



# International Journal of Medicine and Pharmaceutical Research

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## REVIEW ARTICLE

### Updates on Acquired Immuno Deficiency Syndrome

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#### ABSTRACT

This report provides information to increase understanding on the public health impact of HIV. Currently only 60% of people with HIV know their status. The remaining 40% (over 14 million people) still need to access HIV testing services. In 2016, 1 million people died from AIDS-related illnesses. The immune system cannot control or cure the infection in those with human immunodeficiency virus (HIV). Antiretroviral therapy does not remove the virus from the body but, however this treatment can keep the HIV low for long time. If once the treatment stops, antiretroviral therapy also will not protect the body from the attacked virus. It is typically transmitted via sexual intercourse, shared intravenous drug paraphernalia, and mother-to-child transmission (MTCT), which can occur during the birth process or during breastfeeding because it is a blood-borne virus. The main objective of this is to review progress of new updates in therapeutic developments.

**Keywords:** HIV, pathogenesis, transmission, therapeutic development.

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PAPER QR-CODE

**ARTICLE HISTORY:** Received 09 May 2018, Accepted 24 July 2018, Available Online 10 August 2018

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**Citation:** Pallaprolu Jahnvi, et al. Updates on acquired immuno deficiency syndrome. *Int. J. Med. Pharm. Res.*, 2018, 6(4): 153-157.

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### 1. Introduction

Human immunodeficiency syndrome originated in Kinshasa around 1920, When HIV crossed species from chimpanzees to humans. Up until the 1980s, we do not know how many people were infected with HIV or

developed AIDS. HIV was unknown and transmission was not accompanied by noticeable signs or symptoms <sup>[1]</sup>. World AIDS day is celebrated in the month of 1<sup>st</sup> of December.

**Definition:** AIDS is a chronic, life – threatening condition caused by human immunodeficiency virus (HIV). By damaging immune system, HIV interferes with the body’s ability to fight off viruses, bacteria and fungi that cause disease. HIV makes man more susceptible to certain types of cancers and to infections which the body would normally resist [2].

**2. Epidemiology**

**I. World-wide statistics:** million People are living with HIV globally and 30% people don’t know about their status. This is becoming a global public health issue [3].

**Sub Saharan Africa:**

Around the world HIV/AIDS has most severe epidemic in Sub Saharan Africa and in that South Africa is highly affected. 7.1 million People are living with HIV in South Africa. Among young people (10-24) in Africa, AIDS is the leading cause of death. And it is the second leading cause of death globally.

**Table 1 showing the top rank countries affected with AIDS disease [4]**

Rank	Country	Rate
1	South Africa	18.90%
2	Nigeria	2.90%
3	India	0.30%
4	Kenya	5.40%
5	Mozambique	12.30%
6	Tanzania	4.70%
7	Uganda	6.50%
8	United States	0.36%
9	Zimbabwe	13.50%
10	Russia	0.678%

**II. Country level statistics:**India has the third largest epidemic in the world due to its largest population size. According to 2016 census, 2.1 million people living with HIV in India [5]. According to W.H.O 76% [60–88%] of all pregnant women living with HIV globally received medicines that prevent transmission of HIV to their babies. In 2016, 53% [39–65%] of people living with HIV were receiving antiretroviral treatment [6].

**3. Pathophysiology**

HIV is a sexually transmitted disease. In this infection is promoted by Langerhans cells in mucosal epithelial surfaces. HIV can enter into the cell by attaching to the surface receptors of CD4 and T - Lymphocytes. The infection of CD4 and T-lymphocytes is continued by follicular dendritic cells which became infectious by the infection extended to lymphoid tissues. When the CD4 lymphocyte count drops below 200/micro liter, then the stage of clinical AIDS has been reached. At this point, the characteristic opportunistic infections and neoplasm’s of AIDS appear. HIV can also be transmitted via blood or blood products, mostly shared with contaminated needles used by persons engaging in intravenous drug use. Mothers

who are HIV infected can pass the virus on to their fetuses or to infants via breast milk [8].

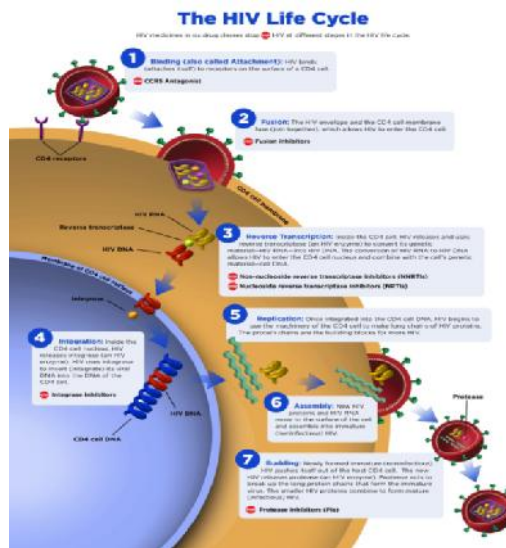
**4. Symptoms [9]:**

**Stage 1: Acute primary infection**

Symptoms can include:

- fever
- sore throat
- swollen glands
- headache
- upset stomach
- Muscle pain
- joint aches and pains
- body rash

These symptoms place because when your body reacts to HIV virus. The infected cells of HIV will circulate through out your blood stream. Then, immune system of infected person will try to attack the HIV virus by producing HIV antibodies. This process is called Seroconversion. Depending upon the type of HIV test it may be too early to get an accurate HIV test result, but it takes few weeks to few months for HIV to show up. But the levels of HIV virus shows very high in your blood stream at this stage.



**Fig: Pathophysiology of AIDS [7]**

**Stage 2: The asymptomatic stage**

After the completion of seroconversion stage many people start to feel better. Depending on age, background and overall health HIV virus may not reveal any other symptoms for up to 10 or even 15 years. However, HIV virus is still active and the new infecting cells make copies of themselves.

**Table 2: Compounds acts against HIV [11]**

S. No	Compound	Treatment/ target	Current phase
1	3BNC117	Monoclonal antibody	Phase 1(ongoing)
2	ABX464	Rev	Phase

		inhibitor	II(ongoing)
3	AGS-004	Vaccine-active immunization	Phase II a(ongoing)
4	AMD-070	CXCR4 Antagonist	Discontinued in phase I/II
5	Albuvirtide	Fusion inhibitor	Phase II (ongoing)
6	Aldesleukin	Immune Modulators	Phase III (ongoing)
7	Amdoxovir	Nucleoside Reverse Transcriptase Inhibitors	Phase II a (discontinued)
8	Apricitabine	Nucleoside Reverse Transcriptase Inhibitors	III (discontinued)
9	Astodimer	Microbicides	Phase I/II (ongoing)
10	Bictegravir	Integrase Inhibitors	Phase II (ongoing)
11	CYT-107	Immune Modulators	Phase II (ongoing)
12	Cabotegravir	Integrase Inhibitors	Phase III (ongoing)
13	Carbopol 974P	Microbicides	Phase II/II b (discontinued)
14	Carrageenan	Microbicides	Phase III (discontinued)
15	Cenicriviroc	CCR5 Antagonist	Phase IIb (ongoing)
16	Censavudine	Nucleoside Reverse Transcriptase Inhibitors	Phase II b (ongoing)
17	Chloroquine	Immune Modulators	Phase II (ongoing)
18	Dapivirine	Microbicides	Phase III b (ongoing)
19	Disulfiram	Latency-Reversing Agents	Phase I/II (ongoing)
20	Doravirine	Non-nucleoside Reverse Transcriptase Inhibitors	Phase III (ongoing)
21	Dexelvucitabine	Nucleoside Reverse Transcriptase Inhibitors	Phase II (discontinued)
22	Elvucitabine	Nucleoside Reverse Transcriptase Inhibitors	Phase II (ongoing)
23	Fosdevirine	Non-nucleoside	Phase II (discontinued)

		Reverse Transcriptase Inhibitors	
24	Fostemsavir	gp120 Attachment Inhibitor	Phase III (ongoing)
25	GSK3532795	Maturation Inhibitors	Phase II b (discontinued)
26	GTU-Multi HIV B	Therapeutic Vaccines	Phase II b (ongoing)
27	INCB-9471	CCR5 Antagonist	Phase II (discontinued)
28	KP-1461	nucleoside Reverse Transcriptase Inhibitors	Phase II a (ongoing)
29	LIPO-5	Therapeutic Vaccines	Phase II (ongoing)
30	Leflitolimod	Latency-Reversing Agents	Phase I b/II a (ongoing)
31	Lersivirine	Non-nucleoside Reverse Transcriptase Inhibitors	Phase II b (discontinued)
32	Lexgenleucel-T	Gene Therapy Products	Phase II (ongoing)
33	Losartan	Antifibrotics	Phase II (ongoing)
34	MPC-4326	Maturation Inhibitors	Phase II (discontinued)
35	Maraviroc (HIV prevention)	CCR5 Antagonist	Phase I (ongoing)
36	Monomeric DAPTA	CCR5 Antagonist	Phase II (ongoing)
37	PRO-2000	Microbicides	Phase III (discontinued)
38	PSI-5004	Nucleoside Reverse Transcriptase Inhibitors	Phase II (discontinued)
39	Panobinostat	Latency-Reversing Agents	Phase I/II (ongoing)
40	Peginterferon Alfa-2a (HIV)	Immune Modulators	Phase II (ongoing)
41	Peginterferon Alfa-2b (HIV)	Immune Modulators	Phase III (ongoing)
42	Poly-ICLC	Latency-Reversing Agents	Phase I/II (ongoing)
43	Rilpivirine LA	Non-nucleoside Reverse Transcriptase Inhibitors	Phase II (ongoing)
44	Rintatolimod	Immune	Phase II b

		Modulators	(ongoing)
45	Romidepsin	Latency-Reversing Agents	Phase II (ongoing)
46	SB-728-TTHV01	Gene Therapy Products	Phase I/II (ongoing)
47	TMC-310911	Protease Inhibitors	Phase II a (ongoing)
48	Tat Oyi	Therapeutic Vaccines	Phase I/II a (ongoing)
49	Tenofovir (Microbicide)	Microbicides	Phase III (ongoing)
50	TenofovirAlafenamide	Nucleoside Reverse Transcriptase Inhibitors	Phase III (ongoing)
51	Tucaresol	Immune Modulators	Phase II (discontinued)
52	UB-421	CD4 Attachment Inhibitor	Phase III (ongoing)
53	VM-1500	Non-nucleoside Reverse Transcriptase Inhibitors	Phase II/III (ongoing)
54	Vac-3S	Therapeutic Vaccines	Phase II a (ongoing)
55	Vacc-4x	Therapeutic Vaccines	Phase II (ongoing)
56	Valproic Acid	Latency-Reversing Agents	Phase II (ongoing)
57	Vicriviroc	CCR5 Antagonist	Phase III (ongoing)
58	Vorinostat	Latency-Reversing Agents	Phase II (ongoing)

Hence, overtime this will cause a lot of damage to your immune system.

### Stage 3: Symptomatic HIV infection

There will be a lot of damage to your immune system after entering into the third stage of HIV. At this stage, many serious infections or bacterial and fungal diseases will effect that you would unable to fight off. These infections are named as “opportunistic infections”.

Symptoms occur at this stage include:

- weight loss
- a persistent cough
- night sweats
- fever
- mouth and skin problems
- regular infections
- chronic diarrhea
- Serious illnesses or diseases.

**Diagnosis** <sup>[10]</sup>: HIV can be diagnosed by either demonstrating the presence of virus or viral products in the host, alternatively by detecting host response to the virus. This was commonly diagnosed by Serological assays to detect HIV specific antibodies or by Nucleic Acid Amplification Test (NAAT) to detect HIV nucleic acids.

#### Serological Tests:

For detecting HIV antibodies enzyme linked immunosorbent assays (ELISAs), rapid tests and western blots (WBs) are commonly used. For specific HIV antibody detection Chemiluminescence Immunoassays (CIA), Immuno Florescent Assays and Line Immunoassays are also available additionally. For P24 antigen detection Commercial assays are also available.

#### NAAT:

For detecting various HIV structural genes (usually gag, pol and env) they use polymerase chain reactions (PCRs). It is the test of choice for early infant diagnosis and during window period. Based on signal amplifications Branch DNA (bdNA) assays are also used. As maternal antibodies may be present in the infant’s circulation diagnosis in a child less than 18 months cannot be done using antibody based assays. Therefore, the diagnosis of HIV infection can only be reliably made by DNA PCR up to the age of 18 months. The window period can be diagnosed by detecting p24 antigens or by PCR. Where PCR is the test of choice since p24 antigen detection test is less sensitive. However, PCR is the test of choice since the p24 antigen detection test is relatively less sensitive.

#### Treatment:

**FDA-approved:** Medication approved by the U.S. Food and Drug Administration (FDA) that treats symptoms of AIDS.

#### New strategies in the treatment of aids:

New strategies in the treatment of AIDS include the new therapeutic approaches to target H.I.V, focusing on pharmaceutical compounds undergoing phase 1, phase 2 and phase 3 are randomized controlled trials.

## 4. Conclusion

Nowadays one of the world’s largest pandemics is HIV. The new treatment standard in 1997 became the highly active antiretroviral therapy. However, it caused a 47% decline in death rates. Where, clinical trials are conducted in different phases which help researchers to answer different questions. Finally, this review concludes that new therapeutic updates on HIV which helps to cure HIV. Various types of new treatment are here to provide knowledge on new updates on HIV.

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