

**THE COMPARATIVE ANALYSIS OF CLINICAL, PREVALENCE CRITERIA &  
TREATMENT OF MATERNAL HIV AMONG CHINA & AFRICA**

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A thesis submitted to the Department of Mathematics and Natural Sciences in partial  
fulfillment of the requirements for the degree of  
B. Sc. in Biotechnology

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## **Declaration**

It is hereby declared that

1. The thesis submitted is my/our own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I/We have acknowledged all main sources of help.

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## Approval

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## **Ethics Statement**

This thesis has been composed solely by me and it has not been submitted, in whole or in part, in any previous institution for a degree or diploma. All explanations that have been adopted literally or analogously are marked as such.

## **Abstract**

Maternal HIV has been a rising issue among different countries. China and African countries are no different to it. The purpose of the paper is to come up with a comparative analysis of clinical, prevalence criteria and treatment for battling and preventing maternal HIV in China and the African countries. In order to come up with the possible solutions, we analyzed the data of China and Africa in graphical patterns to easily compare the situation of maternal HIV in these two places. The results showed that Africa as a continent lag far behind China when it narrows down to different parameters such as, disclosure ratio, mother to child transmission rate, percentage of using antiretroviral therapy or the age at which maternal HIV prevails among the females. The study suggests both China and Africa should come forward, help and learn from each-others mistakes, advantages, disadvantages etc. for preventing maternal HIV successfully. The government can take different measures in this regard.

**Keywords:** Maternal HIV; China; African continent.

## **Dedication**

We would like to sincerely dedicate our work to our family especially our parents for their unending support and without whom we couldn't have reach here today. We also believe our friends, peers seniors and juniors helped us in our journey throughout. Thus, our utmost respect and gratitude towards them.

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## **List of Acronym**

HIV Human Immunodeficiency Virus

AIDS Acquired Immune Deficiency Syndrome

CD Cluster of Difference

MTCT Mother To Child Transmission

SIV Simian Immunodeficiency Virus

ART Antiretroviral Therapy

DNA Deoxyribonucleic Acid

RNA Ribonucleic Acid

GP120 Glycoprotein 120

CCR-5 Chemokine Receptor Type- 5

CXCR- 4 Chemokine Receptor Type- 5

CDC Centers for Disease Control

TPB Theory of Planned Behavior

## 1. Introduction

Human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) appears to be a big public health problem on a global scale. This virus weakens a person's immune system by attacking CD4 cells, which help the body fight off infection. The number of persons living with HIV is increasing as survival rates improve, exceeding over 2 million among pregnant women (M. Yang, Wang, Chen, Zhou, & Jiang, 2019). HIV-infected pregnant women, as a special population, can transfer HIV vertically to their infants through pregnancy, delivery, or breastfeeding.

The first section of the review consists of a summary of what is known about HIV, life cycle of HIV, mechanism of this infection, maternal diagnosis of HIV. Then it outlines how China is battling with HIV and the Prevalence in the African continent. Afterwards, it graphically analyses different data between China and Africa. The paper concludes providing some suggestions on HIV-positive women during pregnancy.

The purpose of this literature review is to provide the analytical comparison of maternal HIV infection between Africa and the Chinese continent where we statistically analyzed the data of HIV prevalence rate by the women's age group, Antiretroviral therapy rate, Mother to child transmission (MTCT) rate and disclosure rate. The prevalence of human immunodeficiency virus (HIV) among women of child-bearing years has an increasing rate which differs significantly between countries. Africa has the highest HIV prevalence of any other continent. Eswatini, Lesotho, Botswana, South Africa, Zimbabwe, Namibia, Mozambique, Zambia, Malawi periodically has the highest HIV rate in the world (**Review, 2022, April 29**). Whereas, China has been a country with low HIV prevalence overall, though some southwestern provinces, like Sichuan and Yunnan, are experiencing HIV (**M. Yang et al., 2019**). Moreover,

the use of antiretroviral treatment during pregnancy has become a standard treatment for this mother to child transmission rates have dropped significantly (**Astawesegn, Stulz, Conroy, & Mannan, 2022**).

## **2. Emergence of HIV**

According to UNAIDS 38 million people are living with HIV around the world. Women account for half of all HIV positive people worldwide and this number is high in African countries (**UNAIDS, 2020**). Many of them do not even know their HIV status. There is no cure for HIV but there's been great progress in developing treatments. HIV is still a leading cause of death of women of child bearing age especially in southern Africa which has the world's highest infection rate (**CSIS, 2019 April 2**). HIV's origins have been the topic of scientific research and debate since it was first discovered in the 1980s. In 1999, scientists determined that HIV-1 originated from the transmission of a virus called SIVcpz from chimps to humans. The chimp virus, according to researchers, is a cross between the SIVs that normally infect two different monkeys, the red-capped mangabey (*Cercocebus torquatus*) and the larger spot-nosed monkey (*Cercopithecus nictitans*). Chimps eat monkeys that is how they inherited the monkey viruses. The genetic gene sequencing and molecular clocking tells us the hybrid virus subsequently expanded across the chimp species and then transmitted in humans to become HIV-1 (**Geographic, 2003, June 12**). **8**. So, it looked like the virus must have originated from Africa and later on spread widely in Europe and Asia as HIV is transmissible. Over 1.3 billion people live in China only, which makes up one-quarter of the world's population. Recently, the country has been dealing with one of the world's fastest-growing HIV epidemics. Moreover, HIV-infected pregnant women are up to 10 times more likely to die during and after pregnancy than pregnant women who are not infected (**McIntyre, 2003**). These deaths could be avoided if high-quality obstetric care, the prevention and treatment of common co-infections, and the treatment of HIV with ART are implemented.

### 3. Life Cycle of HIV

HIV means Human Immunodeficiency Virus that destroys cells of the immune system overtime and causes AIDS which is the final stage of HIV infection. When foreign invaders attack our body they can cause infections. But these events activate our body's defense cell. White blood is part of our body defense cell. One type of white blood cell called helper T cells (also known as CD4) is infected by HIV.

HIV is a typical retrovirus which has an outer envelope and in the center it has two copies of RNA as well as an enzyme. That's reverse transcriptase which will ultimately turn that RNA into DNA. HIV is unable to self-replicate. Instead, the virus attaches to and joins with a T-helper cell. Then it takes control over the cell's DNA and replicates itself within the cell which ultimately releases more HIV into the bloodstream. The HIV life cycle refers to the process through which HIV replicates and spreads throughout the body.

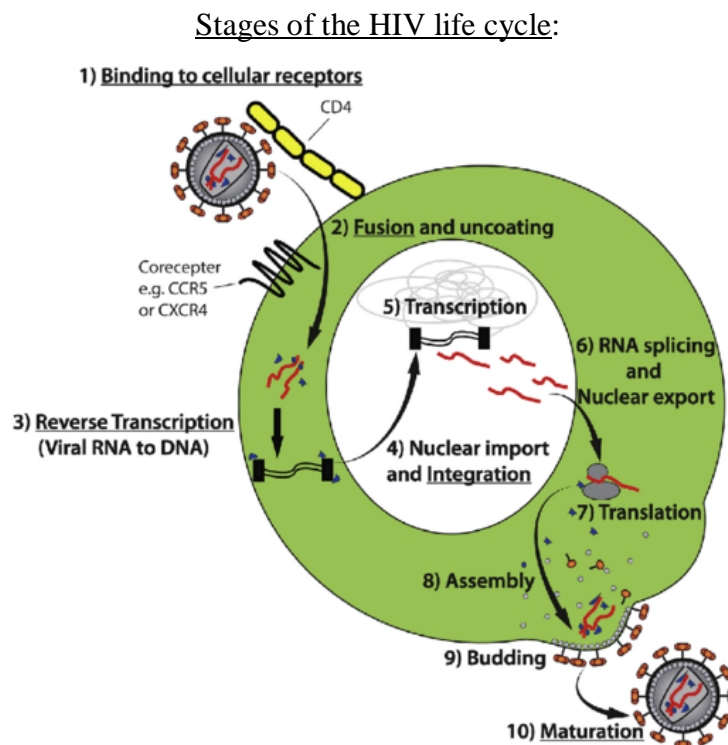


Figure 1 Stages of HIV Cycle

**Figure-** The HIV life cycle (Marsden & Zack, 2013) [1) Binding, 2) Fusion, 3) Reverse Transcription, 4) Integration, 5) Transcription, 6) RNA Splicing and Nuclear Export 7) Translation, 8) Assembly, 9) Budding and 10) Maturation are the stages of the HIV life cycle. It's easier to comprehend each stage of the HIV life cycle if you first visualize what HIV looks like.

The main stages are described below.

1. Binding To Cellular Receptors: This is the initial phase of the HIV Life Cycle. The HIV virus infects the CD4 cell and attaches itself to its surface with the help of a co-receptor.
2. Fusion and Uncoating: The second stage of the HIV life cycle is known as fusion, and it occurs after the virus has successfully attached itself to the CD4 cell. The whole HIV viral envelope will then fuse with the cell, allowing it to enter it.
3. Reverse Transcription: RNA is the genetic material of HIV. It carries the "instructions" for reprogramming the CD4 cell to produce numerous viruses. HIV's RNA must be converted into DNA in order to be effective. HIV reverse transcriptase converts HIV RNA to HIV DNA. Reverse transcriptase enzymes generate double stranded DNA by creating a "mirror image" of RNA strands.
4. Integration: After that, the newly formed HIV DNA penetrates the CD4 cell's nucleus (command center). Another HIV enzyme, integrase, joins or integrates HIV's DNA with the DNA of CD4 cells
5. Replication: Transcription: Once the virus has integrated itself into the CD4 cell, it instructs the CD4 cell to begin producing more HIV proteins. These proteins serve as the genetic material for new HIV viruses. They are manufactured in lengthy chains and spread to other CD4 cells in the body.
6. Assembly: Protease is an HIV enzyme that breaks down lengthy chains of HIV proteins into smaller fragments. A new virus is formed when the smaller protein fragments combine with copies of HIV's RNA (assembled).

7. Budding: The newly assembled virus pushes ("buds") out of the original CD4 cell. This new virus can now target and infect other CD4 cells (**Project, 2022 April 11**).

#### **4. Mechanism of HIV Infection**

Human Immunodeficiency Virus (HIV) spreads in the human body through different ways, namely- **i)** via sexual transmission, **ii)** by contaminated blood transfusion or organ transplantation, **iii)** through sharing injected equipment's and **iv)** from the mother to the baby. Initially, the virus circulated throughout the body. The body of the virus is protected with Glycoprotein, known as GP120. Inside the body of the virus, capsid is located containing the viral RNA and other viral enzymes inside of it. Through endocytosis, the virus enters the macrophage after GP120 binds with the CD4 receptor of the macrophage. The virus enters with the help of CCR5 Co- receptor. Afterwards, the viral RNA and the viral enzyme is released in the cell cytoplasm. Here, reverse transcriptase uses the RNA and forms a single strand of DNA. Following that the complementary strand is also formed resulting in the formation of a Double stranded DNA. The newly formed DNA integrates with the host cell's DNA. After that, the DNA is transcribed and a viral RNA is formed. Now, the viral RNA can function as a genome for the formation of new viruses. This can be used in the making of viral proteins. Moreover, it can be used by ribosomes during the translation phase, in order to make viral proteins, as messenger RNAs. During this whole process, the GP120 is mutated. Now, the mutated GP120 binds with a new co- receptor, CXCR- 4. This is found in CD4+ T cells. After binding with CD4+ T cells, the particles inside the GP120 are released. This leads to the formation of new viruses inside T cells. The viruses kill the T cells while leaving through disruption of the cell. These newly formed viruses interact with other T cells and kill them. The process of affecting the T cells ends up resulting in weak immune response for the virus particles. It has been found that the decreased amount of CD4+ T cells' response towards antigens and mitogens are due to



the increased amount of the viruses. Due to the increased amount of the virus, the function of T cells are down regulated. The main cause behind CD4+ T cell disruption is yet to be discovered. However, HIV and Simian Immunodeficiency Virus (HIV) are being studied in a parallel manner using different techniques such as, in- situ and quantitative PCR and processes namely, In Vivo and Ex Vivo in order to identify the factors affecting HIV(Moir, Chun, & Fauci, 2011) (Varmus, 1988) (Video, 2019, Jan 31)

An illustration of the mechanism of HIV is given below.

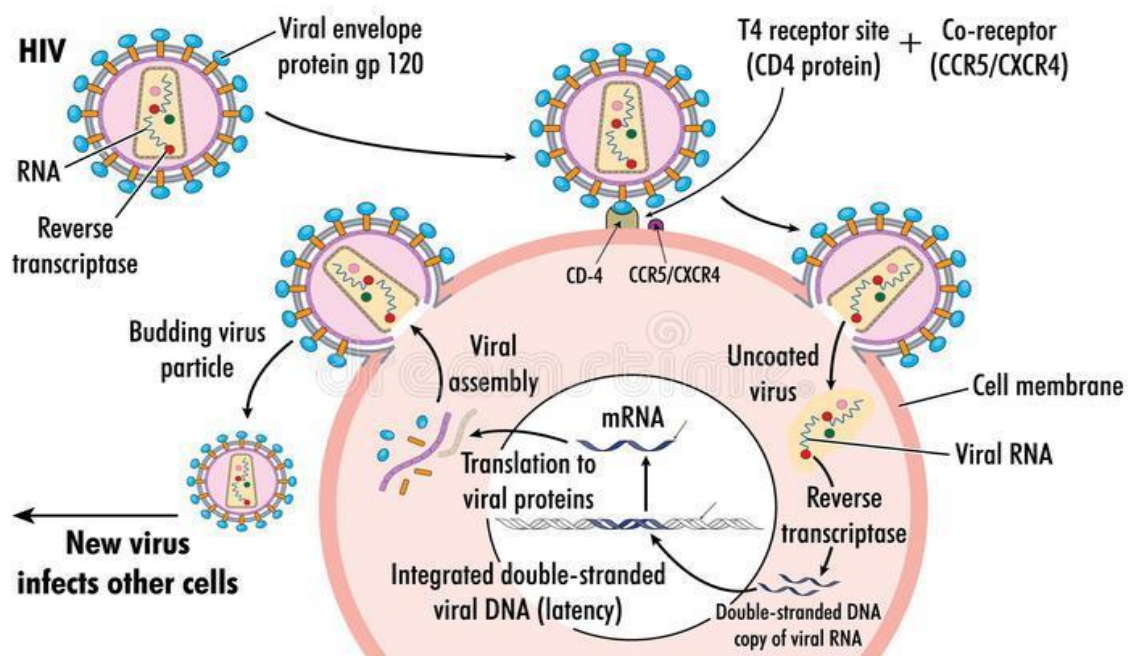


Figure 2 Mechanism of HIV

**Figure-** Illustration of HIV Mechanism (Legger) [The virus binds with the cell membrane through the binding between CD4 receptor GP120 protein and enters with the help of CCR5 co- receptor. After that, the viral RNA and the viral enzyme is released in the cell cytoplasm where the RNA transcripts and form a single strand DNA. Then the complementary strand DNA is formed. Furthermore, the new DNA

is transcribed into forming a viral RNA. Now, this newly formed viral RNA functions as the genome for the formation of new viruses.]

## **5. Maternal Diagnosis Of HIV**

Human Immunodeficiency Virus (HIV) is one of the deadliest diseases in the modern world for the longest period of time. Pregnant women and their fetuses are also at high risk of being affected by HIV. Any person can be affected by this. One of the main reasons is that HIV can mutate its genes and replicate without any difficulties. There are different types of tests that are done using blood, urine, and saliva samples to identify whether a woman is HIV positive or not. During the time of pregnancy doctors recommend three types of tests for the health of the mother. These are- (i) ELISA (Enzyme Linked Immuno- Sorbent Assay), (ii) Western Blotting, and (iii) q- PCR. In the ELISA test for HIV detection, at first primary and afterwards secondary antibodies are added. Now, if the mother is positive, a colour reaction will appear at the end indicating the mother is HIV positive. And, if the colour reaction does not appear at the end, it means that the mother is HIV negative. But, at times the results might be a false positive or a false negative one, if the test is done during the window period. In such scenarios, other tests such as, western blotting is to be done. In the Western Blotting process specific markers are used as standards to compare if the markers are present in the blood sample. HIV has different biomarkers, such as, GP120 protein, Protease, Transcriptase etc. The process is done using different markers to identify the presence of the markers. GP120 Protein can be detected through Western Blotting. After the Western Blotting is done, q- PCR test is done. This test helps to reduce viral load. It helps to identify the presence of viral mRNA. Because, the amount of viral mRNA will give an idea about the rate of production of the virus. In this test, amplification is also done. Absolute amplification is done at the end in order to obtain the total amount of viral load. Using these techniques the waiting time is now reduced than before. In

different cases the result can be obtained in about 20 minutes. Soon after the tests are done two things are monitored strictly by doctors. These are (i) CD4 Count and (ii) Viral Load. Depending on these two further diagnoses are done. Doctors highly recommend initial HIV testing for pregnant women. And, if the result is positive then a follow-up test is to be done during the third trimester of pregnancy. Antiretroviral Therapy (ART) and Prophylaxis is highly suggested by doctors during the earliest stage of pregnancy for pregnant women having HIV. But if a woman did not go through an HIV test during the initial stage of pregnancy, they should do the test during labor. During labor the tests are said to be accurate and no other confirmatory tests are to be done. This is done to identify the risk and exposure of mother and the infant to HIV. And, if the HIV status is unknown during the postpartum period, maternal immunoassay screening is to be done. Thus, if a risk is expected, then plasma HIV RNA test is to be done for mother and immediate HIV test for the newborn. Moreover, breastfeeding is not prescribed for women having HIV, since the newborns need to be breastfed in regular intervals for a certain period of time initially. This may lead to the transmission of HIV from mother to child. Even newborns are recommended to go through HIV testing and take necessary actions according to the results. Different studies are done regarding maternal HIV diagnosis. For instance, in Zambia, one of the top countries with the highest number of HIV patients, a survey was done among women aged 20- 35 years assessing the impact of diagnosis of HIV in women during pregnancy. The study showed that women having HIV during or before pregnancy had a negative impact on them. They had suicidal thoughts, depression, anxiety, the mental health being negatively affected etc. The reason behind this being the less number of doctors and mental health workers being present in Zambia. On the contrary, considering a first world country such as China, different surveys and studies are conducted regarding disclosing HIV results among the mothers and children and others. In China, self-disclosure of HIV of mothers to children played a major role in many different aspects. It

helped in building better mental health, better understanding of the disease, better family planning, better decision makings etc. Even the World Health Organization (WHO) recommends informing young children about the HIV status of their parents. (arpan, 2018, Dec 25) (10, 2017) (Science, 2014) (Practice) (Cachay, 2017) (Newborn, 2021) (Kwalombota, 2002) (Q. Wang et al., 2019)

## **6. China Battling With HIV**

In modern times, China is developing very rapidly. With developments, China is also dealing with maternal HIV.

A study was performed in urban China. The quantitative study of 29 HIV positive parents from the Chaoyang district of Beijing was done in 2011 in order to understand the parental ways of disclosing HIV among their children. Because, there are various types of stigma related to the disclosure of serostatus. It has been previously observed that parents are more concerned about the backlash from society, family members, negative impact on the mental health of their children etc. Thus a team consisting of well trained professional and experienced health workers, staff from the Centers for Disease Control and Preventions (CDC) from Chaoyang district conducted a private and public interview with the participants. The timeline of the interview was from February- May, 2011. The interview was initially done in Chinese Language and later on translated into English language. The whole interview was well encrypted and coded. Among the participants there were men who were involved with men and men involved with women. As a result, the male count was higher than the female count in the study. A total of 86% were men and 14% women. Out of the 29 participants 60% of them were married. And, 41% lived in the urban areas and 59% lived in the suburban area. From all the participants 62% were affected from homosexual behaviors, 14% were infected through heterosexual behaviors. Whereas 7% were infected through blood transfusion and 10% of

people had no clue of their source of infection. The interview consisted of a set of open ended questions concerning disclosure. These concerns included (i) demographic backgrounds, (ii) medical backgrounds related to HIV, (iii) reason and experience of both disclosure and non-disclosure etc. After the study it was found out that the disclosure rate 17% only, which is very low. Different people disclosed in different ways. Some disclosed directly and some disclosed by indirectly talking about HIV to their children or through relatives or any trusted person they know of. At the end of the study parents suggested on how disclosure should be done according to their experiences. According to some parents, they should wait until their children reach at least the age of 15- 16 years. Again, some of them suggested to disclose in a well-developed and a strategic manner. Moreover, importance is also to be given to a children's mental health before disclosure. It has been concluded that parents are still struggling with disclosure of HIV to their children and require professional help (**Qiao, Li, & Stanton, 2014**).

In an article it has been published that, maternal HIV disclosure tendency in China is very low, 16.8%. The study was done with 179+ women. In this study The Theory of Planned Behavior (**TPB**) was applied to other behaviors, for example, cervical cancer, condom use, physical activity etc. A lack of proper policy for disclosure has been mentioned to prevail in China. The study resulted in 64.8% of participant being HIV positive for more than five years, 72.1% of them being affected sexually, 49.7% were asymptomatic and 82.1% of them taking antiretroviral therapy. Moreover, almost 48.6- 53% of participants took disclosure through Theory of Planned Behavior positively. This study is an initial attempt to disclose HIV status through TPB (**Mo, Wang, Lau, Li, & Wang, 2019**).

Overall though China discloses its maternal HIV status, it is required to be much more planned and organized. Also, people should have an in-depth knowledge about HIV, maternal HIV, disclosure, antiretroviral therapy etc.

## 7. Prevalence of HIV In The African Continent

Out of the 34 million people who have HIV in the world, 69 percent live in sub-Saharan Africa. There are approximately 23.8 million people in Africa who have been infected. **(ORG)** The prevalence and incidence of HIV/AIDS have increased exponentially in recent decades. African countries are the hardest hit by this epidemic, which is wreaking havoc on every aspect of human development. The prevalence of HIV/AIDS varies according to different regions of the African continent. **(Boutayeb, 2009)**. Despite the fact that sub-Saharan Africa only has about 11% of the world's people, the region is the world's largest center point of HIV/AIDS. According to UNAIDS, there were 40 million persons living with HIV/AIDS at the end of 2001, with 28.5 million of them from Sub-Saharan Africa. Moreover, they also estimate, all of the continent's worst-affected countries (with prevalence rates greater than 20%) are contiguous in the lower half. South Africa, Lesotho, Swaziland, Botswana, Namibia, Zambia, and Zimbabwe are among them. Botswana, Lesotho, Swaziland, and Zimbabwe all have higher than 30% prevalence rates. The middle part of African countries show an adult HIV prevalence rate under 5%. Whereas, UNAIDS estimates prevalence rates of 7.2 percent in the Congo, 11.8 percent in Cameroon, and 12.9 percent in the Central African Republic in the region **(PRB, 2002, July 2)**.

For decades, South Africans believed that HIV/AIDS was a disease of the impoverished. And this remains essentially true, with nothing that can be done to prevent transmission in impoverished populations. **(V. W. Health, 2020, May 5)**. South Africa's adult population aged 15–49 years has a 19.1 percent HIV prevalence. **(Kim, Tanser, Tomita, Vandormael, & Cuadros, 2021)**.

The best evaluation is that, while there are some encouraging signals, the disease is still raging across Africa. Even if prevention measures become significantly more successful in the near

future than they have been, the HIV/AIDS epidemic will have long-term consequences. If prevention, treatment, and care programs evolve at a slower pace, HIV/AIDS will undoubtedly have a dramatic impact on African development well into the twenty-first century.

## **8. Comparative Study Between China and African Continent**

In this paper, the statistical analysis was divided into two groups; either hospital based or random based study or both. The statistical analysis was done in four categories. These are:

- I. Maternal Age Prevalence**
- II. Therapy Percentage**
- III. Disclosure Ratio**
- IV. Mother To Child Transmission Ratio**

### **I. Maternal HIV Age Prevalence.**

The Maternal HIV age prevalence was estimated by analyzing hospital based data and random based data which prevail the age group with the highest proportion of HIV infections among China and Africa.

#### Hospital Based Data:

In case of this study, we found that in china among 483 HIV infected pregnant women aged between <35 years HIV prevalence rate is 92.1% and >35 years 7.9% (**H. Li et al., 2020**). Also in another paper it was found Among the 4379 mother–infant pairs, 213 (4.9%) mothers were HIV positive and aged between this <35 years HIV prevalence rate is 79.7% and >35yrs 20.3% (**M. Yang et al., 2019**). The average of these two is <35 years has 85.90% and >35 years aged women have 14.10% HIV prevalence rate.

Whereas in Africa, it was found that among 665 pregnant women aged between  $\leq 34$  years has 92.7% and  $>34$  years has 7.3% HIV prevalence rate (Meseret, Dulla, & Nega, 2019) and in another paper it was found  $\leq 34$  years has 83% and  $>34$  years has 17% HIV prevalence rate (Care & Anti-Retroviral) . The average of these two is  $\leq 34$  has 87.85 % and  $>34$  years aged women has 12.15% HIV prevalence rate.

### CHINA (Hospital Based)

Age	Percentage
$\leq 35$ Years	85.90 %
$>35$ Years	14.10%

Table 1 China Hospital Based Study

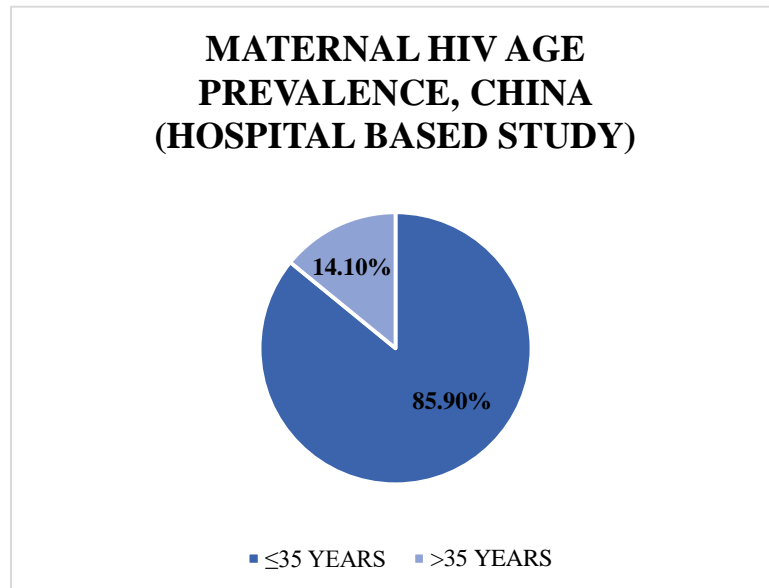


Figure 3 Maternal HIV Age Prevalence, China (HOSPITAL BASED STUDY) STUDY)

**Figure-** Maternal HIV Prevalence in China (Hospital Based Study. [For these data the total sample size was N=696. Among these pregnant women  $<35$  years has 86.50% which shows a high prevalence rate.]



### AFRICA (Hospital Based Study)

Age	Percentage
≤34 Years	87.85 %
>34 Years	12.15%

Table 2 Africa Hospital Based Study

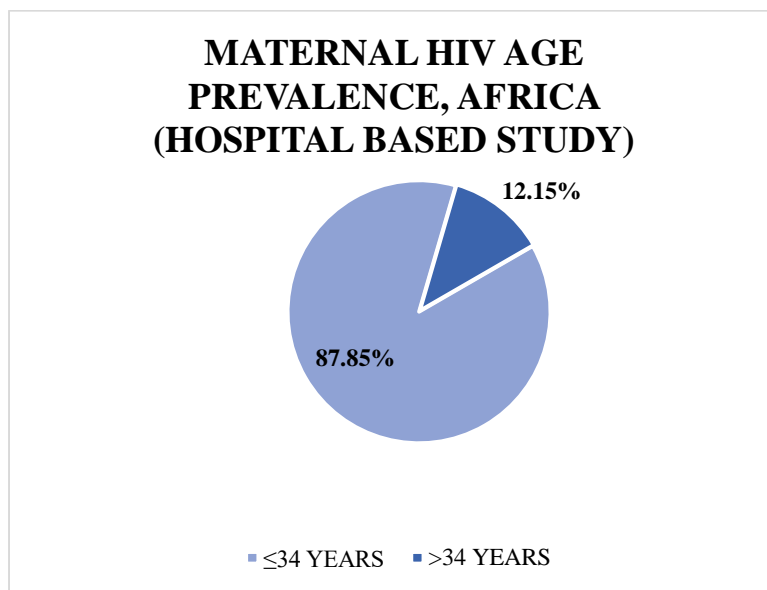


Figure 4 Maternal HIV Age Prevalence, Africa (HOSPITAL BASED STUDY)

**Figure-** Maternal HIV Prevalence in Africa (Hospital Based Study) [The percentages represent the distribution of HIV prevalence rate among different age groups in the African continent. According to the report (**Care & Anti-Retroviral**) data are from 2006, and were collected in 29 sites covering all 13 administrative regions of the country (MOHSS 2006). And another paper (**Meseret et al., 2019**) has a total population of, N=655 which shows that HIV prevails highly among women aged ≤34 years.]

Random Based Data:

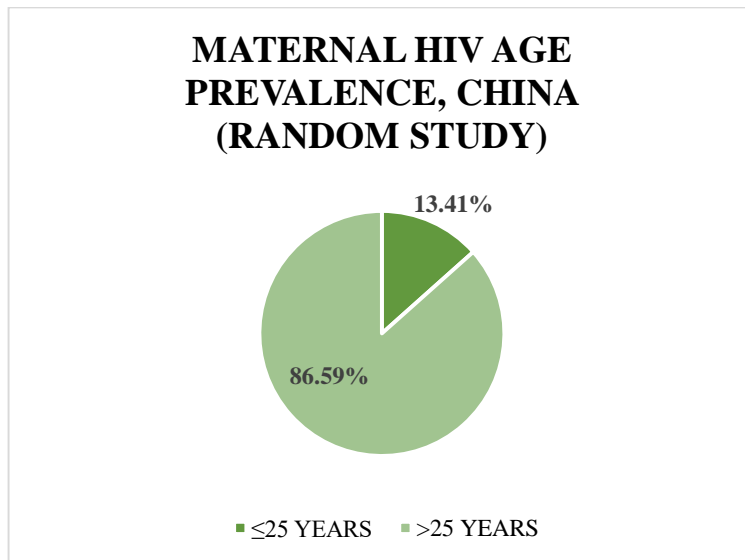
In this case, we analyzed data from two different papers and it was found that women aged  $\leq 25$  Years has 14.8% HIV prevalence rate (**H. Wang et al., 2009**). Also in another paper, data of 3983 pregnant women in Zhaojue and Butuo was collected where 277 pregnant women was HIV infected and who were  $\leq 25$  years their HIV prevalence rate was 26.82% (**S. Yang et al., 2017**). The average of these two is  $\leq 25$  has 13.41 % and  $>25$  years aged women has a 86.59% HIV prevalence rate.

Whereas, In Africa it was found women whose age around  $\leq 34$  years has 35.2% HIV prevalence (**Parker, Rau, & Peppia, 2007**) and another paper shows this prevalence rate of  $\leq 34$  years old women has 90% (**Walcott, Hatcher, Kwena, & Turan, 2013**). The average of these two is  $\leq 34$  has 62.60% % and  $>34$  years aged women has a 37.40% HIV prevalence rate.

**CHINA (Random Based Study)**

<b>Age</b>	<b>Percentage</b>
$\leq 25$ Years	13.41 %
$>25$ Years	86.59%

*Table 3 China Random Based Study*



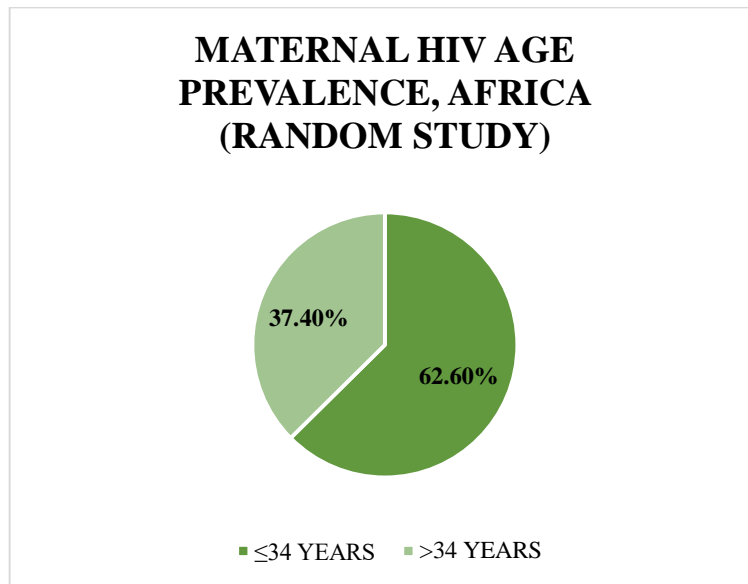
*Figure 5 Maternal HIV Age Prevalence, China (RANDOM STUDY)*

**Figure-** Maternal HIV Prevalence in China (Random Based Study) [For these data the total sample size was N=353. Among these pregnant women >25 years has 86.59% which shows a high prevalence rate]

**AFRICA (Random Based Study)**

Age	Percentage
≤34 Years	62.60%
>34 Years	37.40%

*Table 4 Africa Random Based Study*



*Figure 6 Maternal HIV Age Prevalence, Africa (RANDOM STUDY)*

**Figure-** Maternal HIV Prevalence in Africa (Random Based Study) [The percentages represent the distribution of HIV prevalence rate among different age groups in the African continent. According to the report (**Parker et al., 2007**) data are from Kenya by sex and age group, 2004 And another paper (**Walcott et al., 2013**) has a total pregnant women of, N=20 which shows that HIV prevails highly among women aged ≤34 years.]

## **II. Therapy Percentage**

In this criteria, we pulled out the hospital-based analysis of therapy percentage between China and Africa. Four separate research were evaluated for both China and Africa. Additionally, the sums for China and Africa were averaged individually.

In the African continent, it was found that a total number of 3314 HIV-positive mothers were registered in the 10 study clinics where 86% pregnant mothers took antiretroviral therapy. (**N. Li et al., 2016**). In South Africa pregnant women received 85.7% ART (**van der Merwe et al., 2011**). Another study we found, among 1793 women who had delivered 83% were HIV infected and all of them took antiretroviral therapy. (**Malaba et al., 2017**). Furthermore, in an

article among 665 pregnant women 97% took ART (**Meseret et al., 2019**) . The average rate of receiving antiretroviral therapy rate from these data is 87.93%.

However, In China, a cohort study was carried out among 483 HIV-infected pregnant women among them 414 used antiretroviral therapy which was 85.7%. (**H. Li et al., 2020**) . Another study in Guangzhou, China from October 2009 to May 2018, 802 pregnant women with HIV were recruited among them 74.22% received ART (**Hu et al., 2019**). In a study we also found, the 1,387 pregnant women participated, 298 had their CD4+ T cells counted and 107 had their viral load counted. Only 1,005 pregnant women had a record of ARV use that was accessible. Among these 918 received antiretroviral therapy which was 66.18% (**Q. Wang et al., 2016**). Also in an article among a total number of 266 HIV positive pregnant women only 140 continued antiretroviral treatment and among these 7 people were from china between them 5 people used ART which percentage 30.51% (**Hoffman et al., 2018**) . The sum of these values is 74.38%.

By comparing these sum values, we can evaluate that the percentage of antiretroviral therapy rate is comparatively high in Africa rather than China among HIV infected pregnant women.

#### **THERAPY (Hospital Based Study)**

<b>Country</b>	<b>Percentage</b>
China	74.38%
Africa	87.93%

*Table 5 Therapy Hospital Based Study*

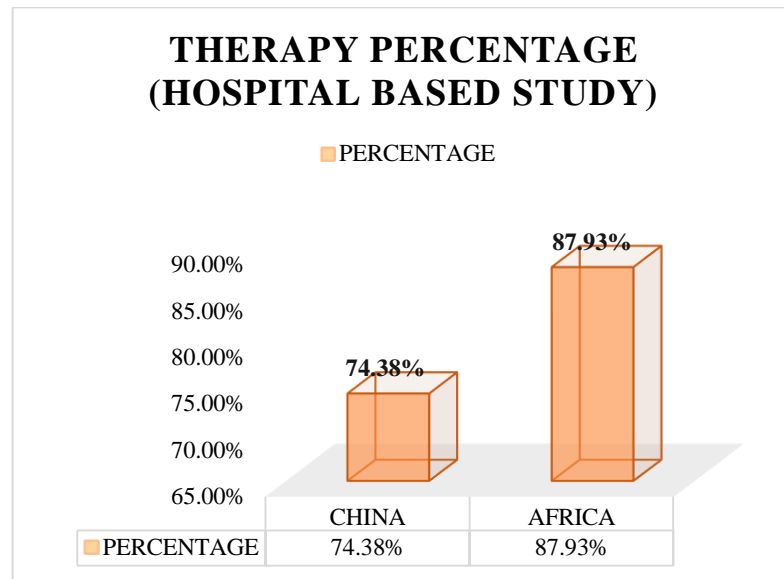


Figure 7 Therapy Percentage (HOSPITAL BASED STUDY)

**Figure-** Therapy Percentage For China & Africa [Here a total of 6398 people from Africa and 1789 people from China were considered for the study who took Antiretroviral therapy. The total population size of China and the African continent combined is N= 8187. Out of this total population China has 74.38% whereas Africa is ahead in case of taking ART with 87.93%.]

### III. Disclosure Ratio

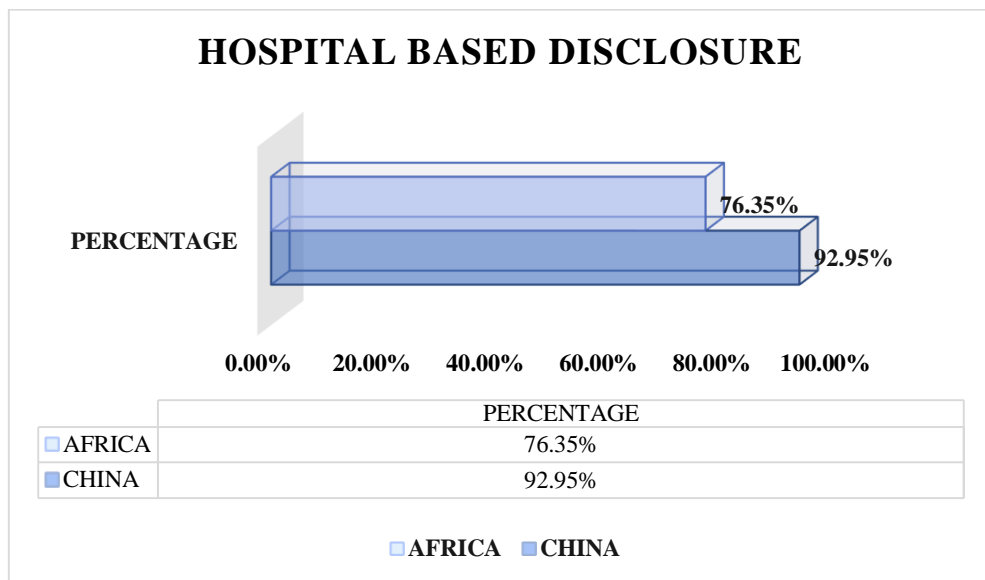
The Disclosure Ratio was estimated analyzing hospital-based data and random based data.

Hospital Based Data: In case of China, it was found that 91% females disclosed their status to their village leader (Lan, Li, Lin, Feng, & Ji, 2016) and 94.9% females disclosed their status to their partners (Mo et al., 2019). The average of these two was a total of 92.95%. Whereas, in case of Africa, 80.6% females disclosed their HIV status to anyone (Meseret et al., 2019) and 72.1% females disclosed their statuses to someone (Ramlagan et al., 2018) The disclosure percentages of the African females were averaged to 76.35%.

### DISCLOSURE RATIO (Hospital Based Study)

Country	Percentage
China	92.95%
Africa	76.35%

*Table 6 Disclosure Ratio Hospital Based Study*



*Figure 8 Disclosure Ratio (HOSPITAL BASED STUDY)*

**Figure-** Hospital Based Disclosure Ratio For China & Africa [Here a total of 1021 people from Africa and 702 people from China were considered for the study. In which it showed that, in Africa out of 1,021 people 76.35% disclosed their HIV status and in case of China out of 702 people 92.95% disclosed their HIV status. The total population size of China and African continent combined is N= 1,723]

Random Based Data: In China 71% (Loutfy et al., 2016) & 59.4% (X. Wang et al., 2018) and 87% (Kinuthia et al., 2018) and 70% (Walcott et al., 2013) female in Africa disclosed their HIV status respectively in four different studies. Bothe the Chinese and African studies averaged 65.20% for China and 78.50% for Africa respectively.

### DISCLOSURE RATIO (Random Based Study)

Country	Percentage
China	65.20%
Africa	78.50%

Table 7 Disclosure Ratio Random Based Study

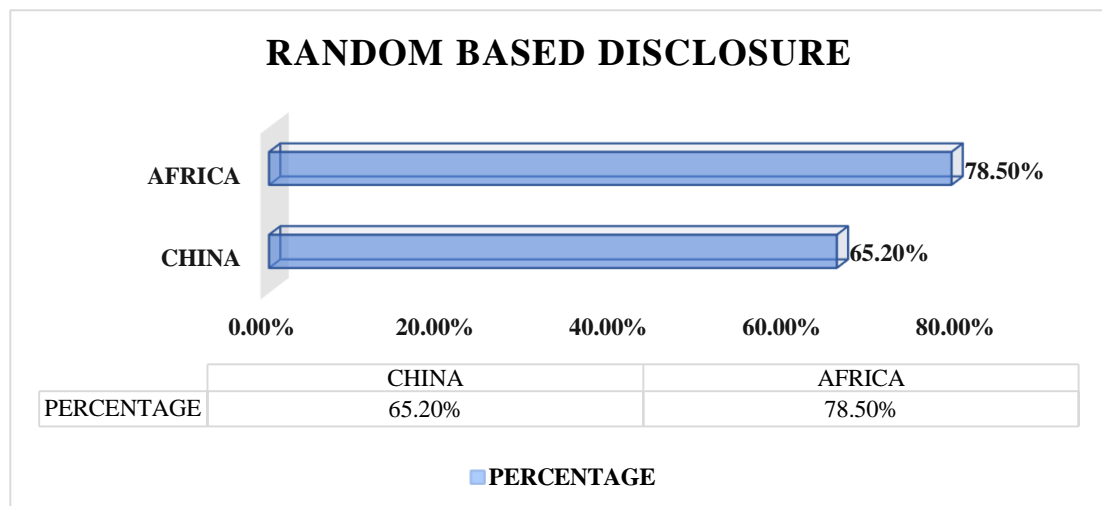


Figure 9 Disclosure Ratio (RANDOM BASED STUDY)

**Figure-** Random Based Disclosure Ratio For China & Africa [In Africa, N=440, China, N=221 people were considered for the study. Among these, In China the disclosure rate is 65.20%



among 221 people and 78.50% is the disclosure rate among 440 people. The total population size of China and African continent combined is N= 661]

In this category it has been observed that, in the hospital-based study disclosure rate of Chinese females were higher than females from the African continent. On the contrary, African females have a higher disclosure rate compared to Chinese females.

#### **IV. Mother To Child Transmission Rate**

The transmission rate was estimated from hospital based data only. For both China and Africa, four different studies were considered for each. And, the sums were averaged individually for China and Africa respectively.

In China, the first study stated that in 2016 the transmission rate was 5.7% (**H. Li et al., 2020**). Secondly in a review, the transmission rate was 0.6% (**Cui, Shi, & Wu, 2017**). Again, in a survey it was found that the rate is 4.9% (**A. Wang et al., 2018**). And, in a research article it was stated that the mother to child transmission rate was 6.6% (**Dong et al., 2020**). All these values were sum and the average was 4.45%.

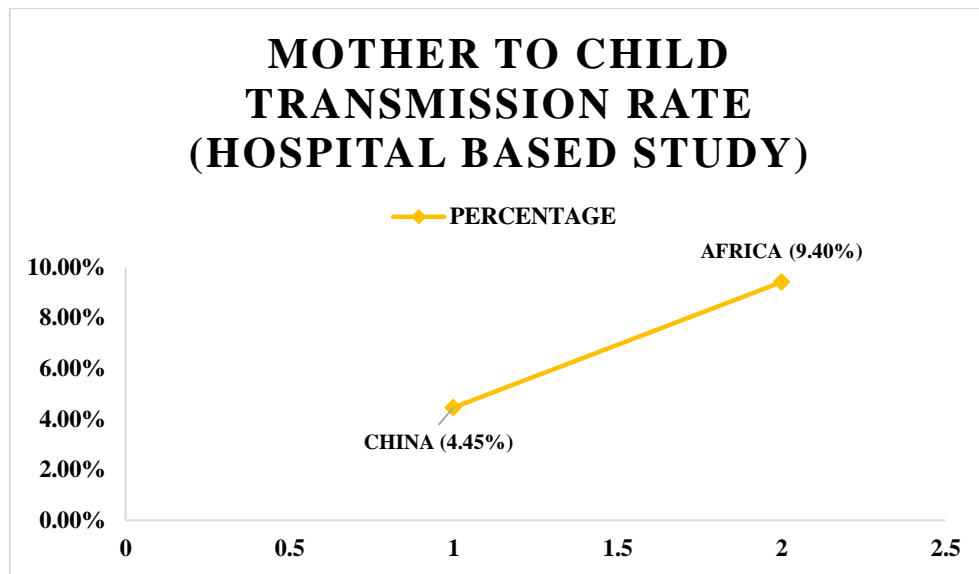
In terms of the African continent, in the first article, the transmission rate from 2012- 2013 was reported to be 6.7% (**Ramraj et al., 2018**). In a meta- analysis of Ethiopia, Moges NA et. Al reported through a cohort study that the transmission rate to be 5.9% (**Kassa, 2018**) Furthermore, in an article it was found that the final MTCT rate was 9% (**Idele, Hayashi, Porth, Mamahit, & Mahy, 2017**). And, in the survey done by the statista department, in 2013 16% MTCT was reported (**Statista, 2014, July 30**). The average MTCT from these data is 9.40%.

Among China and the African continent, the mother to child transmission rate is higher in Africa.

**MOTHER TO CHILD TRANSMISSION RATE (Hospital Based Study)**

Country	Percentage
China	4.45%
Africa	9.40%

*Table 8 Mother To Child Transmission Hospital Based Study*



*Figure 10 Mother To Child Transmission Rate (HOSPITAL BASED STUDY)*

**Figure-** Graph of Mother To Child Transmission Rate Between China & Africa [In China the total population, N= 1,213 and in 2016 it was reported to be 5.7% (H. Li et al., 2020). On the other hand in Africa, the total population, N= 1,693 and in 2000- 2015 it was 9% (Idele et al., 2017) and in 2013 it was 16% (Statista, 2014, July 30) . Out of 1,213 people in China the MTCT rate is 4.45% and in Africa the MTCT rate is 9.40% out of 1,693 people. The total population for MTCT both China and Africa combined is N= 2,906.]

## **9. Preventing Perinatal HIV Transmission**

Perinatal HIV is also known as mother to child transmission that can happen at any time during pregnancy, labour, delivery and breastfeeding. But HIV positive parents can have HIV negative children. For all women who are pregnant or planning to get pregnant, take an HIV test as early as possible. As there is a 45% chance of transmission of HIV from mother to children but more importantly there is 55% of chance she might not. Advances in HIV research, prevention, and therapy have enabled many HIV-positive mothers to give birth to HIV-free children. Consistent adherence to antiretroviral therapy is very important throughout pregnancy, during labour and postpartum which really meant to prevent transmission of perinatal HIV. So medication must be continued during this time. Moreover, for pregnant women who have a high viral load (more than 1,000 copies/mL) or an unknown viral load near the time of delivery, some HIV medicines used during pregnancy can help reduce the risk of HIV through caesarean delivery, also called a C-section, which passes from mother to child (**HIV.gov, 2022, April 25**). HIV can also spread through breastfeeding the child. So, mothers should not breastfeed the child and follow alternative options. Furthermore, babies should not eat food that has been pre-chewed by an HIV-positive individual. Proper treatment can lower the risk of your baby being born with HIV to less than 1% (**Prevention, 2022, March 7**).

## **10. Antiretroviral Therapy in HIV**

Antiretroviral treatment which is also known as antiretroviral therapy or ART, are the drugs that refer to combination drug therapy used to treat HIV. Antiretroviral medications are designed especially to inhibit a retrovirus's life cycle. Human immunodeficiency virus is the most prevalent retrovirus in humans (HIV).

Taking ART means that people living with HIV can live long and healthy lives. ART is not a cure for HIV, but it keeps HIV under control, so it doesn't affect your health and you can carry on with life as usual.

Antiretroviral drug therapy frequently combines three or more drugs from more than one class (combination therapy) to help prevent drug resistance (**E. M. Health, 2020, July 15**).

Antiretroviral therapy does not cure HIV, but it helps patients live longer and also reduces the risk of transmitting the virus to others (**Prevention, 2022, April 20**).

A pregnant HIV infected mother should start antiretroviral therapy straight away because ART helps to prevent HIV from being passed on to the baby (**HIV.gov, 2022, April 25**).

Antiretroviral therapies function by interfering with certain stages of the retrovirus life cycle. Reverse transcriptase inhibitors are a class of medications that block HIV's DNA replication (**Direct**). Another class of compounds suppresses the activity of a protein known as integrase. Integrase is a protein that assists in the integration of HIV DNA into the host cell's genome. If the viral DNA is unable to integrate into the host DNA, the virus's life cycle is terminated. These medications are most effective at preventing HIV from infecting new cells at an early stage of the life cycle. Protease inhibitors are active at a later stage of the virus's life cycle. They suppress the proteases responsible for the release of newly synthesized viruses from the host cell, stopping them from spreading and infecting new cells. This ART can reduce the patient's viral load to an undetectable level.

## **11. Recommendation**

Through and through the paper has enlightened us about the situation of maternal health in China and the African continent. It has been evident that the African countries are lagging

behind the Chinese population in terms of preventing maternal HIV. Africa should focus on having standard protocols in order to deal with HIV. The government can come up with different awareness programs for teaching people about the ins and outs of maternal HIV. They should come out and talk more openly about maternal HIV, its cons and ways of dealing with it. Similarly, in the case of China, the people should be more vocal about maternal HIV. Both China and the African continent can learn from and help each other. Rather than stigmatizing people and societies about AIDS, it should be more and more normalized in this modern era. For both the country and continent, the people living with HIV, other people in the society, the government should come forward hand in hand and put up a joint effort for preventing maternal HIV.

## **12. Conclusion**

The findings of this study indicated the analytical comparison of African and Chinese maternal HIV infection prevalence criteria along with disclosure rate, antiretroviral therapy rate and mother to child transmission rate. As we can see, HIV infection rate is higher in Africa. Most HIV-infected pregnant women started ARV therapy to have a protective effect on stillbirth compared with untreated HIV infection. So, the therapy taking rate is also highest in the African continent instead of China. Moreover, the rate of HIV positive status disclosure is almost comparable with the rate seen between Africa and China in recent years. However this disclosure rate varies on fear of people's reaction and acceptance factor. Furthermore, The MTCT rate in Africa is two times greater than China. This mother to child HIV transmission rate can be minimized by ART, proper medication, proper strategy and counselling which is the only solution also by stopping breastfeeding the child. Although the African has higher maternal HIV infection rather than China, still the coverage and quality of HIV treatments of

Africa have improved, like they are taking therapy in highest numbers and showing more awareness.

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