



Emerging infectious diseases HIV/AIDS

COM311 - Community Medicine Seminar

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1 - Describe the epidemiology and global burden of

HIV/AIDS infection:

Acquired immunodeficiency syndrome (AIDS) is a chronic, potentially life-threatening condition caused by the human immunodeficiency virus (HIV). HIV, the virus that causes AIDS, is one of the world's most serious public health challenges. But there is a global commitment to stopping new HIV infections and ensuring that everyone with HIV has access to HIV treatment.

HIV primarily affects those in their most productive years, it affects the individuals themselves, their households, their communities, as well as the development and economic growth of their countries.

HIV/AIDS continues to have devastating health effects globally, with over 39 million HIV/AIDS-related deaths to date and more than 36 million people living with HIV currently. Despite great advancements in antiretroviral therapy and worldwide progress towards implementation of treatment-as-prevention programmes, approximately 2 million people become newly infected with HIV every year.

Within the global pandemic of HIV infection there are many different epidemics, each with its own dynamics and each influenced by many factors including time of introduction of the virus, population density, and cultural and social issues.

The vast majority of people living with HIV are located in low- and middle-income countries. East and Southern Africa remains the region most affected by HIV in the world, with 20.6 million people living with HIV and 670,000 new HIV infections in 2020. The WHO African region remains most severely affected, with nearly 1 in every 25 adults (3.6%) living with HIV and accounting for more than two-thirds of the people living with HIV worldwide.

Demographic and economic impact:

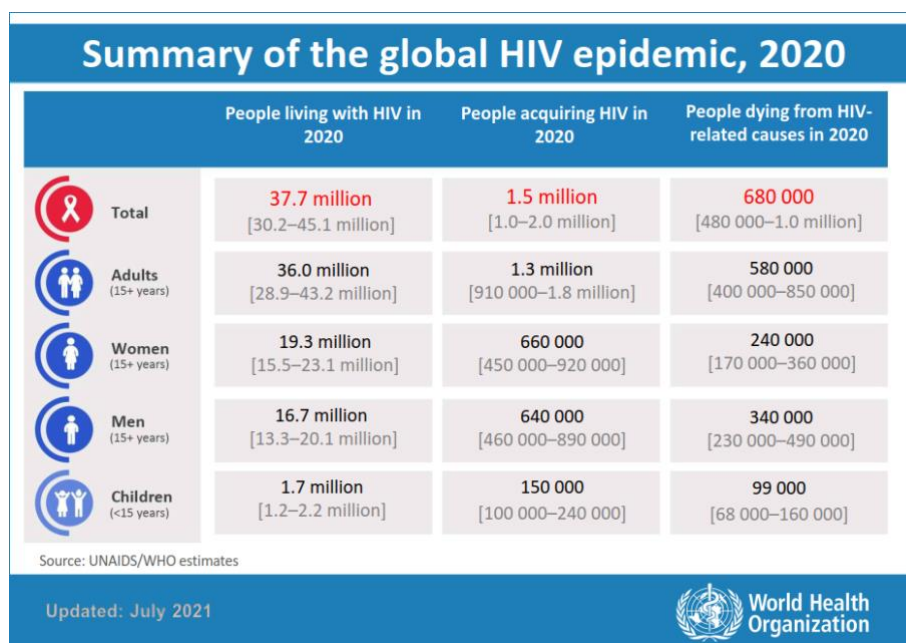
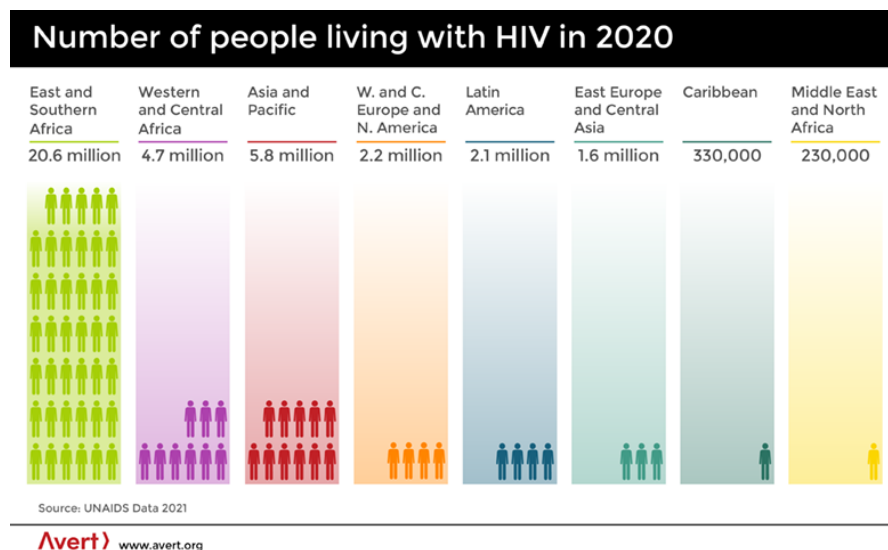
The HIV pandemic is enormously costly and debilitating. In some urban

centers of sub-Saharan Africa, western Europe, and the Americas, AIDS has already become the leading cause of death for both men and women aged 15–49 years. AIDS kills people in their most productive years and ranks as the leading cause of potential healthy life years lost in sub-Saharan Africa.

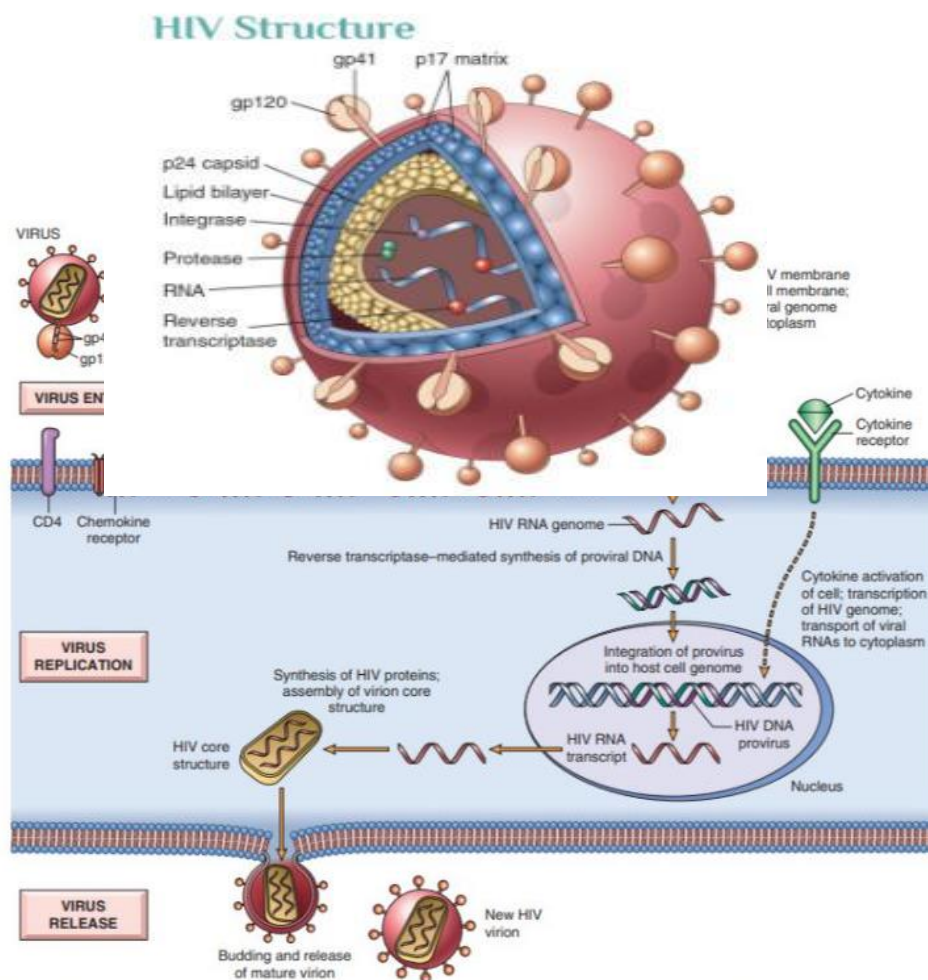
2- Describe how people get infected with HIV:

HIV pathogenesis

One mechanism HIV weakens the immune system is by infecting and



destroying CD4+ T cells, which in turn leads to immunodeficiency at later stage of disease. HIV attaches to the CD4+ protein on the surface of these and other cells to gain entry. However, the presence of CD4+ molecules alone proves to be not enough to allow viral entry into other cell types such as monocytes and dendritic cells. Therefore, a second doorway is needed for the virus to gain access to infect cells. This led to the discovery of the chemokine receptor as essential coreceptors for HIV-1. There are different types of these coreceptors for different cell types that HIV variants can use for infection of cells. Two main chemokine receptors have been identified to play a major role in HIV entry, CCR5 and CXCR4 (or fusin). (1)



Transmission of HIV :

HIV Transmission: HIV can be transmitted via the exchange of a variety of body

fluids from infected people, including:

1-Blood: through blood transfusion, which is pretty rare now due to the advanced screening process of donated blood.

2-Semen and vaginal secretions: having unprotected sex with an infected person puts you at risk of getting infected by HIV whether its vaginal or anal sex.

3- Sharing of needles: Sharing of needles used by others could contain blood which can transmit HIV among other bloodborne diseases.

The other way of transmitting HIV is mother to baby. It is the most common way children get infected with HIV, Therefore all pregnant ladies are recommended to be tested for HIV infection and start treatment immediately if positive. HIV can be transmitted either during pregnancy or during birth or through breast milk, This is called mother-to-child transmission or vertical transmission.(2)

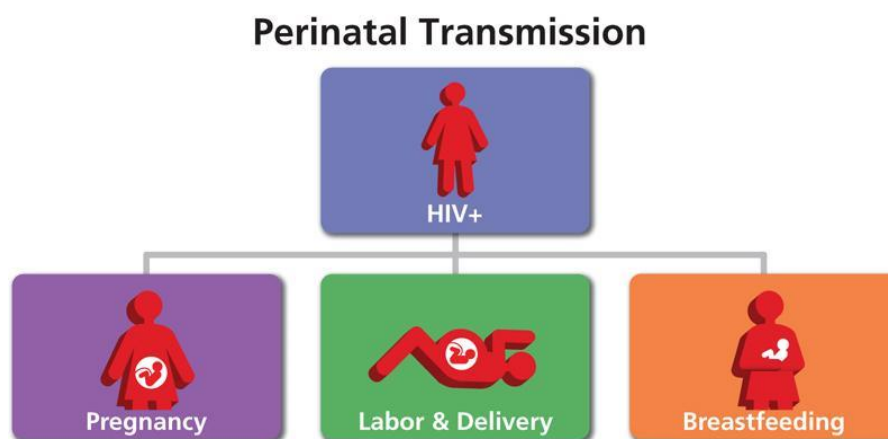
How to prevent vertical transmission?

The risk of vertical transmission can be reduced greatly by taking antiretroviral medication during pregnancy and keeping the viral load low. Moreover, Breast feeding should be avoided and substituted with infant formula. For the mode of delivery it depends on the viral load, If the mother is adherent to the treatment plan, it will lead to undetectable viral load levels, which means the mother can have a vaginal delivery because the risk of transmission will be extremely low, Whereas when the viral load is detectable, cesarean delivery would be a better option because it will reduce the risk of transmission.(3)(4)

What are the recommendations for breastfeeding?

According to CDC and American Academy of Pediatrics, HIV positive mothers

should avoid breastfeeding their infants, regardless of the viral load and therefore should use formulas to feed their infants. On the other hand, In resource-limited settings, such as some parts of Africa, the World Health Organization (WHO) recommends that HIV-infected mothers breastfeed exclusively for the first 6 months of life and continue breastfeeding for at least 12 months, with the addition of complementary foods. These mothers should be given ART to reduce the risk of transmission through breastfeeding.(5)



3- Understand the global initiatives to combat the rising burden of the disease:

1-UNAIDS ambitious 90-90-90 treatment target to help end the AIDS epidemic:

UNAIDS's 90-90-90 goals set as targets that by 2020:

- 90% of all people with HIV will know their HIV status
- 90% of all people who know their status will be on ART
- 90% of all people receiving ART will have viral suppression

Tracking progress toward those goals, UNAIDS reports that in 2020, of all people with HIV worldwide:

- 84% knew their HIV status

- 73% were accessing ART
- 66% were virally suppressed (1)

2-none of the global targets set by UNAIDS for 2020 were met:

Jose Izazola, UNAIDS Special Adviser: (We are not on track to end AIDS by 2030, but our modelling shows that spending wisely and focusing investment in the right place will have remarkable results and get us on track to end AIDS by 2030. We must not repeat the mistakes of the past. The time to invest is now. (2)

3-Pro Test HIV:

Pro Test HIV, a global initiative that encourages young people to get tested for HIV, was launched by UNAIDS Executive Director Michel Sidibé in Libreville, Gabon, on 28 November of 2015. At the event, Mr. Sidibé called on young people worldwide to join the movement and get involved in ending the AIDS epidemic (3)

4-US Response to the global epidemic:

The U.S. President's Emergency Plan for AIDS Relief (PEPFAR) is the U.S. Government's response to the global HIV/AIDS epidemic and represents the largest commitment by any nation to address a single disease in history. Through PEPFAR, the U.S. has supported a world safer and more secure from infectious disease threats. It has demonstrably strengthened the global capacity to prevent, detect, and respond to new and existing risks—which ultimately enhances global health security and protects America's borders. Among other global results, PEPFAR provided HIV testing services for nearly 50 million people in Fiscal Year 2020 and, as of September 30, 2020, supported lifesaving ART for nearly 18.2 million men, women, and children. In addition, the National Institutes of Health (NIH) represents the largest public investment in HIV/AIDS research in the world. NIH is engaged in research around the globe to understand, diagnose, treat, and prevent HIV infection and its many associated conditions, and to find a cure. (1)

5-WHO:

Since 2016, WHO has recommended that all people living with HIV be provided with lifelong ART, including children, adolescents, adults and pregnant and breastfeeding women, regardless of clinical status or CD4 cell count. By June 2021, 187 countries had already adopted this recommendation, covering 99% of all people living with HIV globally. In addition to the treat all strategy, WHO recommends a rapid ART initiation to all people living with HIV, including offering ART on the same day as diagnosis among those who are ready to start treatment. By June 2021, 82 low- and middle-income countries reported that they have adopted this policy, and approximately half of them reported country-wide implementation. (4)

6-Using evidence to drive change:

WHO has been producing regular evidence-based recommendations since HIV testing services were first developed in 1985. In 2015, WHO published the first consolidated guidelines on HIV testing services followed by a supplement focusing on HIV self-testing and partner services. (5)

7-Investment:

At the end of 2020, US\$ 21.5 billion (in constant 2019 United States dollars) was available for the AIDS response in low- and middle-income countries—around 61% was from domestic sources. (6)

8-Causes of poor access to ART:

1-low education

2-duration between risk behavior and HIV test

3-self stigma(7)

4- cost (8)

5-shortage of drugs

6- delays associated with receiving care from treatment centers(9)

9-Mistakes in the past done by some countries:

1-The world is far behind in preventing new HIV infections.

2- unequal progress, with too many vulnerable people and populations left behind such as gay men, sex workers, people who inject drugs and people in prison.(10)

3- Some countries failed to reach investment goals set by UNAIDS to combat HIV.(11)

10- who should be tested for HIV?

1-CDC recommends everyone between the ages of 13 and 64 get tested for HIV at least once

2-man who had has sex with another man.

3-an individual who had sex—anal or vaginal—with a partner who has HIV

4- individuals who had more than one sex partner since their last HIV test

5-individuals who have injected drugs and shared needles, syringes, or other drug injection equipment (for example, cookers) with others

6-individuals who exchange sex for drugs or money

7-anyone who Have been diagnosed with or treated for another sexually transmitted disease.

8-individuals who Have been diagnosed with or treated for hepatitis or tuberculosis (TB)(12)

4- Learn the features which characterize the pandemic in the Eastern Mediterranean Region (EMR)

HIV estimates

- HIV prevalence in the Region is 0.1% (low epidemic).(1)
- According to WHO in 2019 Eastern Mediterranean Region has 420,000 People living with HIV.(2)

- The estimated number of people living with HIV in the Region in 2016 is 360000(1)
- +47% New diagnoses annually relative to 2010(2)
- +57% Deaths annually relative to 2010(2)
- 70% (252 000) PLHIV live in 3 countries Pakistan, Islamic Republic of Iran and Sudan.(1)

Populations at higher risk of HIV ⁽⁴⁾

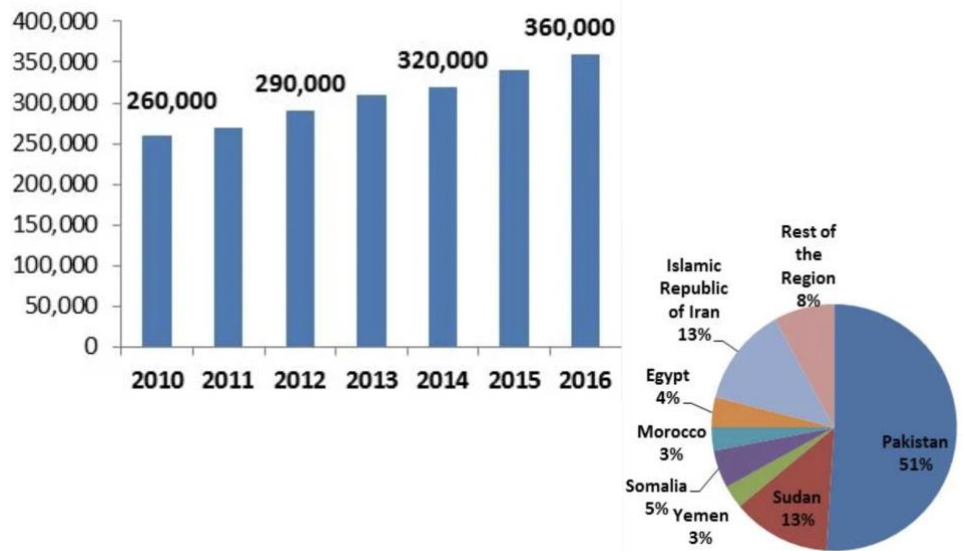
Key populations at increased risk of HIV: People are said to be at increased risk of acquiring the HIV infection if what they are doing, or what they might do if placed in a facilitating situation, is associated with a high risk of HIV transmission. Examples of those population groups are injecting drug users (IDU), male and female sex workers and men who have sex with men.

Vulnerable groups: People are said to be in a state of vulnerability if their living conditions are prone to shifting factors which would place them at risk of contracting HIV. Examples of those groups are young people, women, migrants, long-distance drivers, displaced populations, men in uniform and others, because most of them lack the information about the virus, how it would be transmitted, prevention, and

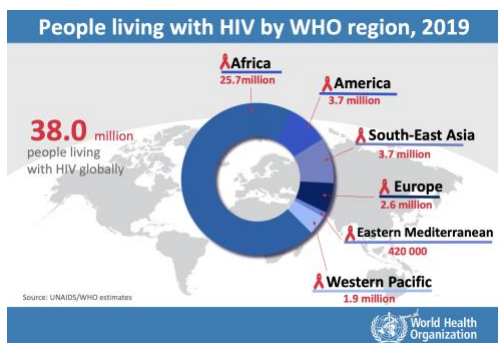
treatment etc.

Importance of HIV Testing for Prevention of HIV Infection(3)

People with HIV who are aware of their status can get HIV treatment (called



antiretroviral therapy or ART) and remain healthy for many years. Studies show that the sooner people start treatment after diagnosis, the more they benefit from ART. Treatment with ART reduces the amount of HIV in the blood (called viral load), reduces HIV-related illness, and helps prevent transmission to others. People with HIV who take HIV medicine as prescribed and get and keep an undetectable viral load (or stay virally suppressed) have effectively no risk of transmitting HIV to HIV-negative sex partners.



HIV tests are very accurate, but no test can detect the virus immediately after

infection. How soon a test can detect HIV depends upon different factors, including the type of test being used. There are three types of HIV diagnostic tests: nucleic acid tests (NAT), antigen/antibody tests, and antibody tests

People who get tested and learn they don't have HIV can also make decisions about sex, drug use, and health care that can protect them from HIV. For people at risk for HIV, taking HIV medicine called pre-exposure prophylaxis (or PrEP) is highly effective for preventing HIV

ART coverage ⁽¹⁾

The number of PLHIV receiving antiretroviral therapy doubled from 2013 reaching 54 300 in 2016. Nonetheless, the Region continues to demonstrate the lowest coverage.

- 15% coverage for ART
- 18% coverage for pediatric HIV treatment
- 13% coverage for effective antiretroviral regimens to prevent mother-to-child transmission.

ART coverage varies across countries in the Region; where high ART coverage is reported in countries such as Qatar (86%), Kuwait (80%), Jordan (55%) Morocco (48%), other countries such as Afghanistan (7%), Pakistan (7%) and Sudan (10%) still have a very low coverage

Issues and challenges ⁽¹⁾

National responses have been challenged by the nature of the epidemic which is concentrated in key populations at increased risk of HIV exposure. Those populations are highly stigmatized and discriminated against. Political developments in the past decade in the Region have not been conducive to de-criminalization and de-stigmatization.

Among rivalling communicable disease priorities, HIV is considered a low priority by many countries.

There is concern that HIV estimates are not very accurate in most countries of the Region because:

1. the UNAIDS estimation methodology is not well adapted to low-prevalence countries
2. Data on sizes of and HIV prevalence among key populations in many countries

are scarce and not always of good quality. However, those data are essential for a meaningful modelling of the HIV epidemics.

- The majority of PLHIV in the Region do not access HIV testing and therefore do not know their HIV status. The majority of HIV testing services use service delivery approaches that do not attract key populations (testing centralized in hospital/clinic laboratories).
- There is concern that HIV estimates are not very accurate in most countries of the Region because the data is scarce and not always of good quality.
- The majority of PLHIV in the Region do not access HIV testing and therefore do not know their HIV status.

5- A) Recognize the epidemiology, burden of disease:

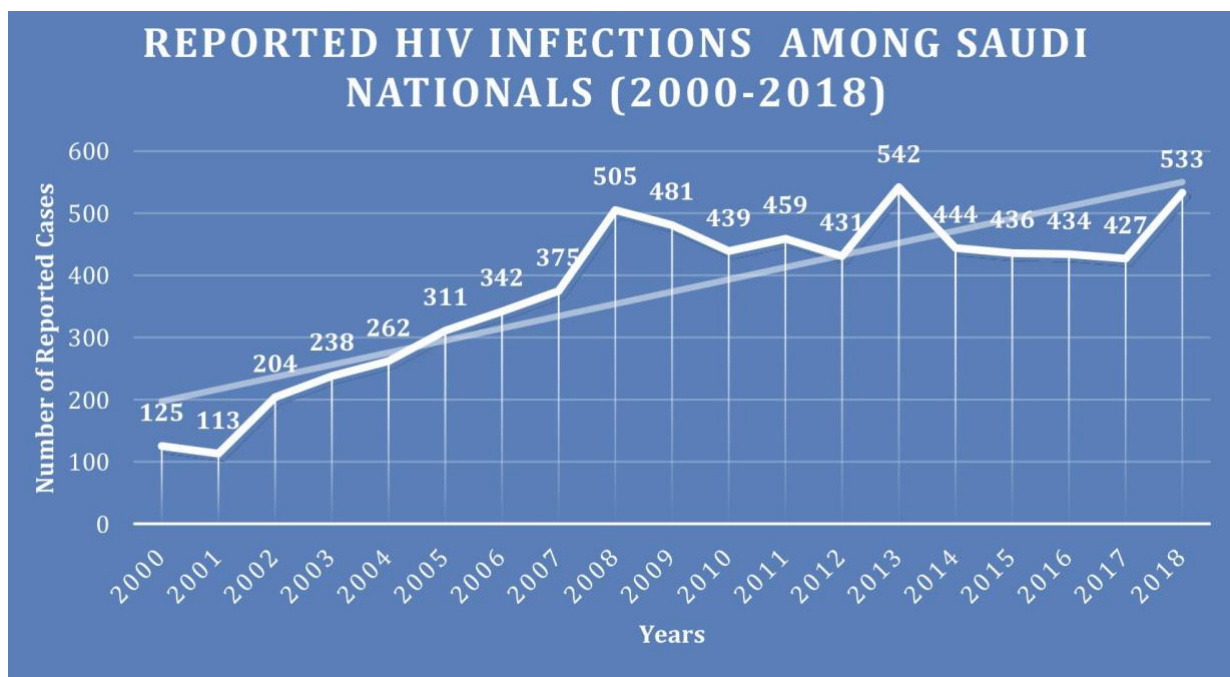
To date, Saudi Arabia remains a low-HIV-prevalence country, with approximately 1.5 newly detected HIV infections per 100,000 per year among Saudi nationals, and 1.2 per 10,000 among non-Saudis¹.

In KSA HIV is increasingly recognized as a major health problem². The first official case of HIV infection in KSA was reported in 1984 in a blood transfusion recipient². By 1986, 13 HIV- infected patients in KSA had been documented, all linked to contaminated blood products². From 1984-1996, the major mode of HIV transmission was through transfusion of blood and blood products and likely reflects the lack of appropriate blood supply testing during this period². Between 1984 and 2001, 6,046 HIV infections were reported in KSA, 1,285 (21%) of whom were Saudi citizens². From 1994-2010, heterosexual activity

remains the dominant risk factor for HIV transmission in KSA².

The trend of officially reported HIV cases among Saudi nationals has been a clearly increasing over time, from a mere 125 HIV cases in 2000, to 533 HIV new cases reported in 2018^{1,3}.

The cumulative number of HIV infection among Saudi nationals over the period 1984- 2018 was 8,148³.

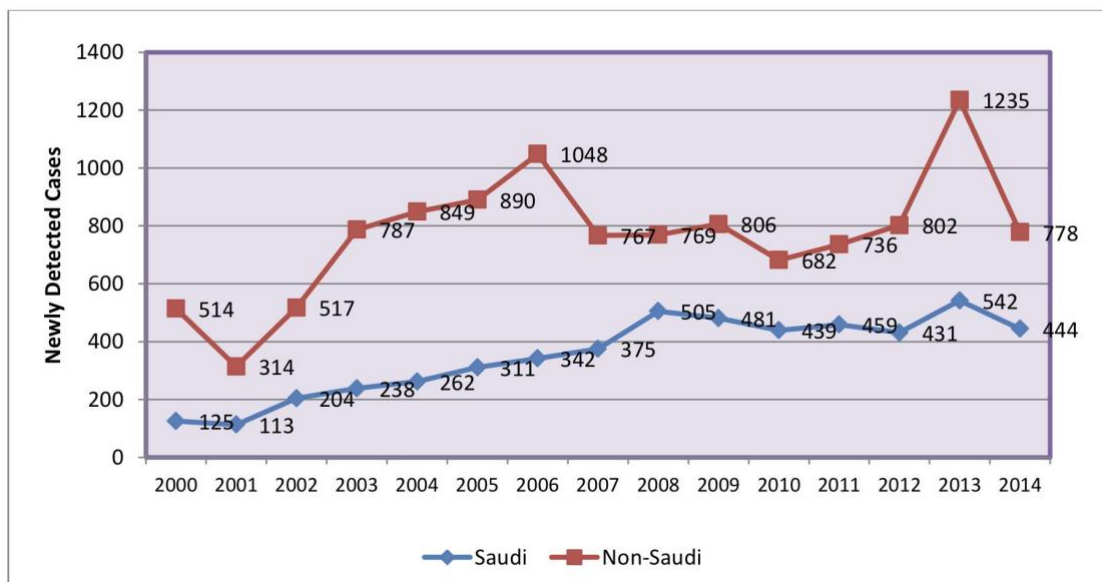


The number of reported HIV cases in KSA during the fourteen year period between 2000 and 2014 indicates more cases among non-Saudis than among Saudis. However, the pattern over the past ten years is changing, with a declining number of new cases among non-Saudis over time, and an increasing number of cases among Saudis. There are many possible explanations for the narrowing of the gap between the number of Saudi and non-Saudi infections. Therefore, the increased infections among Saudis could be merely the result of more testing among Saudis. Non-Saudis are tested systematically when they migrate to KSA legally for work. Those who are positive are generally deported back to their country of origin, this may be the explanation of the decreased number among Non-Saudis having the

infection¹.

The widespread use of antiretroviral (ART) in mid 1990s has led to a remarkable decline in AIDS related mortality among people worldwide living with HIV infection⁶. Total number of people who have died from AIDS-related causes in 2018 was 45 persons accounting for a rate of 0.1 per 100 000 population³. Cumulative number of AIDS-related deaths from 1984 to 2018 is 1121³. AIDS mortality remains low in the kingdom due to higher treatment coverage and better adherence to treatment³.

Figure 4 Reported HIV cases among Saudis and non-Saudis 2000- 2014



5- B) National measures to prevent spread of HIV AIDS in KSA:

1 -Saudi National AIDS program (NAP): was established in the year 1994. The HIV screening program for blood and blood products was introduced in 1984, when the first case was detected. Since then, the response was to develop a central unit at the national capital Riyadh and regional centers in the



twenty health provinces. The program supports HIV prevention, care, treatment and other support services for the marginalized and the vulnerable groups, while provides awareness and education for general public.(1)

NAP's core beliefs / principles(1):

- Respect for every individual as all human beings are equal.
- Everyone has the right to access HIV information and services.
- Passion to make a positive difference in the lives of people living with HIV and AIDS through our personal commitment.
- Greater involvement of people living with HIV and AIDS in programs and policies in the country at all levels.
- Building capacity of individuals and communities so that they can address their own needs.

2-Standards and safe blood transfusion system: it is applying throughout the

Kingdom by blood screening for HIV virus and others.(1)

3-Pre-marital counseling program: it was implanted by Saudi Ministry of health in 2004, and was only concerning to Genetic disorders (thalassemia and sickle cell anemia), In 2008 it was updated to involve some of serious infectious diseases as (HIV, HCV and HBV) .(2)

4- Imposed regular Medical test (include HIV screening) among special workers(3):

- Medical students and Health care providers.
- Military sector
- Barbershop's workers

5-Expatriate medical tests.(4)

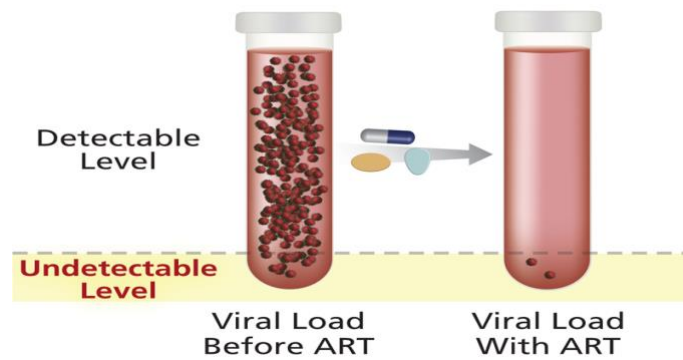
6- Medications

1- General info about medication

HIV disease can be managed by treatment regimens composed of a combination of three or more antiretroviral (ARV) drugs. Current antiretroviral therapy (ART) **does not cure** HIV infection but highly suppresses viral replication within a person's body and allows an individual's immune system recovery to strengthen and regain the capacity to fight off opportunistic infections and some cancers.(1)

By June 2021, 187 countries had already adopted this recommendation, covering 99% of all people living with HIV globally. In addition to the treat all strategy, WHO recommends a rapid ART initiation to all people living with HIV, including offering ART on the same day as diagnosis among those who are ready to start treatment. By June 2021, 82 low- and middle-income countries reported that they have adopted this policy, and approximately half of them reported country-wide

Undetectable Viral Load



implementation.(1)

2- How does HIV work?

HIV attacks and destroys the infection-fighting CD4 cells (CD4 T lymphocyte) of the immune system. Loss of CD4 cells makes it hard for the body to fight off infections and certain HIV-related cancer.(3)

3- How do HIV medications work?

HIV medicines prevent HIV from multiplying (making copies of itself), which reduces the amount of HIV in the body (called the viral load). Having less HIV in the body gives the immune system a chance to recover and produce more CD4 cells. Even though there is still some HIV in the body, the immune system is strong enough to fight off infections and certain HIV-related cancers.

By reducing the amount of HIV in the body, HIV medicines also reduce the risk of HIV transmission. A main goal of HIV treatment is to reduce a person's viral load to an undetectable level.

An undetectable viral load means that the level of HIV in the blood is too low to be detected by a viral load test. People with HIV who maintain an undetectable viral load have effectively no risk of transmitting HIV to their HIV-negative partners through sex.(3)

How do HIV medications work (summarize in points)? (2)

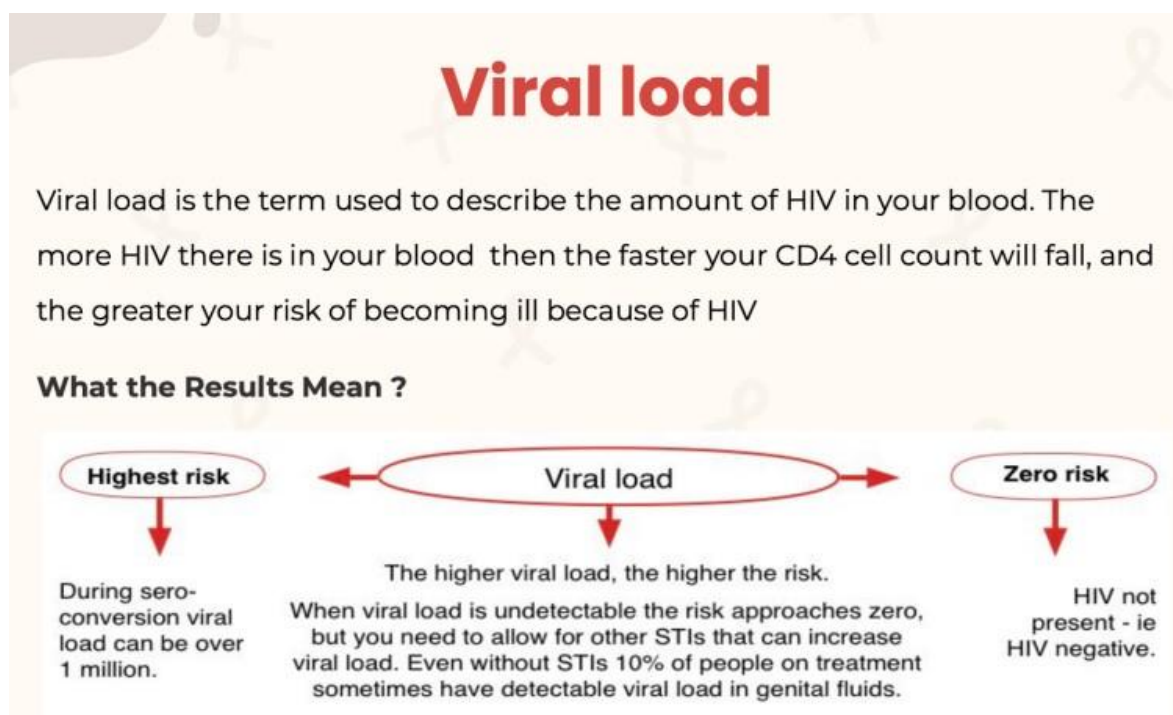
- HIV medicine is called antiretroviral therapy (ART).
- There is no effective cure for HIV. But with proper medical care, you can control HIV.
- Most people can get the virus under control within six months.
- Taking HIV medicine does not prevent transmission of other sexually transmitted diseases.

4- The concept of Viral load: (2)

What are the benefits of taking HIV medicine every day as prescribed?

Treatment Reduces the Amount of HIV in the Blood

- The amount of HIV in the blood is called **viral load**.
- Taking HIV medicine as prescribed will help keep viral load low and CD4 cell count high.
- HIV medicine can make the viral load very low (called *viral suppression*). Viral suppression is defined as having less than 200 copies of HIV per milliliter of blood.
- HIV medicine can make the viral load so low that a test can't detect it (called an *undetectable viral load*).
- If viral load goes down after starting HIV treatment, that means treatment is working.
- Getting and keeping an undetectable viral load (or staying virally suppressed) is the best way to stay healthy and protect others.



5- Types of medications: (4)

There are many medications that can control HIV and prevent complications. These medications are called antiretroviral therapy (ART). Everyone diagnosed with HIV should be started on ART, regardless of their stage of infection or complications.

ART is usually a combination of three or more medications from several different drug classes. This approach has the best chance of lowering the amount of HIV in the blood. There are many ART options that combine three HIV medications into one pill, taken once daily.

Each class of drugs **blocks the virus in different ways.**

Treatment involves combinations of drugs from different classes to:

- Account for individual drug resistance (viral genotype)
- Avoid creating new drug-resistant strains of HIV
- Maximize suppression of virus in the blood

Two drugs from one class, plus a third drug from a second class, are typically used.

The classes of anti-HIV drugs include:

- **Non-nucleoside reverse transcriptase inhibitors (NNRTIs)** turn off a protein needed by HIV to make copies of itself. Examples include efavirenz (Sustiva), rilpivirine (Edurant) and doravirine (Pifeltro).
- **Nucleoside or nucleotide reverse transcriptase inhibitors (NRTIs)** are faulty versions of the building blocks that HIV needs to make copies of itself. Examples include abacavir (Ziagen), tenofovir (Viread), emtricitabine (Emtriva), lamivudine (Epivir) and zidovudine (Retrovir). Combination drugs also are available, such as emtricitabine/tenofovir (Truvada) and emtricitabine/tenofovir alafenamide (Descovy).
- **Protease inhibitors (PIs)** inactivate HIV protease, another protein that HIV needs to make copies of itself. Examples include atazanavir



- (Reyataz), darunavir (Prezista) and lopinavir/ritonavir (Kaletra).
- **Integrase inhibitors** work by disabling a protein called integrase, which HIV uses to insert its genetic material into CD4 T cells. Examples include bictegravir sodium/emtricitabine/tenofovir alafenamide fumar (Biktarvy), raltegravir (Isentress) and dolutegravir (Tivicay).
 - **Entry or fusion inhibitors** block HIV's entry into CD4 T cells. Examples include enfuvirtide (Fuzeon) and maraviroc (Selzentry).

6- When is it time to start taking HIV medicines? ⁽³⁾

People with HIV should start taking HIV medicines as soon as possible after an HIV diagnosis. It is especially important for people with AIDS-defining conditions or early HIV infection to start HIV medicines right away. (Early HIV infection is the period up to 6 months after infection with HIV.)

Women with HIV who become pregnant and are not already taking HIV medicines should also start taking HIV medicines as soon as possible.⁽³⁾

7- The side effects: (2)

HIV medicine can cause side effects in some people. However, not everyone experiences side effects. The most common side effects are

- Nausea and vomiting,
- Diarrhea,
- Difficulty sleeping,
- Dry mouth,
- Headache,
- Rash,
- Dizziness,
- Fatigue, and
- Pain.

7- Differentiate what could work best, as far as prevention and control efforts are concerned, in our region

HIV continues to be a major global public health issue, having claimed 36.3 million [27.2–47.8 million] lives so far. Unfortunately, there is no cure for HIV infection. However, with increasing access to effective HIV prevention, diagnosis, treatment and care, including for opportunistic infections, HIV infection has become a manageable chronic health condition, enabling people living with HIV to lead long and healthy lives(1). There are other various methods of prevention that can be utilized locally to lower the risk of transmitting HIV:

1) Pre-Exposure Prophylaxis (PrEP):

PrEP is when people who do not have HIV but are at risk of getting HIV take HIV medicine every day to prevent HIV infection. PrEP is used by people without HIV who are at risk of being exposed to HIV through sex or injection drug use (2).

2) Antiretroviral therapy (ART):

The treatment for HIV is called antiretroviral therapy (ART). ART involves taking a combination of HIV medicines (called an HIV treatment regimen) every day. ART is recommended for everyone who has HIV. ART cannot cure HIV, but HIV medicines help people with HIV live longer, healthier lives. ART also reduces the risk of HIV transmission. (3)

3) Post-Exposure Prophylaxis (PEP):

PEP consists of a combination of three HIV medications that an HIV-negative person takes for four weeks to reduce their risk of getting HIV after a potential exposure to HIV. This is different from pre-exposure prophylaxis (PrEP), which involves taking two HIV medications on an ongoing basis, starting before and continuing after an exposure to HIV. PEP should be started as soon as possible, but definitely within 72 hours of being exposed to HIV. The prescription drugs used for PEP need to be taken every day for four full weeks (28 days). (4)

4) Prevention of mother-to-child transmission (PMTCT):

Mother-to-child transmission of HIV is the most common way young children contract the virus and happens when HIV is passed from a mother to her unborn baby during pregnancy, birth or breastfeeding.

An effective Prevention of Mother to Child Transmissions (PMTCT) programme requires mothers and their babies to:

- Receive antenatal services and HIV testing during pregnancy
- Have access to antiretroviral treatment (ART)
- Practice safe childbirth practices and appropriate infant feeding
- Make use of infant HIV testing and other post-natal healthcare services (5)

5) Syringe service programs (SSPs):

Syringe services programs (SSPs) are community-based prevention programs that can provide a range of services, including linkage to substance use disorder treatment; access to and disposal of sterile syringes and injection equipment; and vaccination, testing, and linkage to care and treatment for infectious diseases. (6)

References:

1st Objective:

- 1-Global HIV and AIDS statistics. (2021, December 7). Avert. <https://www.avert.org/global-hiv-and-aids-statistics>.
- 2-HIV data and statistics. (2021b, July). WHO. <https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/hiv/strategic-information/hiv-data-and-statistics>
- 3-Global Statistics. (2021, November 30). HIV.Gov. <https://www.hiv.gov/hiv-basics/overview/data-and-trends/global-statistics>.
- 4-The Global HIV/AIDS Epidemic. (2021, August 9). KFF. <https://www.kff.org/global-health-policy/fact-sheet/the-global-hiv-aids-epidemic/>
- 5-Global burden of the HIV pandemic. (1996, July 13). ScienceDirect.
- 6- DEFINE_ME. (2019, August 19). The Lancet. <https://secure.jbs.elsevierhealth.com/action/cookieAbsent>

2nd Objective:

- 1-Naif H. M. (2013). Pathogenesis of HIV Infection. *Infectious disease reports*, 5(Suppl 1), e6. <https://doi.org/10.4081/idr.2013.s1.e6>
- 2-"Ways HIV can be transmitted" CDC at : <https://www.cdc.gov/hiv/basics/hiv-transmission/ways-people-get-hiv.html> accessed 7 December
- 3- NHS. "Can HIV be passed to an unborn baby in pregnancy or through breastfeeding?" 2018 <https://www.nhs.uk/common-health-questions/pregnancy/can-hiv-be-passed-to-an-unborn-baby-in-pregnancy-or-through-breastfeeding/> accessed 18 December
- 4-Avert. "Pregnancy, childbirth & breastfeeding and HIV" 2021 <https://www.avert.org/hiv-transmission-prevention/pregnancy-childbirth-breastfeeding> accessed 18 Decembe
- 5- CDC "Is it safe for a mother infected with HIV to breastfeed her infant?" <https://www.cdc.gov/breastfeeding/breastfeeding-special-circumstances/maternal-or-infant-illnesses/hiv.html> accessed 18 Decembe

3rd objective:

1. HIV.GOV. 2021.The Global HIV/AIDS Epidemic. Available At: <https://www.hiv.gov/federal-response/pepfar-global-aids/global-hiv-aids-overview>
- 2.Avert. 2021. Funding for HIV and AIDS. Available At: <https://www.avert.org/professionals/hiv-around-world/global-response/funding>
- 3.UNAIDS.2015. UNAIDS unveils global initiatives to scale up HIV testing among young people. Available At: https://www.unaids.org/en/resources/presscentre/featurestories/2015/november/20151128_Gabon_protest_HIV
- 4.WHO.2021.HIV/AIDS. Available At: <https://www.who.int/news-room/fact-sheets/detail/hiv-aids>
5. WHO.2020.HIV testing services. Available at: <https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/hiv/testing-diagnostics/hiv-testing-services>
- 6.UNAIDS.2020.Global HIV and AIDS statistics-Fact sheet. Available At: <https://www.unaids.org/en/resources/fact-sheet>
- 7.Nagoya journal of medical science.2015.Factors associated with access to antiretroviral therapy among people living with hiv in vientiane capital, lao pdr. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4361505/>

- 8.WHO.2006.From access to adherence - WHO. Available at:https://www.who.int/medicines/publications/challenges_arvtreatment15Aug2006.pdf
- 9.BioMed Central.2016.ART access-related barriers faced by HIV-positive persons linked to care in southern Ghana: a mixed method study. Available at:<https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-016-2075-0>
- 10.UNAIDS.2020.UNAIDS report on the global AIDS epidemic shows that 2020 targets will not be met because of deeply unequal success; COVID-19 risks blowing HIV progress way off course. Available at:
https://www.unaids.org/en/resources/presscentre/pressreleaseandstatementarchive/2020/july/20200706_global-aids-report
- 11.UNAIDS.2020.UNAIDS calls on countries to step up global action and proposes bold new HIV targets for 2025. Available at:
https://www.unaids.org/en/resources/presscentre/pressreleaseandstatementarchive/2020/november/20201126_bold-new-aids-targets-for-2025
- 12.CDC.2021.Getting Tested. Available at: <https://www.cdc.gov/hiv/basics/hiv-testing/getting-tested.html>

4th objective:

- Latest HIV estimates and updates on HIV policies uptake, November 2020.* (2020). WHO.
https://www.who.int/docs/default-source/hiv-hq/latest-hiv-estimates-and-updates-on-hiv-policies-uptake-november2020.pdf?sfvrsn=10a0043d_12 (2)
- A. (2019a). *HIV in the WHO Eastern Mediterranean Region.* World Health Organization - Regional Office for the Eastern Mediterranean. <http://www.emro.who.int/asd/about/hiv-situation-region.html> (1)
- A. (2019). *Vulnerable groups and key populations at increased risk of HIV.* World Health Organization - Regional Office for the Eastern Mediterranean. <http://www.emro.who.int/asd/health-topics/vulnerable-groups-and-key-populations-at-increased-risk-of-hiv.html> (3)
- A. (2019). *Vulnerable groups and key populations at increased risk of HIV.* World Health Organization - Regional Office for the Eastern Mediterranean. <http://www.emro.who.int/asd/health-topics/vulnerable-groups-and-key-populations-at-increased-risk-of-hiv.html> (4)

5th Objective: A-

- 1- KINGDOM OF SAUDI ARABIA MINISTRY OF HEALTH GLOBAL AIDS RESPONSE PROGRESS REPORT COUNTRY PROGRESS REPORT 2015 KINGDOM OF SAUDI ARABIA. (n.d.). [online] Available at:
https://www.unaids.org/sites/default/files/country/documents/SAU_narrative_report_2015.pdf#page9
[Accessed 12 Dec. 2021].
- 2- A. Al Mozaini , M. (2014). HIV-Care Outcome in Saudi Arabia; a Longitudinal Cohort. *Journal of AIDS & Clinical Research*, 05(11).
- 3- KINGDOM OF SAUDI ARABIA MINISTRY OF HEALTH GLOBAL AIDS MONITORING REPORT COUNTRY PROGRESS REPORT 2018 KINGDOM OF SAUDI ARABIA. (n.d.). [online] Available at:
https://www.unaids.org/sites/default/files/country/documents/SAU_2019_countryreport.pdf#page9
[Accessed 12 Dec. 2021].
- 4- KINGDOM OF SAUDI ARABIA MINISTRY OF HEALTH GLOBAL AIDS MONITORING REPORT COUNTRY PROGRESS REPORT 2017 KINGDOM OF SAUDI ARABIA. (n.d.). [online] Available at:
https://www.unaids.org/sites/default/files/country/documents/SAU_2018_countryreport.pdf#page9
[Accessed 12 Dec. 2021].
- 5- وزارة الصحة, فريق بوابة وزارة (n.d.). Ministry Of Health Saudi Arabia. [online] Ministry Of Health Saudi Arabia. Available at: <https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/News-2016-11-30-001.aspx>
[Accessed 12 Dec. 2021].
- 6- Baadani, A.M., Ballool, S., Alhemyadi, S., Sallam, L., ALSufyani, E., Alghamdi, A. and Alfahad, W. (2020). The clinical outcome of HIV infection at a tertiary care center in Riyadh, Saudi Arabia. *Saudi Medical Journal*, 41(9), pp.965–970.
- 7- وزارة الصحة, فريق بوابة وزارة (n.d.). Ministry Of Health Saudi Arabia. [online] Ministry Of Health Saudi Arabia. Available at: <https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/News-2016-11-30-001.aspx>.

5th Objective: B-

1- GLOBAL AIDS RESPONSE PROGRESS REPORT. (2014). Retrieved December 11, 2021, from https://www.unaids.org/sites/default/files/country/documents/SAU_narrative_report_2014.pdf.

2- Premarital screening. Ministry Of Health Saudi Arabia. (2021). Retrieved December 11, 2021, from <https://www.moh.gov.sa/en/HealthAwareness/Beforemarriage/Pages/default.aspx>.

3- Saudi regulation . (2021). Retrieved December 11, 2021, from <https://laws.boe.gov.sa//BoeLaws/Laws/>.

4- Ministry of interior . (2021). Retrieved December 11, 2021, from https://www.moi.gov.sa/wps/portal/Home/Home/!ut/p/z1/04_Sj9CPykssy0xPLMnMz0vMAfljo8ziLQPdnT08Ty83Q0dzQwcPc2N_A08TQ3dPY30wwkpiAJKG-AAjgZA_VFgJc7ujh4m5j4GBhY-7qYGno4eoUGWgcbGBo7GUAV4zCjliTDIdFRUBAApuVo7/dz/d5/L0IDUmlTUSEhL3dHa0FKRnNBLzROV3FpQSEhL2Fy/#.

6th objective:

- 1) World Health Organization(WHO), HIV/AIDS (2021, November 30). <https://www.who.int/news-room/fact-sheets/detail/hiv-aids>.
- 2) Centers for Disease Control and Prevention (CDC), HIV (2021 , May 20). <https://www.cdc.gov/hiv/basics/livingwithhiv/treatment.html>
- 3) HIVInfo NIH.gov : HIV / AIDS treatment (2021 , August 16). (Image 2) <https://hivinfo.nih.gov/understanding-hiv/fact-sheets/hiv-treatment-basics>
- 4) Mayo clinic HIV / AIDS diagnosis and treatment (2020 , Feb 13). <https://www.mayoclinic.org/diseases-conditions/hiv-aids/diagnosis-treatment/drc-20373531>
- 5) (Image 1): <https://clinicalinfo.hiv.gov/en/glossary/undetectable-viral-load>
- 6) (Image 2): <https://i-base.info/guides/testing/viral-load>.

7th objective:

- 1) HIV/AIDS. (2021, November 30). WHO. <https://www.who.int/news-room/fact-sheets/detail/hiv-aids>
- 2) Pre-Exposure Prophylaxis (PrEP) | NIH. (2021). Hivinfo. <https://hivinfo.nih.gov/understanding-hiv/fact-sheets/pre-exposure-prophylaxis-prep>
- 3) HIV Treatment: The Basics | NIH. (2020). Hivinfo. <https://hivinfo.nih.gov/understanding-hiv/fact-sheets/hiv-treatment-basics>
- 4) Post-exposure prophylaxis (PEP). (2019). CATIE - Canada's Source for HIV and Hepatitis C Information. <https://www.catie.ca/post-exposure-prophylaxis-peg>
- 5) Prevention of Mother to Child Transmission (PMTCT). (2019). Western Cape Government. <https://www.westerncape.gov.za/service/prevention-mother-child-transmission-pmtct>
- 6) Syringe Services Programs (SSPs) | CDC. (2020). CDC. <https://www.cdc.gov/ssp/index.html>