish to thank Mr. Chidozie Njoku for his impute on the data analysis. My appreciation also goes to the Greater Francistown District health Management Team, the Health Research and Development Division of the Ministry of Health, and the Research and Ethics Committee of Stellenbosch University for giving their approval for the conduct of this research.

My sincere appreciation also goes to the staff of the Department of HIV and AIDS Prevention and Care, Botswana Ministry of Health for granting me access to the PMTCT records of the department. I also wish to acknowledge and thank the Botswana-Harvard AIDS Institute Partnership for HIV and AIDS Research and Education for granting me access to their research library.

My special thanks and gratitude also go to all the respondents who participated in the study, and to the local staff of the Area W Clinic for their kind co-operation and support.

Finally, my deepest appreciation goes to my dear wife Mrs. Mary Ochigbo, and our lovely children Elsie Ochigbo and Roy Ochigbo for being a pillar of support and encouragement to me, and for their patience and understanding all through the entire duration of the course.

Dedication

This work is dedicated to Elsie and Roy, my Jesus babies.

To God is the glory.

Abbreviations used

AIDS- Acquired Immune Deficiency Syndrome

ALV- Aluvia (Lopinavir 200mg boosted by Ritonavir 50mg tablets)

ANC- Antenatal Clinic

ART- Antiretroviral Therapy

ARV- Antiretroviral

ATRIPLA- Tenofovir 300mg, Emtricibine 200mg, and Efavirenz 600mg tablets

CBV- Combivir (Ziovudine 300mg and lamivudine 150mg tablets)

HAART- Highly Active Antiretroviral Therapy

HIV- Human Immune Deficiency Virus

MOH- Botswana Ministry of Health

MTCT- Mother-to-child transmission

NACA- National AIDS Coordinating Agency

NVP- Nevirapine 200mg tablets

PMTCT- Prevention of Mother to Child Transmission

TAP- Triple Antiretroviral Prophylaxis

TRV- Truvada (Tenofovir 300mg and emtricibine 200mg tablets)

UNAIDS- United States Agency for International Development

UNICEF- United Nations International Children's Fund

WHO- World Health Organization

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1. BACKGROUND

The World Health Organization (WHO) describes Mother-to-child transmission (MTCT) of HIV as the transmission of the HIV virus from a HIV positive mother to her child during pregnancy, labour, delivery, or breastfeeding leading to established HIV infection in the child (WHO 2010). Prophylactic antiretroviral therapy for the prevention of HIV infection from a pregnant mother to her child is known as prevention-of-mother-to-child-transmission (PMTCT). It involves medication with antiretroviral agents for the mother during pregnancy and eventually for the new born to prevent viral transmission or infection of the child. Transmission rates of HIV from mother to child in the absence of prophylactic intervention ranges from 20-45 %, and can be reduced to below 5% when effective PMTCT interventions are employed (WHO 2010). In Sub-Saharan Africa in 2008, an estimated 45% of pregnant women who were HIV positive accessed antiretroviral medication for PMTCT (WHO 2009).

Botswana has a very comprehensive and free antiretroviral roll out program for her citizens. The program is locally known as MASA, a Setswana word meaning “A new dawn”, of which the PMTCT is a part of. The PMTCT program was introduced in 1999 and it is presently widely available in health facilities nationwide (National AIDS Coordinating Agency NACA, 2008). Botswana is one of the Sub-Sahara African countries reported to have achieved the 2001 United Nations General Assembly Special Session (UNGASS) global target of an 80% PMTCT coverage of antiretroviral therapy for HIV positive pregnant women and their children by the year 2010 (WHO 2010).

According to the UNICEF 2010 Botswana PMTCT Factsheet, as at 2010 an estimated 16,000 children between the ages of birth to fourteen years are living with HIV and AIDS, and an estimated 13,000 pregnant women are living with HIV and AIDS. A total of 73.3% of pregnant women in Botswana attend at least four ante-natal clinic visits during pregnancy, and with all ante-natal facilities in the country presently providing HIV testing and antiretroviral medication for PMTCT, the prevention of mother to child infection continues to improve (UNICEF 2010). The United States Agency for International Development (USAID 2010) reported that Botswana is one of only four countries in the world that provides more than 75% antiretroviral medication coverage for PMTCT. Their records also show that by the end of 2007, there was a recorded fivefold decline of HIV infection among neonates born to HIV infected mothers from 1999 to 2007 (USAID 2010).

For any antiretroviral roll out initiative to be successful, those affected must adhere to the treatment regimen with adherence levels above 95%. Pregnant mothers undergoing PMTCT may have issues of poor adherence to treatment even after pre-treatment initiation counselling, the causes of which the study aimed to identify. The peculiar nature and circumstances surrounding pregnant women who are HIV positive and have to undergo PMTCT to save their unborn children from HIV infection may have an impact on their ability to achieve desired levels of treatment adherence. It was therefore the intention of the research to uncover, and bring focus to the factors responsible for non-adherence to PMTCT therapy despite adequate adherence counselling, and the influence of identified adherence barriers on attaining recommended levels of treatment adherence, with a view of recommending appropriate intervention measures that can improve overall adherence to antiretroviral PMTCT treatment.

The research was conducted in Area W Clinic in Francistown, Botswana. Francistown is the second largest city in Botswana, located in the North-eastern part of the country. The Area W Clinic is one of the popular Government owned clinics in the city, providing among other services, antiretroviral treatment roll out services for the public. It is under the management of the Greater Francistown District Health Management Team, in affiliation with the Botswana Ministry of Health. The clinic also provides antiretroviral therapy for the PMTCT program in Francistown for pregnant women along with ante-natal clinic (ANC) services. It has good information management practices, and keeps an up to date pill count record of antiretroviral drugs dispensed to patients including pregnant women on PMTCT. These were the reasons why the clinic was chosen for this study, along with the fact that the investigator resides in the area.

2. RESEARCH QUESTION

The PMTCT program in Botswana currently enjoys good success rates but with room for improvement. Sustenance or improvement can only be achieved with proper and adequate adherence to the preventive therapy. There is therefore need to assess the level of adherence and the factors that impede it, in order to design and implement appropriate interventions that will improve the overall adherence to PMTCT.

The following therefore were the questions this research intended to answer. What is the level of adherence to PMTCT antiretroviral therapy among pregnant women in Area W Clinic in Francistown Botswana? What are the factors responsible for poor adherence to antiretroviral treatment in an informed pregnant mother undergoing PMTCT who, through counselling, is aware of the importance of adherence and the dangers of treatment failure that may result from non-optimum adherence? What are the factors that influence adherence to PMTCT therapy and what is their relative importance?

3. SIGNIFICANCE OF RESEARCH

Most of the studies conducted on antiretroviral treatment adherence focuses on regular patients with few concentrating on pregnant women and their adherence particularly to PMTCT. This research aims to unearth more information on the level of adherence to PMTCT therapy and the factors that are causing poor adherence in this population despite pre-treatment initiation counselling.

Botswana has a highly successful PMTCT program in place. However, over the past decade of program implementation, the infant HIV transmission rate has not fallen to below 2% as portrayed possible by the WHO (2007). The reason for this may be related to medication adherence. It is therefore important to determine the level of adherence to PMTCT antiretroviral therapy, and to establish the factors that contribute to poor adherence in order to develop adherence intervention strategies that can further improve the impact of the PMTCT program.

4. LITERATURE REVIEW

4.1 HIV and PMTCT in Botswana

HIV and AIDS is a leading public health challenge in Botswana since the diagnosis of the first AIDS case in 1985 (Botswana Ministry of Health MOH, 2012). It has since become an epidemic with a recorded prevalence of 32.5% in 2009 (Botswana Central Statistics Office, 2009). The prevalence rate of HIV in Botswana is higher in women than in men, with

national prevalence rates among pregnant women aged between 15 and 49 years reported at 31.8%. In 2001, the HIV prevalence among pregnant women accessing ante-natal clinic services in Botswana was 36.2% (Ministry of Health MOH Botswana National Guidelines PMTCT 2011).

A mode of transmission of HIV infection is the vertical transmission which is transmission from a pregnant mother to an unborn child. During pregnancy or delivery, an infected pregnant mother may transmit the HIV virus to her baby. Transmission can also occur during breastfeeding in the absence of appropriate prophylactic interventions.
According to the WHO (2007), MTCT alone accounts for over 10% of all HIV infections globally, and over 90% of new infections presenting in infants occur through MTCT.
Presently, the treatment of a pregnant mother with antiretroviral medication and the treatment of the newborn postpartum (after delivery) can prevent transmission of the virus to the newborn baby. The comprehensive use of antiretroviral drugs to prevent this mode of transmission is known as PMTCT therapy.

The United Nations Millennium Development Goals (MDG) to be met by 2015 consist among others the reduction, by two thirds, of the mortality rate among children under five years old, reduction of maternal mortality ratio by three quarters, and to halt and begin to reverse the spread of HIV and AIDS. The global success or failure of PMTCT efforts directly affects the achievement of these three millennium development goals (WHO 2007). The United Nations therefore developed a comprehensive approach consisting of a four-pronged strategy for PMTCT to "address a broad range of HIV-related prevention, care, and treatment and support needs of pregnant women, mothers, their children and families" (WHO 2007).

The WHO four-pronged PMTCT strategy are-

i. Primary prevention of HIV infection among women, especially young women.
ii. Prevention of unintended pregnancies among HIV-infected women.
iii. Provision of specific interventions to reduce HIV transmission from HIV-infected women to their infants.
iv. Provision of treatment, care and support for HIV-infected mothers, their infants and family.

The Botswana PMTCT approach was designed in accordance with WHO guidelines and includes the four elements of the comprehensive approach (MOH Botswana National Guidelines PMTCT 2011). The PMTCT program in Botswana started in 1999, and by July of 2000 the country embarked on a national roll-out of the program under the Sexual and Reproductive Health (SRH) services. By November 2001, all public healthcare facilities in the country were offering PMTCT services. With the advent of the National ARV Program in 2002 expanding antiretroviral treatment access, the PMTCT program became more widespread with increased program uptake and improved services. Availability of routine HIV testing, post-test counselling, eligibility analysis and provision of triple prophylaxis or HAART initiation, adoption of safe obstetric practices, infant HIV testing and infant feeding under the auspices of the PMTCT program all contribute to making the Botswana PMTCT program a success story (MOH Botswana National Guidelines PMTCT 2011).

The program uptake has grown from 27% in 2002 to 93% in 2011. The number of women tested during ante-natal clinic visits has also grown progressively from 49% in 2002 to 98% in 2011. The percentage of HIV-infected babies has also dropped markedly as a result of PMTCT intervention. It recorded an admirably low 2.3% HIV-infection rate in babies in 2008. The average percentage of HIV-infected babies between 2008 and 2011 was 3.68%. (MOH PMTCT Program National database statistics, 2011). PMTCT has been documented as having registered the greatest prevention success among all other HIV prevention strategies (Celentano D., Beyrer C., (Ed) 2008).

4.2 PMTCT treatment regimen used in Botswana and its current impact

PMTCT therapy in Botswana was initially based on a single drug zidovudine given as a short course treatment on a United Nations Agency supported PMTCT pilot (Celentano et al (Ed) 2008, page 307). It has however evolved and developed to the more effective combination therapy utilized at present.

The current Botswana annual National Summary of the PMTCT program (January 2011 to December 2011) report show that in 2011, a total of 50,812 recorded new attendees accessed ante-natal clinic services in Botswana. Of this number, 36,027 women representing 89% were tested for HIV in ANC. A total of 33% of the women who delivered were HIV positive.

The total deliveries recorded in 2011 was 47,443, of which 12,738 women who delivered were HIV positive and were on treatment or on prophylactic therapy (PMTCT). Of these, 53% were on Zidovudine, and 40% were on HAART during ANC. This gives a PMTCT program uptake of 93% in 2011.

Of the children born to HIV positive mothers, 93% (13,101) were started on prophylactic antiretroviral treatment using Zidovudine/Nevirapine. A total of 92% (12,979) of the infants were started on formula feeding. The records show that 87% of the infants (12,263) were tested for HIV and of these, 247 were HIV positive. This gives an infant HIV infection rate of 4% in 2011 as a result of PMTCT intervention. This value of 4% infant infection rate, though quite an impressive achievement, is more than the <2% WHO ultimate hallmark of an excellent PMTCT program. This allows room for improvement of the program to achieve the <2% infant infection rate expectation.

HIV testing is routine and recommended in Botswana, but it is not mandatory. The male partners of the pregnant mothers attending ANC are encouraged to test for HIV infection. In 2011, 5,183 male partners were tested representing a 14% male testing rate.
Addendum 6 shows the PMTCT treatment algorithm presently used in Botswana.

4.3 Adherence

4.3.1 Antiretroviral Treatment Adherence

Osterberg and Blaschke (2005) defined adherence to medication generally as the extent to which patients take medications as prescribed by their healthcare providers. The rates of adherence for individual patients are usually reported as the prescribed doses of the medication actually taken by the patient over a specified period. For successful treatment, an adherence level of over 95% is usually expected for optimum viral suppression in an HIV infected individual on antiretroviral therapy (Mannheimer, Friedland, Matts, Child, & Chesney, 2002). It therefore follows that the importance of adherence to antiretroviral medication cannot be over-emphasized.

There are many barriers to adherence and many reasons why patients do not adhere to medication. The factors affecting the adherence to antiretroviral therapy has been outlined and ranges from patient variables such as social and demographic factors, psychosocial factors, socio-cultural factors to factors relating to the type of treatment regimen involved, disease characteristics, clinic setting, and relationship between patient and healthcare provider (Edward, Machtinger, & Bangsberg, 2005; Kgatlwane, Madaki, Ogenyi, Moyo, Ekezie, & Moroka, 2006).

4.3.2 Adherence and barriers to PMTCT

Not much research has been done on antiretroviral PMTCT adherence in Botswana. As the number of pregnant mothers on PMTCT continues to increase, the PMTCT program can become more successful with more attention given to patient adherence to the preventive therapy.

Studies elsewhere has shown a non-adherence rate of 21.7% to antiretroviral preventive therapy in HIV positive pregnant women, with forgetfulness being the most cited reason for non-adherence (Igwegbe, Ugboaja, & Nwajiaku, 2010). The factors that inhibit general antiretroviral treatment adherence also relate to adherence to PMTCT therapy alongside other peculiar pregnancy related factors such as morning sickness, GIT upsets, fear of potential effect of drug on foetus (Kartikeyan et al., 2007), and mood changes amongst others.
Kebaabetswe P. M. (2007) identified stigma, fear of knowing one's own HIV status, fear of diagnosis, disclosure, infant feeding distribution stigma, lack of male partners' support and negative attitudes of health workers, loss to follow up, inadequate care providers, lack of prenatal care, and weak health infrastructure as barriers to participation in the PMTCT program in Botswana. Some of these factors were studied closely in this research as barriers to adherence for those already on PMTCT therapy. The relative importance of the factors that may act as adherence barriers or predictors of low adherence in this population were also assessed.

4.3.3 Measurement of adherence

The provision of free medicines do not guarantee patient adherence to the drugs provided, hence the need to develop adherence measurement and monitoring systems which should preferably be built into treatment protocols (Kartikeyan S., Bharmal R. N., Tiwari R. P., & Bisen P. S., 2007). Measuring adherence to medication involves the frank cooperation of the patient and the healthcare worker or researcher. This is because obtaining values that describe adherence do not necessarily translate to the patient actually taking the medication, except in cases of direct observed therapy, which is often not applicable in most settings where chronic medication is involved such as treatment of HIV and AIDS.

There have been attempts however, to device workable adherence measurements and the most common methods are those outlined by Edward et al (2005). They include the use of computerized software systems such as the MEMS Caps which involves the use of a computer chip embedded on the medication cap which records the number of times the medication is opened to be accessed, use of the pill count system, use of biological markers, and analysis of pharmacy dispensing records. Other tools for measuring adherence include pill identification tests, issuing pill calendars, adherence partner, using recall questionnaires (Kartikeyan S. et al, 2007), and other self reporting systems such as the virtual analogue scale.

The pill count and the visual analogue scale self reporting system was used to evaluate adherence in this research. The pill count basically compares a patient's actual drug consumption with the expected consumption within a given period, or since the medication was last dispensed to the patient. The records and data obtained from the pill count can then be used to calculate the pill count adherence measures (Chalker, Andualem, Tadeg, Gitau, Ntaganira, Obua, & Waako, 2009). The visual analogue scale was described by Reips and Funke (2008) to be a psychometric response scale which can be used in questionnaires to measure subjective characteristics or attitudes that cannot be directly measured, by utilizing a continuous line between two end-points or scales, where respondents can specify their level of agreement to a statement by indicating a position along the continuous line or analogue scale. In this research, the participants indicated on a visual analogue scale their self assessed level of adherence to PMTCT therapy over the past one month. The pill count adherence measure and the virtual analogue scale have been used to measure adherence in other

antiretroviral therapy adherence studies (San Lio, Carbini, Germano, Guidotti, Mancinelli, Magid, Narciso, Palombi, Renzi, Zimba, & Marazzi 2008; Amico, Fisher, Cornman, Shuper, Redding, Konkle-Parker, Barta, & Fisher 2006; Ogenyi R. 2006).

5. AIMS AND OBJECTIVES

5.1 Aim of research

The aim of the research was to determine the level of adherence to PMTCT among HIV infected pregnant women on PMTCT antiretroviral therapy, and to establish the factors that contribute to poor adherence and their relative importance, in order to provide intervention strategies to improve the adherence to therapy among this population in Area W Clinic, Francistown, Botswana.

5.2 Objectives

- To determine the extent of ART medication adherence of pregnant women on antiretroviral PMTCT therapy in Area W Clinic Francistown
- To establish the level of knowledge of PMTCT patients regarding the importance of adherence to antiretroviral PMTCT treatment
- To establish the factors influencing adherence and their relative importance as adherence predictors/barriers to PMTCT adherence in this population
- To make recommendations for intervention strategies that will improve adherence to PMTCT therapy

6. RESEARCH DESIGN AND METHODOLOGY

The research was a prospective cross sectional study relying on purposeful sampling, semi-structured questionnaires, and document observation. The study focused on HIV infected pregnant mothers on antiretroviral PMTCT therapy, and how they adhere to their treatment regimen.

The study design and methodology was approved by the Research Ethics Committee of Stellenbosch University, and the Health Research and Development Division of the Botswana Ministry of Health. Permission to carry out the research in Area W Clinic Francistown was granted by the Ministry of Health, and the Greater Francistown District Health Management Team.

The PMTCT register and medication records of the pregnant patients on PMTCT antiretroviral therapy in the clinic were reviewed in the IDCC department of the clinic. The HIV positive pregnant patients attending ANC at the clinic were identified and approached to participate in the study. The inclusion criteria for participants were established HIV infection in pregnancy, and current enrolment on the PMTCT antiretroviral therapy program at the Area W Clinic for the prevention of transmission of the HIV virus to the unborn child. The exclusion criteria were HIV infected pregnant women who refuse PMTCT, or who do not qualify for PMTCT, and those who refuse, or withdrew their consent to participate in the study. A written and signed informed consent was obtained from all those who accepted to enrol in the research.

A total of seventy pregnant women on highly active antiretroviral therapy (HAART) in the clinic, were originally sampled to participate in the study. Of these, sixty one enrolled and completed the study giving a response rate of 87%. The interview/survey was conducted in either English or Setswana in private, under strict confidentiality by way of a structured questionnaire in one of the patient-counselling offices of the clinic by the principal investigator and a locally trained data collector. The data collector was trained to assist with administration of the questionnaires. The training was done by way of role playing, thorough study and perusal of the research protocol, and on the processes and procedures to be followed during the interview.

The questionnaire used obtained information on demographics, social/marital status, and alcohol intake. Participant's medication taking patterns were also analyzed by inquiring about missed doses within the last three days before the interview and missed doses during the weekend preceding the interview. Information on perceived predictors of adherence and their relative importance, and subject’s level of knowledge on the importance of adherence to ART were also obtained. Parts of the questionnaire were modified from the NIH/NIAID QOL/Adherence forms by the AIDS Outcomes Committee of the AIDS Clinical Trials Group

(2008). Adherence levels were investigated using a one month recall measure, utilizing dispensing records, pill count, and a self reporting measure via a visual analogue scale.

7. MEASURING INSTRUMENTS AND DATA ANALYSIS

The data was analyzed using percentages and other descriptive methods of analysis. The software used was the Microsoft Excel and the SPSS data analysis.

Adherence obtained from the pill count calculations and the virtual analogue scale were compared and considered optimum if greater than or equal to 95%. Adherence values below 95% were considered sub-optimal. The relative importance of the selected adherence predictors was analyzed as well.

Addendum 1 shows the adherence questionnaire and virtual analogue scale. Addendum 2 shows the pill count data collection form and the formula used to calculate the percentage adherence by pill count.

8. ETHICAL CONSIDERATIONS

Authorization to carry out the research was sought from the relevant quarters and each subject participated voluntarily. Signed informed consent was obtained from each participant and questionnaires were answered anonymously without any reference to names or personality.

The incentive to the participant was the knowledge that the research outcome shall highlight the peculiar issues that concern PMTCT treatment adherence and barriers to PMTCT treatment adherence in pregnant mothers thereby enabling strategic interventions to be made.

Pregnant mothers on antiretroviral preventive therapy may be a sensitive population as there are often emotional issues surrounding their HIV status and the outcome of the status of the unborn child. As a result, counselling was offered after the exercise for those who required it.

9. RESULTS

The results are presented in line with the study objectives and demographic characteristics, and expressed in percentages and proportions utilizing tables and figures.

9.1 Demographical Characteristics

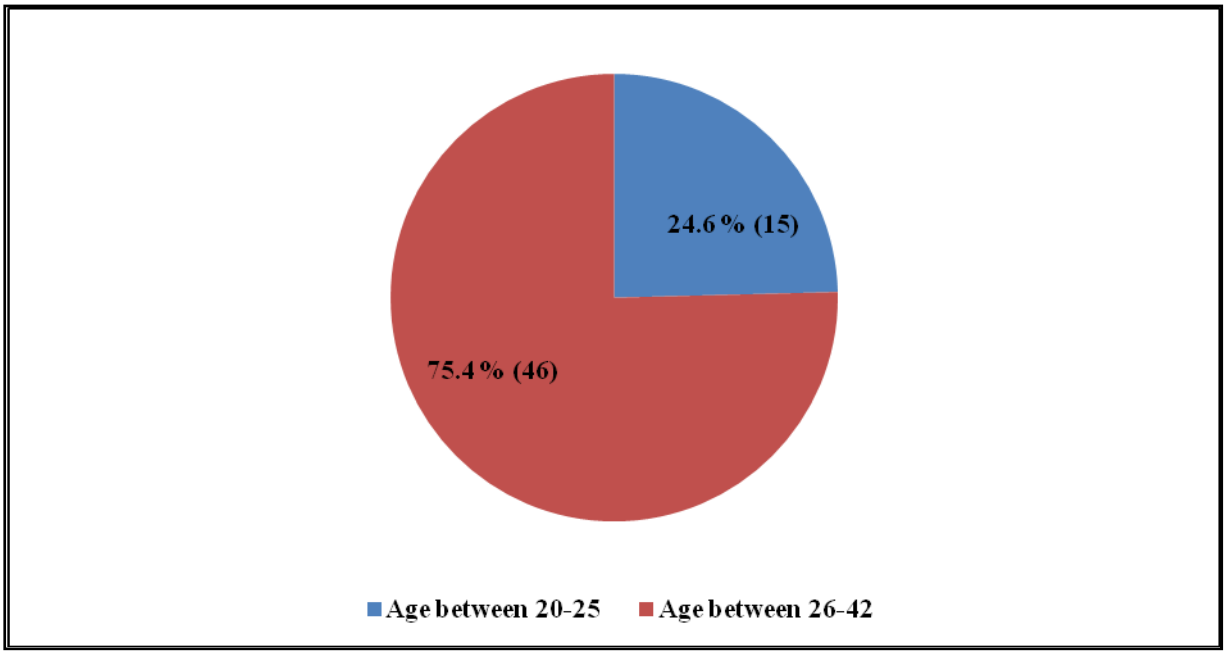


Figure 1. **Age distribution of the respondents**

Figure 1 shows that majority of the respondents (75.4%) were between the ages of 26 to 42 years while 24.6% were between the ages of 20 to 25 years old.

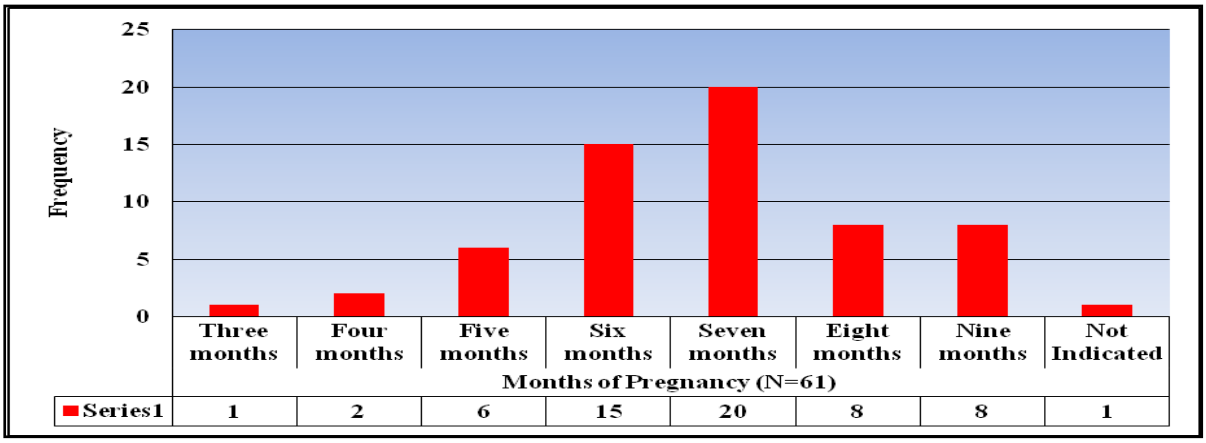


Figure 2. **Months of Pregnancy of the respondents**

Figure 2 shows the variations in months of gestation of the pregnant women. It depicted that participants in this study ranged from three months gestation, to full gestation or due for delivery. The figure also depicted that the majority of the pregnant women that participated in this study (57.4%) were six or seven months pregnant (n=35), eight of them were eight months pregnant, while only one of them was three months pregnant.

Table 1

Cross tabulation of employment status with education level and marital status

		Employed		Not employed		Total	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
Education level	Primary	0	0.0	3	8.1	3	5.1
	Secondary	18	81.8	30	81.1	48	81.4
	Tertiary	4	18.2	4	10.8	8	13.6
Marital status	Single	22	95.7	32	86.5	54	90.0
	Married	1	4.3	4	10.8	5	8.3
	Widowed	0	0.0	1	2.7	1	1.7

Table 1 shows majority of the respondents 81.4% (n=48) have attained secondary school, of which 30 of them, representing 62.5% of those who had secondary school education were unemployed at the time of the study. Three of the respondents had attended primary school, all of whom were unemployed. The results also depicted that majority (90%) of the respondents (n=54) were single of which 32 of them (59.3%) were unemployed at the time of this study.

9.2 Adherence levels to PMTCT therapy

The data presented in this section addresses the first objective of determining the extent of ART medication adherence in pregnant women on PMTCT therapy in Area W Clinic Francistown. The result includes the three day adherence recall, adherence measured by self report using virtual analogue assessment, and adherence as calculated by the pill count. Presentation is done using proportions and percentages comprising of participants who demonstrated optimal adherence defined as achievement of ≥95% adherence and non-adherence defined as ≤95% adherence by each method. The medication taken by participants and their medication taking behaviour are also presented.

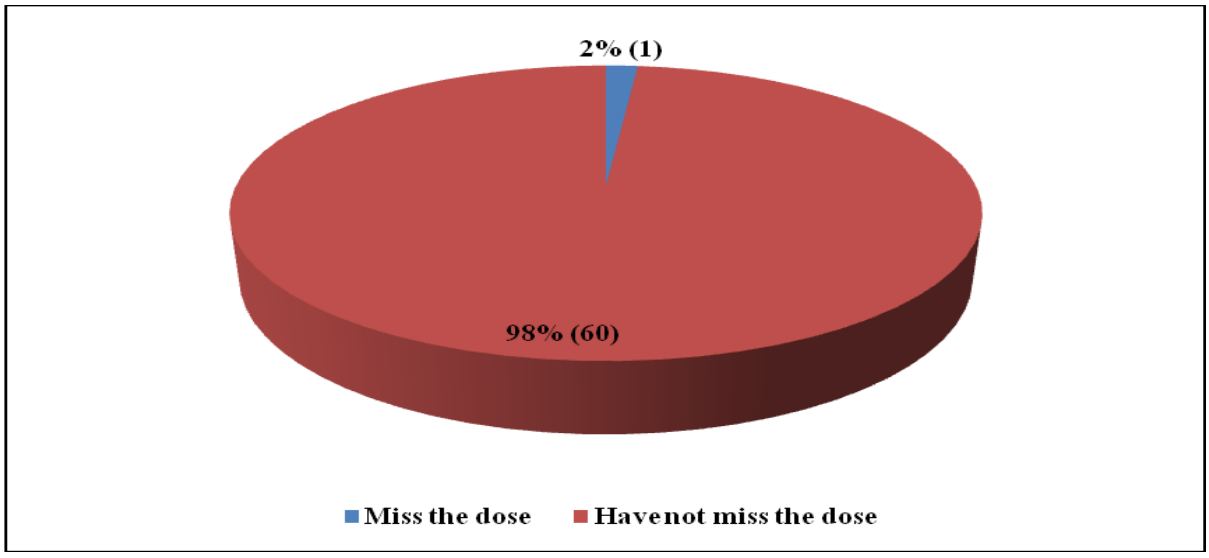


Figure 3. **Medication adherence recall over the last three days (N=61)**

Figure 3 shows that also all the respondents were consistent in taken their drugs (n=60), only one of them missed taking her drug within the three days preceding the interview.

Table 2

Medication taken by participants

	Multiple Responses N=61	Percent of Cases
CBV	8	13.1
NVP	10	16.4
ATRIPLA	47	77.0
TRUVADA	5	8.2
ALUVIA	3	4.9

From table 2, the names of the drugs taken by the respondents were Combivir (CBV), Nevirapine (NVP), ATRIPLA, TRUVADA and ALUVIA. The majority of the pregnant women (77.0%) that participated in this study were taking ATRIPLA only. For those on multiple pill combinations, 16.4% were taking either NVP, 13.1% were taking either CBV, TRUVADA was taken by 8.2% of the respondents and 4.9% of the pregnant women were taking ALUVIA, all as part of a combination therapy. It is important to note that these drugs were taken in a combination therapy, except for ATRIPLA which is a single dose triple combination therapy drug formulation.

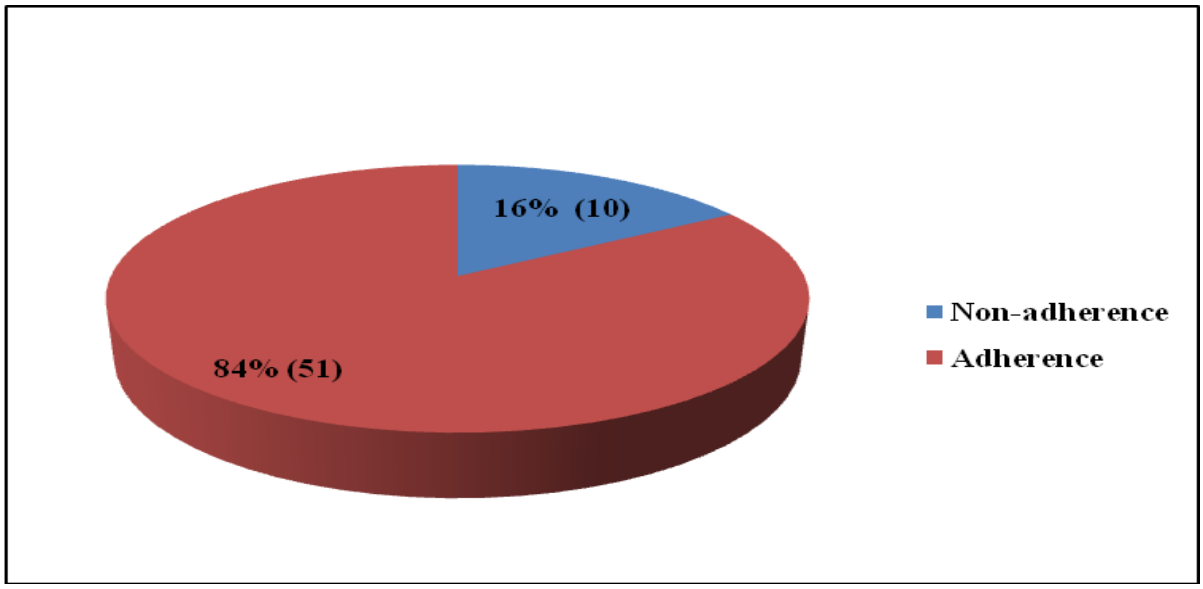


Figure 4. **One month adherence recall by virtual analogue scale**

Figure 4 show 84% optimum adherence by virtual analogues from the pregnant women that participated in this study, and 16% of them had adherence level below 95% based on the virtual analogue assessment.

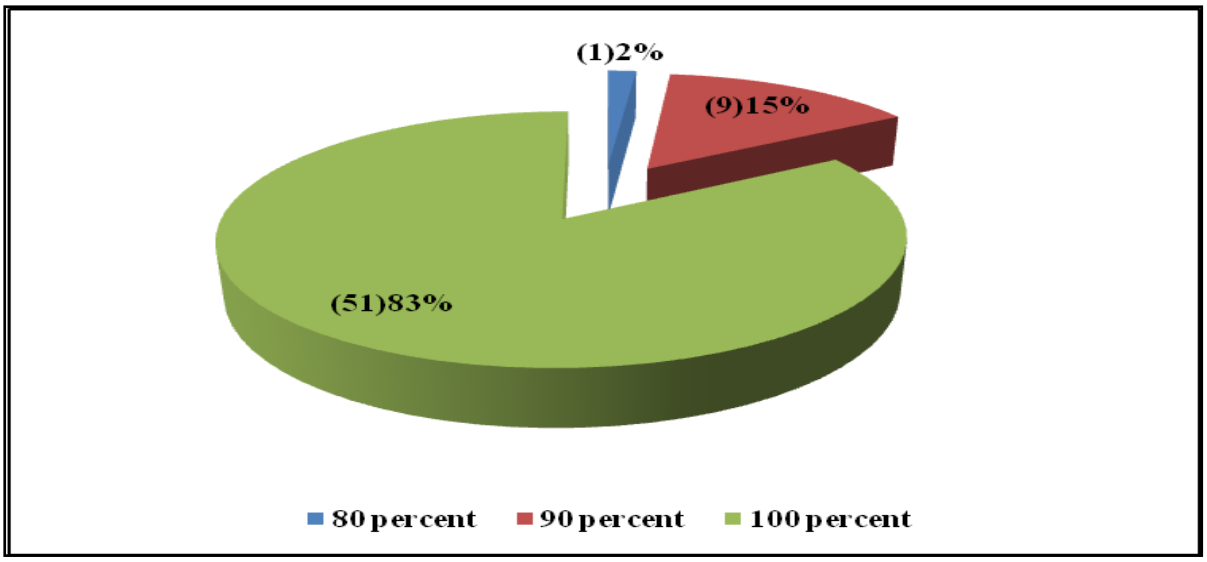


Figure 5. **Breakdown of reported adherence levels by virtual analogue scale**

Figure 5 shows the breakdown in the level of participants' adherence to their medications using the analogue scale. The results show that majority of the participants (83%) reported a 100% adherence rate, 15% of them reported 90% adherence rates, while 2% of the participants reported 80% adherence rate.

Table 3

ART medication taking behaviour of pregnant women on PMTCT

	zero	One	Two	Total
Dose (No. of pills taken at a time) : CBV	0	7	1	8
Dose (No. of pills taken at a time) : NVP	0	8	2	10
Dose (No. of pills taken at a time) : ATRIPLA	0	48	0	48
Dose (No. of pills taken at a time) : TRUVADA	0	5	0	5
Dose (No. of pills taken at a time) : ALUVIA	0	0	3	3
Frequency (No. of times taken in a day): CBV	0	1	7	8
Frequency (No. of times taken in a day): NVP	0	1	8	9
Frequency (No. of times taken in a day): ATRIPLA	0	47	0	47
Frequency (No. of times taken in a day): TRUVADA	0	4	1	5
Frequency (No. of times taken in a day): ALUVIA	0	0	3	3
How many doses missed: CBV	8	0	0	8
How many doses missed: NVP	10	0	0	10
How many doses missed: ATRIPLA	45	0	1	46
How many doses missed: TRUVADA	7	0	0	7
How many doses missed: ALUVIA	3	0	0	3

Table 3 demonstrates the behaviours of the respondents toward taking their medications. Eight of the respondents were taking CBV, of which majority of them (n=7) were taking a

pill at a time while one of them was taking two of the CBV at a time. The majority of them (n=7) were taking CBV twice a day, a pregnant woman was taking CBV once a day and none of them had missed taking CBV medication. The prescribed dosage for CBV was one tablet to be taken twice a day.

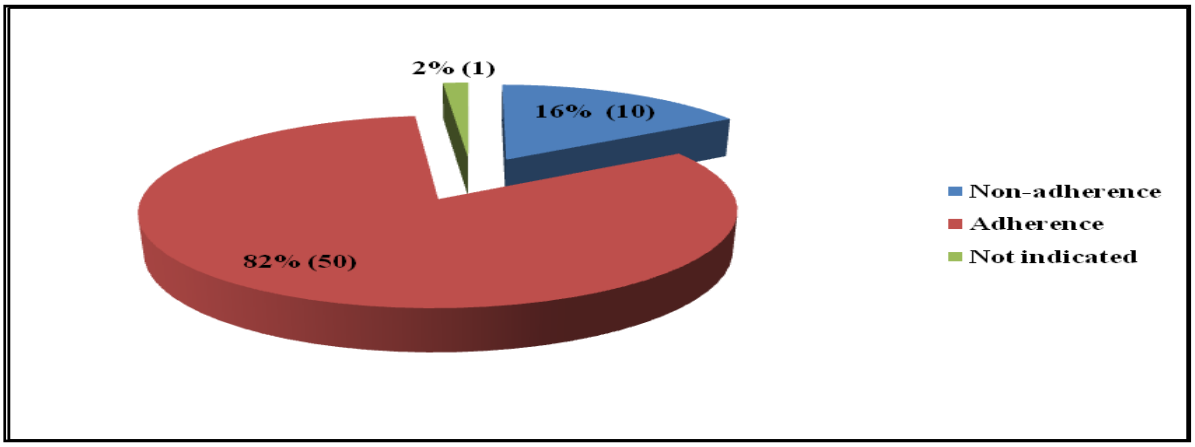


Figure 6. **Adherence by pill count**

Furthermore, table 3 above shows that of all the 48 pregnant women that were taking ATRIPLA, 47 of them were taking one pill on a daily bases as prescribed, and only one of them had missed her pills twice. ALUVIA pills were taken by three pregnant women, two pills twice daily, while of the ten that were taking NVP, eight of them were taking a pill twice daily as prescribed, and two of them were taking two pills at once daily. Finally, the graph in figure 6 shows a high level of adherence (n=50) from the participants by pill count.

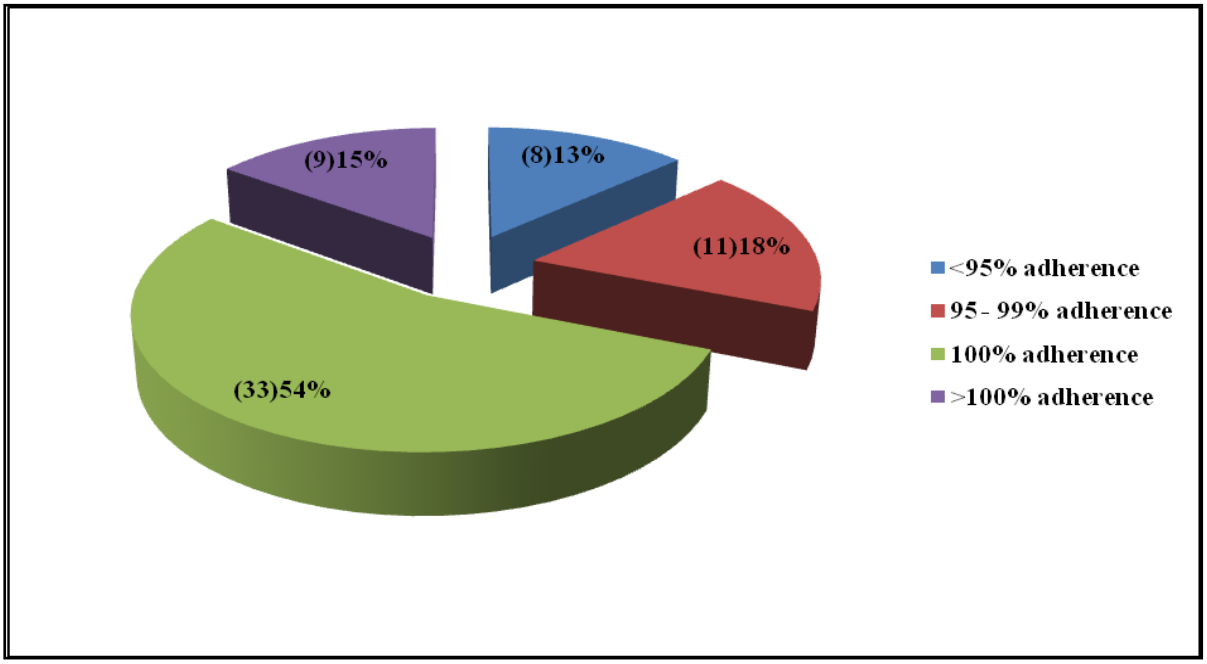
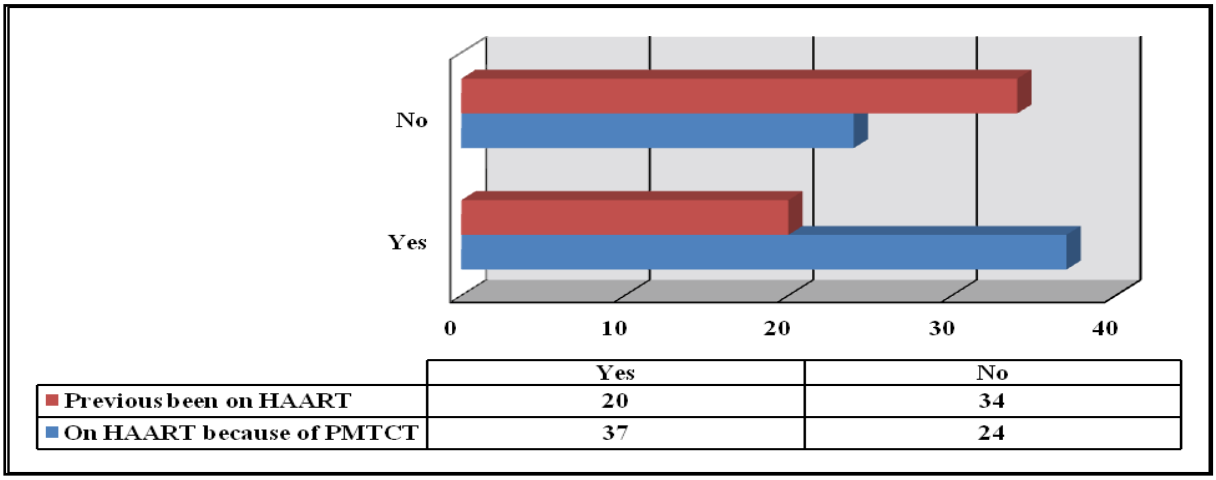


Figure 7. **Breakdown of participant's adherence levels by pill count**

Figure 7 shows that 54% of the participants had 100% adherence levels from the pill count, 18% of them had adherence levels ranging 95.2-99.4%, 13% of them had adherence levels of less than 95% which is below the optimum adherence desired, and 15% of them had adherence levels above 100% using the same method.

9.3 Level of knowledge of participants regarding the importance of adherence to PMTCT treatment

The result in this section expresses the level of knowledge participants have regarding the importance of adherence to PMTCT antiretroviral treatment in Area W Clinic Francistown.



	Somewhat sure	Very sure	Extremely sure	Total
Able to take all or most of Anti-HIV medications as directed	0	23	38	61
The anti-HIV medication prevent HIV transmission to baby if well taken	0	28	33	61
If anti-HIV medication was not taken Exactly as directed, the HIV in one's body Will become resistant to this medication	2	23	36	61

Figure 8. **Participants level of knowledge about PMTCT treatment**

Figure 8 shows that majority of participants (n=34) had not previously been on HAART. The reason why the majority of them (n=37) were on HAART was because of PMTCT. Participants were consistent in taking their ARV drugs as directed. They all believed that anti-HIV medication prevent HIV transmission to baby if well taken, and two of them were not sure if anti-HIV medication not taken exactly as directed will result in the HIV in one's body to become resistant to ARV medication.

9.4 Factors influencing PMTCT adherence and their relative importance as adherence predictors/barriers

This section answers the third objective which was to establish the factors contributing to poor adherence and their relative importance as adherence predictors/barriers to PMTCT adherence in this population.

Table 4

Reasons for missing medications

	Often	Sometimes	Rarely	Never	Total
Wanted to avoid side effects	0	1	3	57	61
Lack support from partner or spouse	0	1	1	59	61
Not fully understanding how and when to take the medications	0	0	2	59	61
Lost pills	0	0	1	60	61
Did not like the attitude of the health workers	1	2	2	56	61
Had a bad event happen that you felt was related to taking the pills	0	1	1	58	60
Forgot	0	0	1	60	61
Ran out of pills	0	0	1	60	61
Tired of taking too many pills	0	0	1	60	61
Felt the drugs may harm your baby	0	1	1	59	61
Other illness, nausea, or some pregnancy related health problems got in the way	0	5	2	54	61
Stigmatization (what others may say or discover about my disease) by people outside of one's family	0	1	0	60	61
Fear of stigmatization/disclosure within the home (e.g. not wanting the husband or family to know)	0	1	0	60	61

Table 4 shows some reasons why HIV pregnant women on PMTCT medication would want to miss their medications. Although the results depicted that almost all of them believed that there is no reason enough to stop anyone from taking their medications, but few of them gave the following reasons for missing the medications.

Four of them stated that it was to avoid the drug side effects, two of them said they did not fully understand how and when to take their medication, while seven of them missed because some pregnancy related health problems got in the way. Other reasons were the attitude of the health workers (n=2), lost pills (n=1), and pill fatigue (n=1).

Table 5

Factors influencing adherence among pregnant women

	B	S.E.	Wald	Sig.	Exp(B)
Education level	-1.308	1.089	1.442	.230	.270
Month of pregnancy	-.563	.330	2.902	.088	.570***
Marital status	-.113	1.166	.009	.923	.893
Age	-.010	1.012	.000	.992	.990
On HAART because of PMTCT	-.875	1.085	.651	.420	.417
Previous been on HAART	1.017	1.132	.807	.369	2.765
Constant	8.245	4.812	2.936	.087	3809.901***
Cox & Snell R Square	.133				
Nagelkerke R Square	.219				

Probabilities are computed assuming asymptotic normality. Critical values 1% *, Critical values at 5%** and Critical values at 10%*

Table 5 shows a binary logistic regression model where adherence was captured as a dummy variable (i.e. 1= adhered, 0= non-adherence). The results show that the month of pregnancy as a factor has a significant negative effect on the level of adherence, and the other factors had insignificant effects. In other words, as the pregnant women drew towards delivery, they became less likely to adhere to their medications. The results also stipulated that the level of the participants' adherence to their medications was not influenced by the other factors. This inference can be deduced from the comparisons between the Exp (B) of the constant (3809.901) and Exp (B) coefficients of the variables in the model

10. Analysis and discussion of results

10.1 Demographics

A total of 61 pregnant women participated in this study and their ages ranged from 20 years to 42 years. The majority of the respondents was over 26 years old, single, and had at least secondary school education. The respondents within the ages of 26 to 42 years formed the bulk of the pregnant women, representing 75.4% of total respondents in this study. Participants within the 20 to 25 years old age bracket made up 24.6%. This age demographics observed in the study was consistent with HIV and AIDS prevalence among pregnant women in Botswana which was reported to be highest in the 30 to 39 year old age group (MOH 2012).

All the participants were within three to nine months gestation and had been enrolled onto the PMTCT program at least more than one month previously. The majority were at six and seven month's gestation.

10.2 Level of knowledge of importance of adherence

Most of the participants (n=37) were antiretroviral treatment naive when they were initiated on PMTCT therapy as a result of pregnancy. The remaining twenty four participants were already on HAART before pregnancy. Some (n=20) however reported that they have previously taken antiretroviral therapy. It was not quite clear if these were among the twenty four that reported being on HAART before they became pregnant or if some had on a different occasion been on antiretroviral treatment, and had the treatment discontinued before being re-initiated onto the present PMTCT therapy.

The participants however, demonstrated a good knowledge of the importance of treatment adherence in PMTCT therapy. This shows that adherence counselling in Area W Clinic was impactful and the patients, generally speaking, understood the need to adhere to their medication. This is also consistent with the quality of adherence observed in this study. However, there is room for improvement as two participants reported they did not quite fully understand the concept of virological resistance that can develop from poor adherence to antiretroviral therapy.

10.3 Adherence levels

The drugs administered to the women were in a combination therapy in accordance with the Botswana PMTCT treatment guidelines. The guideline prescribes the use of highly active anti retroviral therapy (HAART) mostly comprising of three different drugs in the treatment for PMTCT in HIV infection and has recently adopted the triple antiretroviral therapy for prophylaxis (TAP) for PMTCT (Keapoletswe, 2012). The drug Atripla was the only once a day medication that was prescribed to be taken alone and not in combination with another antiretroviral pill. This is because Atripla is a triple drug HAART combination, formulated as a single dose. Majority of the patients in this study were using Atripla following the implementation of TAP in Botswana. Of the 48 women on Atripla, only one missed her dose on two occasions. Atripla being a once a day dosage formulation decreases the number of

pills patients need to take and the frequency as well. This could potentially improve adherence levels. More needs to be done to find out if adherence levels to single dose formulations are better than multiple dose formulations in both pregnant and non pregnant patients on antiretroviral therapy.

The other medications were either a two drug formulation (for example CBV, TRV, ALV), or a single drug formulation (NVP), intended to be taken one with another to obtain a complete HAART therapy. The women on multiple dosage regimens with requirements to swallow more than one pill a day showed different patterns of adherence. Most of them took their drugs as prescribed and adhered very well. Few on the other hand, though they did take their medications, however took them inappropriately. An example was a pregnant woman who reported taking two CBV tablets once a day instead of one tablet twice a day as prescribed, and two women who were taking two NVP pills once a day instead of the prescribed one pill twice a day. Such dosage errors can be overcome by counselling. It is therefore important for medication counselling and re-counselling to be re-enforced at every opportunity to help weed out such miss-understandings in medication usage. All the women on Aluvia took their pills as prescribed.

The three day adherence recall for participants in the study was good with 98% of the participants reporting to have achieved optimum adherence to their PMTCT medication within the last three days preceding the interview, and none missing their medication during the last weekend preceding the interview.
The results of the virtual analogue scale one month adherence recall self reporting system utilized in this study yielded an adherence level of 84%, and a non-adherence level of 16%. A breakdown of the analysis show that 83% of the participants (n=51) reported a 100% adherence, taking all their medication exactly as prescribed.

The levels recorded using the pill count measurement were optimum adherence levels of 82% to PMTCT therapy, with a non adherence rate of 16%, and a 2% (n=1) non-indication. A breakdown of the pill count adherence show that 54% (n=33) of the participants obtained 100% adherence, taking all the pills they were expected to have taken, and exactly as prescribed within the period. A further 18% of the participants (n=11) also achieved optimum adherence, recording adherence levels between 95-99%. Thirteen percent of the participants (n=8) however, did not achieve optimum adherence as their adherence levels were below the

desired 95%. It is important to point out that for some reason, 15% of the participants (n=9) exceeded 100% adherence, with the pill count showing that more pills were taken than expected with respect to the prescribed quantities. The reasons for this was not clear but it could be as a result of the participants actually consuming more pills than required, in which case it will constitute an over dosage. This can be corrected by intensifying adherence monitoring and counselling. It may also be due to loss of pills, hence the return of fewer pills than expected at the pill count.

A comparison of both adherence measurement methods show a significant similarity and consistency in the levels of adherence reported by the participants via the virtual analogue scale, and that obtained by the more objective pill count. They also correspond with the level of adherence reported in the three day recall measure. These show that the levels of adherence in the pregnant population in the clinic were quite high. This finding correlates generally with the reported success of the PMTCT program in Botswana.

The adherence rates, when compared to PMTCT adherence studies elsewhere in Africa such as the study conducted by Igwebe et al (2010), which reported a non adherence rate of 21.7%, show that there may be a higher adherence to PMTCT therapy in Botswana. The higher adherence rates may be contributory to the recorded success of the PMTCT program in Botswana as compared to some other African countries.

Comparing the adherence recorded in this study with other HAART adherence studies carried out in Botswana in non-pregnant subjects such as the Barriers to Antiretroviral adherence for patients living with HIV infection and AIDS in Botswana by Weiser et al, (2003) which reported an adherence rate of 54% by self report and 56% by provider assessment; and the Ogenyi (2006) adherence study investigating adherence to antiretroviral therapy among paediatric patients in Mahalapye District Hospital, Botswana, which reported an optimal adherence rate of 20.8% by pill count measure, and a 76.3% by self report via a virtual analogue scale; as well as the Factors that facilitate or constrain adherence to antiretroviral therapy among adults at four public health facilities in Botswana: a pre-intervention study by Kgatlwane et al (2006) which reported an optimal adherence rate of 75% by pill count, 60% by virtual analogue scale, and 96% by a two day pre-interview adherence recall, all show that pregnant women on PMTCT may have better adherence levels to antiretroviral treatment than other populations on HAART in Botswana. This may be because pregnant women on

PMTCT are highly motivated to adhere to their medication, being keen to prevent vertical transmission to their children. Also, pregnant women on PMTCT typically visit the clinic on a monthly basis for ante-natal services and collection of their antiretroviral medication. This gives the healthcare workers a good opportunity to carry out continuous adherence counselling to ensure good adherence to therapy. Area W Clinic utilizes this opportunity to carry out adherence monitoring to ensure medication adherence.

Adherence studies elsewhere in Africa in non pregnant adult subjects by Irude et al, (2005) reported an optimal adherence level of 21% among ARV users interviewed which was also below what was observed in this study. It therefore follows that pregnant women in Botswana on PMTCT demonstrate higher adherence rates to antiretroviral treatment than patients who are on antiretroviral treatment primarily for their own health. The reasons for the higher adherence rates among pregnant women need to be evaluated further in future studies as this may inform strategies to improve adherence in non-pregnant patients on antiretroviral treatment.

10.4 Factors influencing adherence to PMTCT therapy and their relative importance

This study reports a non-adherence rate of 16%. The most cited reason for non-adherence among the participants who did not demonstrate optimum adherence to treatment was that a pregnancy related illness such as nausea prevented them from achieving optimal adherence. The second most cited reason was medication side effects. It therefore becomes important for healthcare workers to consider prompt management of pregnancy related illness in patients on PMTCT, as well as to promptly manage medication side effects as these may impact negatively on medication adherence, and consequently PMTCT treatment failure. Other reasons cited were inadequate medication counselling, negative attitude of health workers, lost pills, and pill fatigue. The study also showed that the month of pregnancy had an effect on PMTCT treatment adherence as participants tend to adhere less to therapy as they approached delivery. This may be due to pill fatigue or due to some pregnancy related illness. The most important factors influencing adherence to PMTCT therapy and in order of their relative importance deduced from this study therefore, are pregnancy related illnesses, medication side effects, and month of pregnancy of the patient on PMTCT.

Comparing the most cited reasons for non-adherence to PMTCT therapy with other barriers to HAART in non-pregnant subjects identified in another study carried out in Botswana by Weiser et al (2003) which listed cost, stigma, travel/migration and side effects as barriers to adherence in non-pregnant adult patients, show that only side effects correlates with the findings of this study as a barrier to optimal adherence in pregnant women. Antiretroviral drugs are presently given free of charge to citizens of Botswana hence cost of medication did not play any role in the observed levels of adherence in this study. Some of the factors listed as barriers to enrolment onto the PMTCT program in Botswana in the Barriers to participation in the prevention of mother-to-child HIV transmission program in Gaborone, Botswana: A qualitative approach study by Kebaabetswe (2007) such as lack of male partner support, stigma and disclosure researched in this study did not significantly affect the rate of adherence for participants already enrolled on the PMTCT program in this study. The other factors investigated in this study did not show any significant influence on optimal adherence in the participants. This is elaborated by the high levels of adherence observed in the study.

11. LIMITATIONS OF THE STUDY

The study reported a high adherence rate for the majority of participants including those who were treatment naïve before being placed on HAART as a result of pregnancy. The scope of the study was unable to follow up participants to determine if the adherence currently reported will translate to adherence to HAART when the participants are eventually enrolled onto life-long antiretroviral therapy.

PMTCT therapy in Botswana continues for six weeks after delivery. The study however focused only subjects during pregnancy. It was therefore unable to evaluate if there were changes in adherence in the subjects after delivery and if there is any post partum influences on adherence.

Similarly, PMTCT therapy in Botswana also consists of neonatal antiretroviral interventions for the infant as well as infant feeding interventions. Adherence to these was not evaluated in the study.

Finally, limitations of adherence measurements were encountered during the study.

12. CONCLUSION AND RECOMMENDATIONS

The study was designed to determine the adherence levels among pregnant women on PMTCT, to establish their level of knowledge of the importance of adherence to PMTCT medication, and to identify the factors that influence adherence as well as their relative importance on the population studied.

The study reported a consistent and high adherence rate for participants both by the three day adherence recall, and the virtual analogue scale as well as the pill count adherence measure. Ninety eight percent of participants reported they did not miss any dose during the last three days. Eighty four percent demonstrated optimal adherences on the virtual analogue scale, and the pill count recorded 82% adherences.

The major reasons for non-adherence were medication side effects, and some pregnancy related illness which interfered with adherence. The month of pregnancy also had an influence on adherence as participants tended to adhere less as they got closer to delivery. The other adherence barriers studied did not show any significant impact on the adherence levels and this is reflected in the adherence levels reported.

The majority of the participants demonstrated adequate knowledge on the importance of PMTCT medication adherence, showing that good counselling had been done prior to treatment initiation.

The recommendations drawn from this study to improve adherence in pregnant women undergoing PMTCT therapy are as follows-

1. Pregnant women on PMTCT should be carefully monitored for pregnancy related illness as these have been shown to affect adherence to PMTCT therapy.
2. There is need for caregivers to promptly treat medication side effects whenever they occur in order to ensure optimum adherence.
3. The healthcare workers should routinely ask about medication side effects and pregnancy related illnesses at consultation.

4. It is also important to carry out continuous medication adherence counselling among pregnant women on PMTCT, to re-enforce adherence and correct any potential dosage errors.
5. Special attention should be given to pregnant women on PMTCT when they approach delivery, or when they are at term, to ensure that they continue to adhere to their treatment regimen and overcome any feelings of pill fatigue.

In conclusion, adherence levels to PMTCT therapy in Area W Clinic were high and the patients are generally well educated on the importance of adherence to PMTCT therapy.

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Addendum 1: Interview form

PMTCT ADHERENCE QUESTIONNAIRE

To determine the level of adherence of pregnant mothers to PMTCT in Area W Clinic Francistown

Participant research number ☐☐☐ Date ☐☐ ☐☐ ☐☐☐☐
dd mm yy

Please check one box for each question where there are check boxes. If you do not wish to answer a question, please draw a line through it.

A. Socio-demographic data

Age (years) ……. On HAART because of PMTCT? Yes ☐ No☐

Months of pregnancy …… Date of initiation of PMTCT therapy…….

Education level-☐ ☐ ☐ Previously been on HAART? Yes ☐ No☐
Primary Secondary Tetiary If yes, Date of initiation of HAART
……..

Employment status-Y☐ ☐

If yes, profession or job title……

Marital status-Single ☐ Married☐ Divorced ☐ Widowed☐

Do you drink alcohol☐ ☐If yes, what do you drink? Beers ☐Wines☐ Others☐
……
Yes No
How often do you drink in a week?.....

B. Adherence

1. How sure are you that:

Please check one box for each question.

		Not at all Sure	Some what sure	Very sure	Extremely sure
a.	You will be able to take all or most of your Anti-HIV medications as directed?	☐ 0	☐ 1	☐ 2	☐ 3
b.	The anti-HIV medication will prevent HIV transmission to your baby if well taken?....	☐ 0	☐ 1	☐ 2	☐ 3

c. If you do not take your anti-HIV medication ☐ ☐ ☐ ☐

Exactly as directed, the HIV in your body 0 1 2 3

Will become resistant to this medication?....

2. During the last three days did you miss any dose of your medications? YES☐ NO☐

3. Did you miss to take the dose of any of the following medications?

Name of medicine	Dose (No. of pills taken at a time)	Frequency (No. of times taken in a day)	How many doses did you miss?

4. Some people find that they forget to take their pills on the weekend days. Did you miss any of your ARV medications last Saturday or Sunday? ☐YES ☐NO

People may miss taking their medications for various reasons. Here is a list of possible reasons why you may have missed taking any medications within the **past month.**

5. In the **past month**, how often have you **missed taking your medications** because you:

	Please check one box for each question.	**Never 3**	**Rarely 2**	**Sometimes 1**	**Often 0**
a.	Wanted to avoid side effects?	☐	☐	☐	☐
b.	Lack support from partner or spouse?.....	☐	☐	☐	☐
c.	Not fully understanding how and when to take the medications?.....	☐	☐	☐	☐
d.	Lost pills?.....	☐	☐	☐	☐
e.	Did not like the attitude of the health workers?.....	☐	☐	☐	☐
f.	Had a bad event happen that you felt was related to taking the pills?	☐	☐	☐	☐
		☐	☐	☐	☐

g. Forgot?

h.	Ran out of pills?	☐	☐	☐	☐
i.	Tired of taking too many pills?	☐	☐	☐	☐
j.	Felt the drugs may harm your baby?	☐	☐	☐	☐
k.	Other illness, nausea, or some pregnancy related health problems got in the way?	☐	☐	☐	☐
l.	Stigmatization (what others may say or discover about my disease) by people outside of one's family?	☐	☐	☐	☐
m.	Fear of stigmatization/disclosure within the home (e.g. not wanting the husband or family to know)?	☐	☐	☐	☐
n.	Other-?	☐	☐	☐	☐

If other, specify ----------

Virtual Analogue scale

Consider the line below as a scale from 0 to 10 and score yourself by marking the point on the line that you think represents your overall level of adherence to the ARV medications

0 1 2 3 4 5 6 7 8 9 10

Thank you very much for completing these questions.

Parts of this questionnaire was modified from the NIAID AIDS CLINICAL TRIALS GROUP questionnaires

Addendum 2:

Pharmacy pill count data collection form

Assigned Subject Research Number: | | | |

Name of ARV Drug	**Dosage** *(for example i bd, etc)*	**Quantity given previously(P0)** (qty dispensed + any remaining pills) ***from pharmacy records***		**Quantity returned presently(P1)** (Pill count)	
		QUANTITY	**DATE**	**QUANTITY**	**DATE**
1.					
2.					
3.					

%ADHERENCE=

Total # of pills provided at previous visit (P0) - # pills remaining(P1)

---------- X 100%

pills instructed to take daily x # days since last visit

(office of Clinical Research, Health Sciences, University of Pittsburg, USA. November 17, 2010)

Addendum 3: Approval letter from health facility

GREATER FRANCISTOWN DHMT

ALL CORRESPONDENCE TO
BE ADDRESSED TO DHMT
COORDINATOR

PRIVATE BAG 69
TONOTA BOTSWANA
TELEPHONE: 2484932/281
FAX: 2484513

Republic of Botswana

REF: GFHMT/2012

21st June 2012

Ochigbo B.B.Ekwu
P.O.Box 646
Francistown

Dear Sir/Madam

RE: REQUEST TO CONDUCT A RESEARCH PROJECT AT AREA W CLINIC

Yours dated 20th May 2012.

Approval is hereby granted for you to conduct research on adherence to PMTCT antiretroviral therapy among HIV infected expectant mothers at Area W Clinic subject to the following conditions:-

1. District Health Management Team will not pay you any allowance or wages.
2. District Health Management Team will not be responsible for your insurance.
3. District Health Management Team will not provide you with protective clothing.

Thank you.

Yours Faithfully

for Dr Retta Ayelle Habtemariam
GFHMT Coordinator

cc: Matron In charge – Area W Clinic Cluster
Nurse Incharge – Area W Clinic

Addendum 4: Approval letter from the Botswana Ministry of Health.

TELEPHONE: 363 2766
FAX: 391 0647
TELEGRAMS: RABONGAKA
TELEX: 2818 CARE BD

Republic of Botswana

MINISTRY OF HEALTH
PRIVATE BAG 0038
GABORONE

REFERENCE NO: PPME 13/18/1 PS V (228) 27 June 2012

Health Research and Development Division

Notification of IRB Review: New application

Ochigbo B.B. Ekwu
P.O. Box 646
Francistown

Protocol Title:	ADHERENCE TO PMTCT ANTIRETROVIRAL THERAPY AMONG HIV INFECTED EXPECTANT MOTHERS IN AREA W CLINIC FRANCISTOWN . 2012
HRU Protocol Number:	HRU 00777
HRU Approval Date:	26 June 2012
HRU Expiration Date:	25 June 2013
HRU Review Type:	HRU reviewed
HRU Review Determination:	Approved
Risk Determination:	Minimal risk

Dear Mr Ekwu

Thank you for submitting new application for the above referenced protocol.
This approval includes the following:-

1. Application form
2. Protocol
3. Data collection tools

This permit does not however give you authority to collect data from the selected site without prior approval from the management. Consent from the identified individuals should be obtained at all times.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Health Research and Development Division in the Ministry of Health for consideration and approval.

Furthermore, you are requested to submit at least one hardcopy and an electronic copy of the report to the Health Research, Ministry of Health within 3 months of completion of the study. Approval is for academic fulfillment only. Copies should also be submitted to all other relevant authorities.

Continuing Review
In order to continue work on this study (including data analysis) beyond the expiry date, submit a Continuing Review Form for Approval at least three (3) months prior to the protocol's expiration date. The Continuing Review Form can be obtained from the Health Research Division Office (HRDD), Office No. 9A 11 or Ministry of Health website: www.moh.gov.bw or can be requested via e-mail from Mr. Kgomotso Motlhanka, e-mail address: kgmmotlhanka@gov.bw As a courtesy, the HRDD will send you a reminder email about eight (8) weeks before the lapse date, but failure to receive it does not affect your responsibility to submit a timely Continuing Report form

Amendments
During the approval period, if you propose any change to the protocol such as its funding source, recruiting materials, or consent documents, you must seek HRDC approval before implementing it. Please summarize the proposed change and the rationale for it in the amendment form available from the Health Research Division Office (HRDD), Office No. 9A 11 or Ministry of Health website: www.moh.gov.bw or can be requested via e- mail from Mr. Kgomotso Motlhanka, e-mail address: kmotlhanka@gov.bw . In addition submit three copies of an updated version of your original protocol application showing all proposed changes in bold or "track changes".

Reporting
Other events which must be reported promptly in writing to the HRDC include:
- Suspension or termination of the protocol by you or the grantor
- Unexpected problems involving risk to subjects or others
- Adverse events, including unanticipated or anticipated but severe physical harm to subjects.

If you have any questions please do not hesitate to contact Mr. P. Khulumani at pkhulumani@gov.bw, Tel +267-3914467 or Lemphi Moremi at lamoremi@gov.bw or Tel: +267-3632464. Thank you for your cooperation and your commitment to the protection of human subjects in research.

Yours sincerely

P. Khulumani
For Permanent Secretary

MINISTRY OF HEALTH
DEPT. OF POLICY PLANNING, MONITORING AND EVALUATION
27 JUN 2012
P/BAG 0038
GABORONE
REPUBLIC OF BOTSWANA

Addendum 5: Approval from Research and Ethics Committee (REC) Stellenbosch University

UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot • your knowledge partner

Approved with Stipulations
New Application

06-Aug-2012
OCHIGBO, Boniface Bradford

Protocol #: HS818/2012

Title: **Adherence to prevention of mother to child transmission (PMTCT) therapy among HIV positive expectant mothers in area W Clinc Francistown Botswana.**

Dear Mr Boniface OCHIGBO,

The **New Application** received on **16-Jul-2012**, was reviewed by Research Ethics Committee: Human Research (Humanities) via Committee Review procedures on **26-Jul-2012**.

Please note the following information about your approved research protocol:

Protocol Approval Period: **26-Jul-2012 -25-Jul-2013**

Present Committee Members:
Theron, Carl CC
Somhlaba, Ncebazakhe NZ
Viviers, Suzette S
Van Zyl, Gerhard G
Fouche, Magdalena MG
Van Wyk, Berte B
Hansen, Leonard LD
Horn, Lynette LM
De Villiers-Botha, Tanya T
Newmark, Rona R
Prozesky, Heidi HE
Beukes, Winston WA

The Stipulations of your ethics approval are as follows:
1.Please provide some information on the occupational background of the researcher and current employment relationship (if any) with the research site. How will the researcher gain access to the identities of HIV positive women attending Antenatal clinic in order to recruit participants onto the study, as this would normally be regarded as confidential healthcare information available only to those directly involved in patient care?
2.How will anonymous questionnaires be linked to the adherence records/ pill count information?
3.Please confirm that the researcher is competent in the local language. If not how will this problem be addressed?
Consent Form:
1.Explain in simple language what is meant by adherence in this context.
2.Remove the sentence "This is because the investigator is unable to afford payment".

Standard provisions
1. The researcher will remain within the procedures and protocols indicated in the proposal, particularly in terms of any undertakings made in terms of the confidentiality of the information gathered.
2. The research will again be submitted for ethical clearance if there is any substantial departure from the existing proposal.
3. The researcher will remain within the parameters of any applicable national legislation, institutional guidelines and scientific standards relevant to the specific field of research.
4. The researcher will consider and implement the foregoing suggestions to lower the ethical risk associated with the research.

You may commence with your research with strict adherence to the abovementioned provisions and stipulations.

Please remember to use your **protocol number** (**HS818/2012**) on any documents or correspondence with the REC concerning your research protocol.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:

Please note that a progress report should be submitted to the Committee before the approval period has expired if a continuation is required.
The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

National Health Research Ethics Committee (NHREC) number REC-050411-032.

This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility permission must be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health (healthres@pgwc.gov.za Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za Tel: +27 21 400 3981).
Research that will be conducted at any tertiary academic institution requires approval from the relevant parties. For approvals from the Western Cape Education Department, contact Dr AT Wyngaard (awyngaar@pgwc.gov.za, Tel: 0214769272, Fax: 0865902282, http://wced.wcape.gov.za).

Institutional permission from academic institutions for students, staff & alumni. This institutional permission should be obtained before submitting an application for ethics clearance to the REC.
Please note that informed consent from participants can only be obtained after ethics approval has been granted. It is your responsibility as researcher to keep signed informed consent forms for inspection for the duration of the research.

We wish you the best as you conduct your research.
If you have any questions or need further help, please contact the REC office at .

Included Documents:
Admin review
consent to participate
Assent form
certificate of translation
Letter of permission
Participation sheet 2
consent form
Research Proposal
Questionnaire
Questionnaire translated
Interview guide
Participation sheet
DESC App
REC app

Sincerely,

Winston Beukes
REC Coordinator
Research Ethics Committee: Human Research (Humanities)

Investigator Responsibilities

Protection of Human Research Participants

Some of the responsibilities investigators have when conducting research involving human participants are listed below:

1.Conducting the Research. You are responsible for making sure that the research is conducted according to the REC approved research protocol. You are also responsible for the actions of all your co-investigators and research staff involved with this research. You must also ensure that the research is conducted within the standards of your field of research.

2.Participant Enrollment. You may not recruit or enroll participants prior to the REC approval date or after the expiration date of REC approval. All recruitment materials for any form of media must be approved by the REC prior to their use. If you need to recruit more participants than was noted in your REC approval letter, you must submit an amendment requesting an increase in the number of participants.

3.Informed Consent. You are responsible for obtaining and documenting effective informed consent using **only** the REC-approved consent documents, and for ensuring that no human participants are involved in research prior to obtaining their informed consent. Please give all participants copies of the signed informed consent documents. Keep the originals in your secured research files for at least five (5) years.

4.Continuing Review. The REC must review and approve all REC-approved research protocols at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period**. Prior to the date on which the REC approval of the research expires, **it is your responsibility to submit the continuing review report in a timely fashion to ensure a lapse in REC approval does not occur.** If REC approval of your research lapses, you must stop new participant enrollment, and contact the REC office immediately.

5.Amendments and Changes. If you wish to amend or change any aspect of your research (such as research design, interventions or procedures, number of participants, participant population, informed consent document, instruments, surveys or recruiting material), you must submit the amendment to the REC for review using the current Amendment Form. You **may not initiate** any amendments or changes to your research without first obtaining written REC review and approval. The **only exception** is when it is necessary to eliminate apparent immediate hazards to participants and the REC should be immediately informed of this necessity.

6.Adverse or Unanticipated Events. Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research related injuries, occurring at this institution or at other performance sites must be reported to Malene Fouch within **five (5) days** of discovery of the incident. You must also report any instances of serious or continuing problems, or non-compliance with the RECs requirements for protecting human research participants. The only exception to this policy is that the death of a research participant must be reported in accordance with the Stellenbosch Universtiy Research Ethics Committee Standard Operating Procedures. All reportable events should be submitted to the REC using the Serious Adverse Event Report Form.

7.Research Record Keeping. You must keep the following research related records, at a minimum, in a secure location for a minimum of five years: the REC approved research protocol and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence from the REC

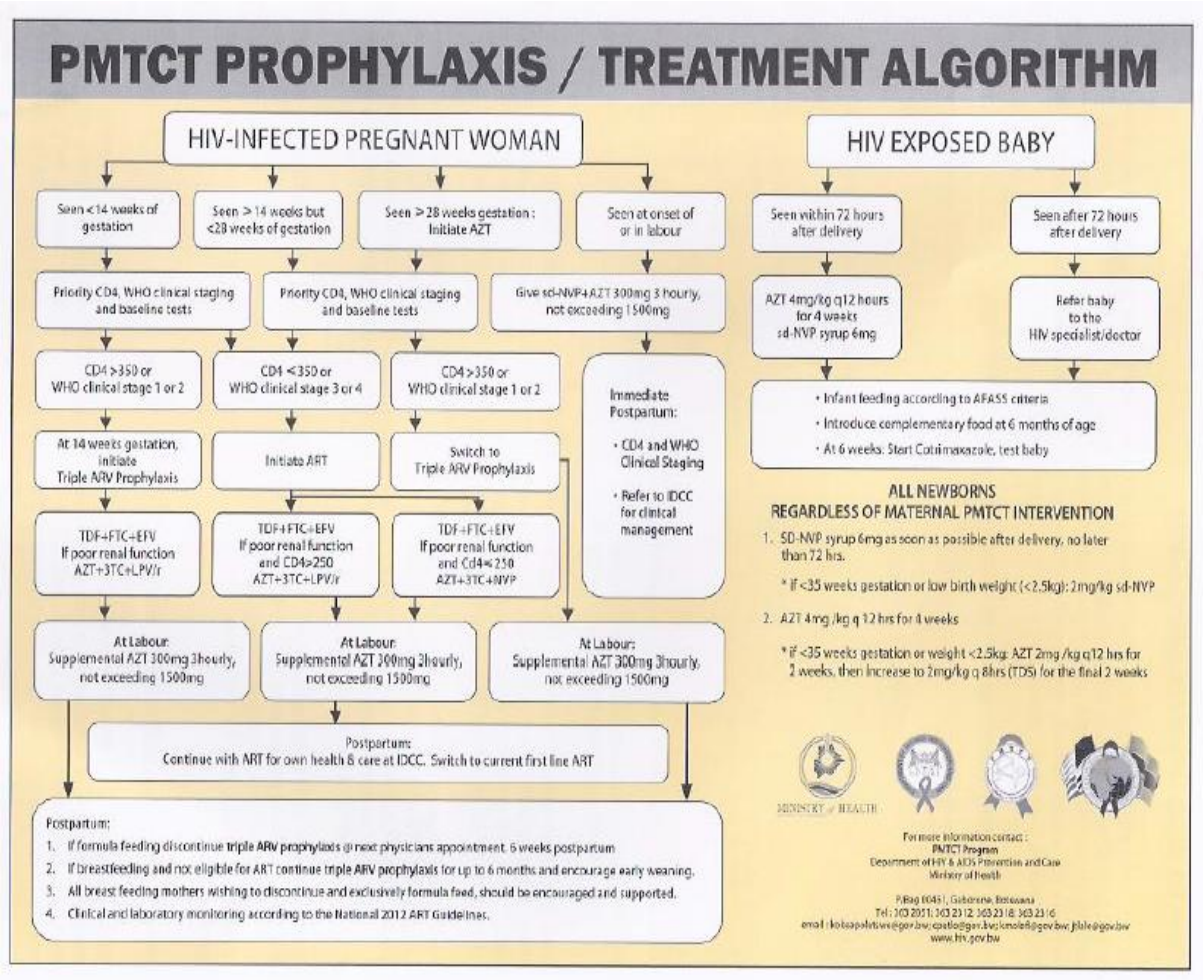
8.Reports to Sponsor. When you submit the required reports to your sponsor, you **must** provide a copy of that report to the REC. You may submit the report at the time of continuing REC review.

9.Provision of Counselling or emergency support. When a dedicated counsellor or physchologis provides support to a participant without prior REC review and approval, to the extent permitted by law, such activities will not be recognised as research nor the data used in support of research. Such cases should be indicated in the progress report or final report.

10.Final reports. When you have completed (no further participant enrollment, interactions, interventions or data analysis) or stopped work on your research, you must submit a Final Report to the REC.

11.On-Site Evaluations, Inspections, or Audits. If you are notified that your research will be reviewed or audited by the sponsor or any other external agency or any internal group, you must inform the REC immediately of the impending audit/evaluation.

Addendum 6: Botswana PMTCT prophylaxis/treatment algorithm



2012 Botswana National HIV and AIDS Treatment Guidelines, page 179

Addendum 7: Self assessment

DEPARTEMENT BEDRYFSIELKUNDE / DEPARTMENT OF INDUSTRIAL PSYCHOLOGY

SELFBEOORDELING / SELF ASSESSMENT *

MODULE: BEDRYFSIELKUNDE / INDUSTRIAL PSYCHOLOGY _____

STUDENT: OCHIGBO B.B.E. US NR: 16863909

UITKLOP ITEMS / KNOCK OUT ITEMS (indien NEE aangedui word, sal u seminaar nie beoordeel word nie / if NO is indicated, your seminar will not be assessed)		Ja / Yes	Nee / No
Bronverwysings en bronnelys ingesluit / References and "reference list" included		✓	
Getekende plagiaat verklaring / Signed plagiarism declaration		✓	
Selfbeoordeling / Self - assessment (voeg in as bylae / include as an appendix)		✓	
Turnitin opsomming / summary ** (Voeg in as bylae / include as an appendix)	%	✓	
Inhoud is tans aangebied / Own content		✓	

DIMENSIES VAN ASSESSERING / DIMENSIONS OF ASSESSMENT			PUNT MARK
VOORKOMS EN TEGNIESE VERSORGING VOLGENS APA RIGLYNE / APPEARANCE AND TECHNICAL CARE ACCORDING TO APA GUIDELINES [10]	Ja / Yes	Nee / No	
Voorkoms kundig en netjies / appearance professional & neat	✓		
Inhoudsopgawe en inhoud met bladsy nommers / List of contents and content with page numbers	✓		
Voldoende verwysinge na erkenning van bronne / Sufficient reference to avoid plagiarism / references	✓		
Korrekte van verwysings in teks en verwysingslys / Correctness of references in text and reference list	✓		
Alle bronne in verwysingslys ook in teks en vice versa / All references in reference list also in text and vice versa	✓		

	Uitstekend / Very good	Goed / Good	Redelik / Fair	Swak / Poor	Baie swak / Very poor	
BRONNE / SOURCES [10]						
Gehalte van bronne / quality of references (is dit die erkende bronne vir die onderwerp / vakgebied / Die "beste" bronne / are these sources the most recognised sources from the "best" sources)						
Regmatigheid van bronne / legitimacy of references				✓		
Aantal bronne gebruik / number of sources used				✓		
TAALGEBRUIK / LANGUAGE [5]						
Wetenskaplike styl/styl / scientific writing style - sien riglyne / see guidelines					✓	
Gerapporteerde woordgebruik / use of own words [eie woorde / own words used]				✓		
"Jargon" vermy / "language of communication" [sien riglyne / see guidelines]					✓	
INHOUD / CONTENT [75]						
Logiese afbakening & struktuur / logical delimitation & structure [volg die inhoud logies op mekaar sodat daar voldoende struktuur aan die inhoud gegee / is there a logical delimitation to the content, is there sufficient structure to the content]					✓	
Tematiese vloei / thematic exposition [volg die dele logies op mekaar sodat daar 'n vloeiende vloei en koppeling tussen paragrawe? / do the sections logically follow eachother, other, is there a flow between paragraphs]					✓	
Beredenerende aanbieding / argumentative presentation [volg die skrywer 'n beredeneerde ingesteldheid eerder as die een outeur noem dit en die ander dat; integreer/kontrasteer en bespreek/ die mate / do the writing style show argumentative presentation rather than one one author states this and the other that, integrate, contrast and agree the contrary]					✓	
Integrasie van bronne / integration of references [is daar een bron wat die ander "behandel" nie – die bronne moet bespreek en geïntegreer word/ integrate sources by argument, do not discuss one source after the other with no discussions and integration]					✓	