

# **AIDS Epidemic—Origin, mechanism, stigmas, American struggles, mental issues and cure.**

Research Paper on AIDS Epidemic: struggles of the past  
teaching a lesson for tomorrow

**By Arshan Khatri**

Email- [arshan.khtr@gmail.com](mailto:arshan.khtr@gmail.com)

Address- Near high school, Basna, CG, India

17th September 2021

## Abstract

There have been many plagues and Pandemics before, affecting people in negative ways. The AIDS Epidemic was an unexpected one, putting the victims at high risk of Immune deficiencies and breaking them down mentally. The Acquired Immune Deficiency Syndrome (AIDS) disease is caused by the HIV viruses, a group of very latent viruses, which makes them more so threatening. AIDS was not just a medical challenge but also a political one. The early 1980's shook the world with unfolding of one of the most fatal disease killing around 690,000 humans in 2020. The Good News is that the statistics are decreasing with the advent of modern day technology, awareness and prevention efforts.

The AIDS Epidemic was a huge challenge to the Healthcare systems around the world. This disease most likely originated from Western Africa and seemed to have transferred from non-human primates to human beings. This virus then traveled across the world when Africa was colonised and when sex trade began. It reached United States; California and New York were its primary targets.

It started among gay men in LA and San Francisco. The symptoms were of *Pneumocystis Pneumonia* (PCP). A cancer type called *Kaposi Sarcoma* was also diagnosed. Not only gay men but people who used intravenous drugs were also vulnerable to catching HIV. At first the CDC or the **Center for Disease Control** couldn't understand much and they needed fundings from the government to do Research; they were made fun of at the press for reporting a epidemic that was prevalent in gay men. It was too late; People were dying in big numbers.

The government was too late to help. After the president gave the funds, the research began nationwide, collecting data. Drugs were proposed like the **AZT**. Tests were conducted to check the usability of these drugs but the people were inpatient. They pledged against the **NIH** and formed support groups like ACT UP.

As the studies happened, the understanding of AIDS cleared more and more. At the beginning, AIDS was subject of stigmatisation and mockery to the regular people. AIDS patients like 13-year old Ryan White were not allowed to attend public places and refrained to attend schools. Soon though this changed, people began to mature and grasped the does and don'ts of this global Epidemic.

Many treatments like **HAART**, **Stem Cell Transplant** and **Bone Marrow Transplant** are being practiced. There are constant efforts made to educate people about precautions, treatments, sexual behaviour and more, to undo the errors of the past. Unfortunately, the deaths happened due to the carelessness of the government officials, people and health care workers couldn't be undone. Slowly but surely, the future is looking promising for AIDS considering the new breakthroughs in health care systems, public support and the governmental aid. We can only get better at it if only the patients, doctors, people and government work together in harmony.

## Origin of the Disease

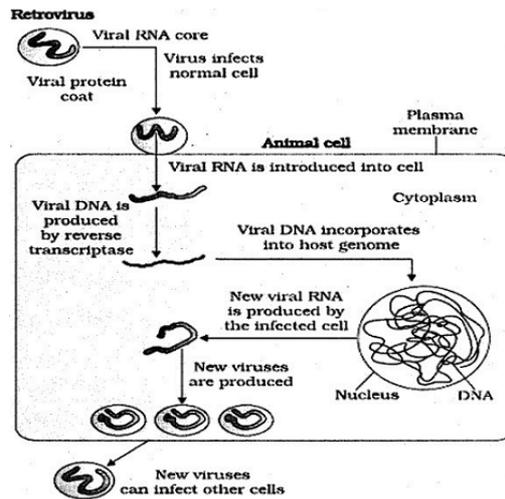
Microorganisms are both harmful and beneficial to mankind. Our body has millions of bacteria, fungi, viruses etc. but they don't pose any significant damage to us. In fact some microbes in our body help us in major ways, their absence can lead to illness. These microbes take their nutrition from the host body and grow, this relationship is called **commensalism**. The question arises, then how do they become fatal sometimes? The answer—virulent evolution of these microbes into infectious pathogens and external pathogens from different species entering a human population through various ways like hunting, eating, agriculture habits and many more.

The process by which pathogens enter from a non-human host to a human host is called **Zoonosis**. We think, HIV is a zoonotic disease.

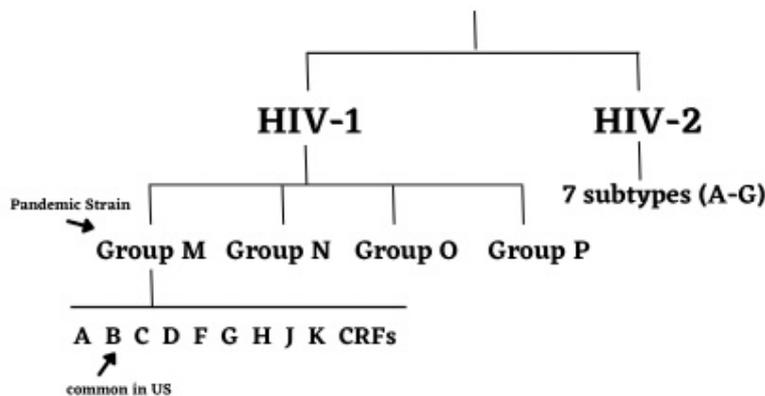
The central point of discussion when it comes to the HIV is Africa, particularly Western Africa. In Africa, the primates had **SIV** (Simian Immunodeficiency Virus) strains from the Genus *Lentivirus*, which seemed to live in harmony with their primate hosts. The main concern is their **crossover** to the Human, there were many theories proposed as to how did that occur. The most prevalent is the '**Bushmeat Trade**', which involved hunting of animals especially primates for food and other purposes. The hunters were regularly subjected to the animal's blood and any cuts or injuries in the hunter's body led to the mixing of their bloods and subsequently the Crossover event occurred. However, the notion that the primates were unaffected by the SIV strain they had, is challenged today. Most likely, this crossover event took place in **1930s**. In a nutshell, the transfer of these SIV strains from various primates like Chimpanzees, monkeys was the root of a tragic epidemic which would horrify the people of the world after a few decades.

## A brief scientific account

A virus is protein with genetic information within the protein coat. The genetic material in viruses can either be DNA or RNA. In the case of **HIV** (Human immunodeficiency Virus), it belongs to group of **Retroviruses**, which have RNA as their genetic information. Viruses require a host to survive and multiply, they inject their genetic information into the cell and get incorporated in the host's genetic material, thereby multiplying and forming new viruses. Let's see the mechanism with the help of an illustration-



As you see in the figure, once a retrovirus injects its RNA into the host cell, an enzyme called **Reverse transcriptase**, transcribes the RNA into a double-stranded DNA. The viral DNA then wends its way through the nuclear pores to gain entry into the nucleus. HIV integrase then inserts the viral DNA into human chromosomes, where it remains for the life of the cell. Initially, the HIV provirus was thought to insert randomly. However, studies made possible by complete sequencing of the human genome revealed that HIV preferentially integrates into actively transcribed genes, a feature that may further enable its replication and spread. This process takes long time to express itself in the form of a disease hence are called *Lentiviruses*. As a natural way to fight back, the affected cells release



**Interferons**, which aids to avoid further infection.

The types of HIV—

- The HIV I strain is most similar to SIV strain in Chimpanzees, subspecies *Pan troglodytes* (common chimpanzee).
- The HIV II strain is most closely related to SIV strain in *Sooty mangabeys*.

## How did it turn into an epidemic?

In the time, when the tragic event of crossover happened probably in **Kinshasa**, in the Democratic Republic of Congo or the Western Africa and as the colonial period casted into the African history, cities began to become more populated and the large distances between cities shrank down. These series of events along with many other factors like; Sex trade and commerce contributed to the terror that

would be faced by generations to come. It wasn't until the 1980s when AIDS started showing its threat in the United States, Scientists began Speculating that the virus began in **Haiti** and with a similar phenomena occurring across a belt in Africa, they proposed that the virus travelled across the Atlantic from Africa to Haiti and then from Haiti to **California**. It travelled across **Europe and Asia** simultaneously.

## **Homosexual men and the HIV—an interesting event**

It was May **1981**, *Dr. James W. Curran*, a STD specialist at the **CDC** (Centres for Disease Control) was holding an early draft of the June **Morbidity and Mortality weekly report** that said- Between October 1980 and May 1981, 5 young and previously healthy men in Los Angeles showed signs of peculiar diseases and fungal infections, one man in particular had a headache for 2 months and another for 5 whole months. All five men were diagnosed with ***Pneumocystis pneumonia*** (PCP), a rare and serious fungal infection which targets the Immune system of an individual. After some interviewing, doctors found no mutual contact or sexual relations amongst these 5 men, though the report clearly said that they were openly **gay** men. This unusual scenario rang a suspicious alarm in Dr. Curran's head. By the time the report was published next month, 2 men had already died. Soon followed by more and more information coming from all around the country on men diagnosed with PCP, the CDC launched a special task force called '***kaposi sarcoma*** and opportunistic infections' on June 8th, 1981. Dr. Curran was elected as the Chair of the committee for the three-month assignment. Around the same time, Dr. Arye Rubinstein, a paediatric immunologist in New York noticed a similar outbreak in 5 infants showing symptoms of Immune suppression and PCP. He came to know that most of their mothers were sex workers and intravenous drug users. Dr. Rubinstein dismissed these cases as his colleagues saw no connection between gay men in California and infants in New York.

The next month, in July, the CDC published another report citing a cluster of strange diagnoses— 26 young gay men all around California and New York were experiencing something unusual, they had blue and purple skin lesions, swollen lymph nodes and tumours throughout their bodies. All 26 of these men had ***Kaposi sarcoma*** confirmed, 4 of them with PCP alongside the sarcoma. Dr. Curran began to take notice that if we were to compare the PCP diagnoses with the Kaposi sarcoma diagnoses, they would almost paired each other on demographics and geographic locations. If Curran could find what this connection was, he could stop it from spreading more, but it was far from his control. People outside the medical community began to take notice. On July 3rd 1981, the New York Times released an article titled 'Rare cancer seen in 41 homosexuals', the article speculated on possible causes for this disease but did not provide solid scientific evidences to support it, however the article did cite Dr. James W. Curran as a reference. It also mentioned that straight men were not at a risk of contracting the disease. The CDC

went on a high warning signal, they realised that it is not a joke, if they wouldn't act fast hundreds of more people could die. Dr. Curran had very little information on *Kaposi sarcoma* and the PCP and very limited funding. So, he and his team at CDC began analysing reports of requests for **Pentamidine isethionate**, the drug prescribed when a patient was suffering from PCP, because the PCP was incredibly rare condition, doctors had to request the drug directly through the CDC, which made it easy for Dr. Curran to access the information.

Interviewing 90% of this drug users, Curran realised that it was spreading at an exponential rate in openly gay men. At this stage, Curran and his team had two working theories as to why it was prominent in gay men—

- If it was spread sexually, then gay men were more likely to have multiple sexual partners as evidence showed in patient interview.
- **Poppers**—drugs made of **Amyl nitrate** to enhance sexual pleasure and was exclusively used by gay men. The drug use could've been a factor for the outbreak.

Concerns in the gay community were increasing but because of Homophobia, it didn't get the much needed attention and the already underfunded CDC can only do so much. On 11 August of that year, a group of 80 men in New York City raised upto \$6,635 to put towards research.

That September, Bobbi Campbell and his partner Bobby Halyard began a honeymoon trip driving down the coast of California, when they returned home later that evening, Bobbi removed his hiking boots and was greeted by purple skin lesions in his legs, he ignored these spots and assumed it to be blood blisters because they didn't cause pain. He figured they would clear up in few days. Bobbi's partner recommended him to see a doctor as he has seen an uptake on a disease in gay men which started from the feet. Bobbi's doctor performed biopsy on the skin lesions and soon after, Bobbi's worst fears came to life. Despite the CDC studying the disease for a year now, there was on cure visible and the federal government was ignoring the dangerous crisis. After his *Kaposi sarcoma* diagnosis, Bobbi travelled through five phases of lose- **Denial** to his diagnoses and **anger** on the people close to him followed by **bargaining** between working full time, College and cancer treatments, these struggles gave ways for **Depression** to join his companionship, as a result he started **abusing Alcohol**. As he moved closer and closer to his final phase, Acceptance was the only way out. On December 19th 1981, Bobbi Campbell was the first men to publicly come out as a victim of *Kaposi sarcoma*. He knew that this way the only way to help others who were in the same circumstances as his, to come out and get proper treatment.

Around the same time, the New England Journal of Medicine reported a similar outbreak amongst **intravenous drug users**, of the 13 people interviewed 6 were gay, 7 used drugs while 2 of them fell into both categories. Researchers realised that intravenous drug users were also at risk. The clear conclusion is that PCP and *Kaposi sarcoma* are somehow linked. Over the period of next few month, the CDC published reports speculating groups which are most vulnerable to the infections.

On July of 1982, they released a report explaining 34 cases of *Kaposi sarcoma* amongst **Haitian immigrants**. Later, a Morbidity and Mortality report put a whole new group of at risk— those with **Haemophilia A**. Haemophilia is a genetic disease where certain blood clotting factors don't function, as an outcome of this disease the patient requires regular blood transfusions which puts him at risk.

In a nutshell, according to the theories and analysis at the time by the CDC, these were the most vulnerable groups—

- **Homosexual men,**
- **Heroin and other intravenous drug users,**
- **Haitian immigrants and**
- **Haemophiliacs.**

## Next step by the Researchers

Dr. Curran and Dr. David Auerbach began analysing reports, they figured that this outbreak should have been linked to sexual relations. Being an expert on STDs, Dr. Curran felt he could take an upper hand at the epidemic. They started by analysing the cluster of cases, out of the first 19 people diagnosed with PCP and *Kaposi sarcoma* and similar immunodeficiency diseases in Southern California, 8 had already died. Dr. Curran and Dr. Auerbach began a series of interviews of these patients and talking to those close to them, they were able to trace sexual history of 13 of those men- 4 patients had passed sexual encounters with other and 9 of those patients shared a partner with another patient. In order to keep the account of this tangled web, the doctors began to name them based on their locations so, patients living in LA were labelled as LA1, LA2 and so on. In the beginning, they kept this research limited to Southern California. After asking series of questions to the patients throughout California, many of them reported having sex with a **handsome blonde flight attendant**. Curran and Auerbach expanded their study to more parts of the country particularly New York, patients in NY also mentioned a handsome blonde flight attendant who frequented bath houses and bars in San Francisco but, of course they didn't know his name and labelled him **Patent O**, meaning outside California. Until one unique interview, where a patient took out his appointment book to reference this flight attendant- Gaëtan Dugas. Curran was sure that **Dugas was patient o**. The CDC met Dugas where he claimed to have about 750 sexual partners in just 2 years. The doctors were eager to warn the patient who had sexual relations with Dugas. They published an article to spread awareness.

## Naming the epidemic- 'AIDS'

Armed with their latest findings the CDC devised an umbrella term- AIDS or **Acquired Immune Deficiency Syndrome**. The CDC hoped that this term would help people to understand the severity of the epidemic but, this hope didn't benefit them, instead when the government officials of the highest authority refused to take AIDS seriously, the CDC found their hands cuffed. This ignorance by the

federal government was sufficient to humiliate people's life with bad humiliation. The lack of funding, increasing cases and death tolls made the situation even more catastrophic.

## Stigmas associated with AIDS—Ryan White and his struggles

**Ryan White**- an young boy from Indiana, US was unique from the beginning, he was born with Haemophilia A. Although Ryan hated being different from the very start and he kept it to himself but, being a haemophiliac comes with its own visible challenges like staying away from injuries, coming up with bruised body due to the disorder and being on the spotlight of people's **gossips** and much more. However Ryan would try to stay optimistic and religiosity convinced him to believe that God would help him live with this disease. Around 1976, Ryan's doctors gave him regular supply of **Factor 8**- a blood clotting protein which ensures no major blood loss on minor injuries. This would permit Ryan to live seemingly normal life but it brought risks as well. In his biography, Ryan remembered a conversation between his mother and his grandfather, in it his grandfather told Ryan's mother that AIDS can spread through blood transfusions, he pleaded Ryan's mother to stop those doses as it were derived from donors blood which may have been affected. However, neither Ryan nor his mother cared. He felt sick throughout the summer of 1984 and didn't expect it to be anything major but, in December of that year Ryan's grandfather's fear proved to be true. Ryan White was diagnosed with PCP at the age of 13, her mother went into **denial** and it was at that time that she realised the Stigmas associated with AIDS. People presumed that AIDS was spread via touch, using same toilet seats, drinking from the same cup etc.

The reason why AIDS is so deadly is that it attacks a person's immune system particularly **T-Cells**, which are responsible for fighting diseases. Not only the person with HIV is exposed to other virulent diseases but also use these White Blood Cells to produce more viruses. Ryan had a regular visit to his hospital for his **Gamma globulin Therapy**. This therapy is like blood transfusion but with antibody-rich blood plasma instead of whole blood, although it was not a permanent or long-term cure but, it did help him short time by providing strength to the T-Cells to fight infections. Ryan also had to take nasal treatment like Pentamidine- main drug at the time for treating PCP. These two treatments helped him to recover from PCP but did nothing to treat his HIV infection.

Ryan Grandfather read that after just 6 months from the diagnosis, AIDS patient would die. While other students of his age plan on math tests and dance events, he had to **prepare to die**. In *Ryan White: My own story*, he said "***I bet if live 5 years I can beat this thing or I will die trying***". Ryan received a phone call from a local reporter and it was printed on the newspaper that *Ryan White has AIDS*, Ryan worst nightmare came to become a real phenomena. At the time the

stigmatisation of AIDS was strong because it started from gay men and sexual interaction and intravenous drug users, he knew that this would soon follow into a topic of gossips for everyone at school and bullying him for his situation. He survived, making into the summer of 1985 by proving his doctors wrong and his neighbours by acting a normal boy when his school started. Ryan was constantly subjected to **discriminations even at the Church**, he either sat at the first pew or at the last. Around that time, an elite film actor Rock Hudson was diagnosed with HIV and it plagued the media as he came out with his homosexuality. This major coverage brought a hope that the Reagan Administration would help the situation with funding as Mr. Hudson and the President were friends, unfortunately to the disappointment of the masses it didn't move an inch. However, it helped raise funds so that researchers could find a possible treatment at a large scale. By the time Ryan prepared for his seventh grade, 12 medical centres launched a big clinical study, finally the resources were in place and the stakes couldn't be higher. A cure wasn't about saving people's lives but maintaining the quality of their living as well so that they can play with their peers normally or sit wherever they wanted at Church.

Ryan's mother wouldn't let his son go to school and deal with all the discriminations, gossips, bullying etc. but, Ryan insisted. Finally, he was given the permission to go to school by his mother. In the fall semester, the parents at school **filled a petition against Ryan's school entry**, the parents were approved of their request. Ryan's mother sue the local district and the law process wasn't quick so, after a mutual understanding the district agreed to give Ryan a tutor free of charge. But, that didn't work out as the tutors would come up with excuses so as not to come in contact with him. **Ryan was devastated** by the experience and the indecorous behaviour of the school district. Ryan was astounded by how much people of the media were kind towards him. Ryan became very popular as a boy with AIDS. His mail box was flooded with gifts, cards and letters. In an eventual pace, the HIV was seen as an real crisis rather than the stigmatisation of the situation. By the end of 1984, the president didn't address anything publicly but one year later, when the death tolls peaked at about 6000 he had to speak on the catastrophe. When he finally did, he defended the federal government. The research was funded with only \$126 million, which was not enough, after some back and forth, the researchers managed to get \$190 million as a funding to aid the HIV research. While the activists raised awareness in Washington DC, Ryan was fighting the law at Kokomo. His court case was long and tiring but he won the case and was allowed to go to school after one and a half years. It was miraculous that Ryan managed to make it alive this far. Soon, Ryan and other HIV patients saw a **light of hope**. On march 20th of 1987, the FDA approved a anti-HIV drug in the USA— **Azidothymidine or AZT**. This anti-retroviral drug couldn't cure the HIV infection but help to prevent its further growth and development. This AZT was discovered accidentally when a scientist tried to make a drug for cancer treatment. However, the drug couldn't make it to the market because it was never able to make pass the animal trials as it was ineffective. The researcher found that AZT can block the enzyme that HIV uses to take over a cell- *Reverse transcriptase*. This

was highly controversial because the test period for this drug was about 20 months while the test of this scale needs at least **10 years** but, the FDA was at immense pressure to speed up the process.

## **Azidothymidine- trials and mistakes**

During the brief trial, 300 participants diagnosed with AIDS were randomly assigned pills- a **placebo pill** and a **AZT pill**. The doctors weren't allowed to know neither their patients. In just 4 months of human trial phase the researchers ended the tests. During the trial, 1 person taking the AZT pills had died in contrast, 19 placebo pill takers lost their lives, the FDA claimed that this was enough evidence to approve the drug was safe, why should we wait after people are dying anyways. The problem was the research wasn't as scientific as the researchers expected, they measured their results based on how many patients survived simultaneously ignorant of that fact that AIDS isn't an inherently fatal disease, it weakens the immune system, it's the opportunistic infections that technically kill the patient. So, if a patient suffered from Diarrhoea and if the doctors gave him life saving treatment; it was the AZT that got all the credits as there were no standardised methods for treatment. Besides, the rumours suggested that the patient might have exchanged pills with each other, if this were true, the researchers had no way to identify or verify that. AZT also posed serious health side effects like Nausea, vomiting and liver problems. Despite its major health hazards, the doctors thought it couldn't get any worse than the death that would eventually come without the cure at least it would help them in some way and by that, **the drug made it to the market.**

## **There was a worst disease than AIDS**

Ryan was not aware of the side effects of AZT and the drug wouldn't suit him due to his past Hepatitis experience, it may cause liver problems. His doctors seem to realise that it was better than an untreated HIV infection. By this time, he lived for a year and a half with AIDS- 10 months more than he was expected to. He hoped that he can get through AIDS but not through the stigmas associated to it. Ryan returned to his school to finish his 8th grade and he did that amidst of bullying, discriminations and harassments. Strangely enough Ryan felt more accepted and appreciated amongst strangers and celebrities. Sadly, Ryan felt hunger for dignity and honour. Even though the CDC had debunked the theory that AIDS can spread through casual contact, the students and teachers at school **refused to shake Ryan's hands** or use the same toilet as his. Ryan was the centre for the homophobic jokes. People accused Ryan **coughing at the food in grocery stores and spit on people who annoyed him.** The students would deface his locker and write slurs on his folders. Gradually Ryan's health was deteriorating and our hero took **his last breath on 8th of April 1990 at 18 years of age.**

## Possible cure and treatment

1991 saw a new drug hitting the market- *Didanosine*, an oral solution of powder and water. When a patient's cell absorb Didanosine, it severely slowed down HIV's ability to replicate. It wasn't a cure and had dangerous side effects including potential neural damage. However, it was effective at decreasing the progression of AIDS in patients who previously took AZT. The support and fundings led the FDA to approve *highly active anti-retroviral therapy* or **HAART** in 1996. HAART referred to any treatment regimen that involves two or more prescription medications for example, researchers found that Didanosine is more effective when used in combination with AZT. Each form of HAART is customised to a patient's specific need. It works best when patients can have honest conversation with their doctors on what is working best for them, not feeling shame and free of judgement. While HAART can't cure AIDS it can help the patients to control and limit its spread throughout the body.

Timothy Ray Brown was **cured of AIDS**. We didn't go public until 2010 before that he was just called 'The Berlin Patient'. We went through a **Stem Cell Transplant** to treat his *Leukaemia* in 2007. Within 3 months HIV couldn't be traced in Brown's blood. Another possible cure was appeared in 2019, when. Nature reported on a patient in London who got a **bone marrow transplant**, he has no detectable AIDS in his blood.

Meanwhile, the efforts are being made to aware people of its spread. In the past decade the FDA approved a drug for HIV negative individuals who are high risk of contracting the disease- **PrEP** or *Pre-exposure prophylaxis*.

Unfortunately, HIV had another surprise in store – the persistence of small amounts of virus in a latent, drug-insensitive state within resting CD4 memory T cells. While rare (1/100 000 to 1/1 000 000 white blood cells), such latently infected cells display a half-life of at least 44 months; thus, patients will require at least 60 years of treatment before this reservoir is eliminated. Predictably, within weeks of HAART discontinuation, viral loads rebounded in patients to pretreatment levels. If the problem of HIV latency is not solved, a true cure of HIV will not be possible. Surprisingly, male circumcision seemed to prevent AIDS.

In 2016, Nature published a finding that Dugas was not the initiator of the epidemic rather the studies of his blood samples showed that the strain of HIV he had was already prominent before he started working as a flight attendant with Air Canada in 1974. In other words, Dugas wasn't the demonised figure that he was labelled as.

## Looking ahead

There are constant efforts made to educate people about precautions, treatments, sexual behaviour and more, to undo the errors of the past. Unfortunately, the

deaths happened due to the carelessness of the government officials, people and health care workers couldn't be undone. Slowly but surely, the future is looking promising for AIDS considering the new breakthroughs in health care systems, public support and the governmental aid. We can only get better at it if only the patients, doctors, people and government work together in harmony.

**Conflict of interest:** The author declares no financial or commercial conflict of interests.

## Reference

1. [hiv.gov](http://hiv.gov) Global statistics 2020
2. Morbidity & Mortality Weekly Report. Kaposi's sarcoma and pneumocystis pneumonia among homosexual men - New York City and California. MMWR Weekly 1981. 30: 305-308.
3. Morbidity & Mortality Weekly Report. Epidemiologic notes and reports: possible transfusion-associated acquired immune deficiency syndrome, AIDS - California. MMWR Weekly 1982. 31: 652-654.
4. Morbidity & Mortality Weekly Report. Epidemiologic notes and reports: immunodeficiency among female sexual partners of males with acquired immune deficiency syndrome (AIDS) - New York. MMWR Weekly 1983. 31: 697-698.
5. Coffin, J., Haase, A., Levy, J. A., Montagnier, L., Oroszlan, S., Teich, N., Temin, H. et al., What to call the AIDS virus? Nature 1986. 321: 10.
6. Greene, W. C. and Peterlin, B. M., Charting HIV's remarkable voyage through the cell: Basic science as a passport to future therapy. Nat. Med. 2002. 8: 673-680.
7. Connor, E. M., Sperling, R. S., Gelber, R., Kiselev, P., Scott, G., O'Sullivan, M. J., VanDyke, R. et al., Reduction of maternal-infant transmission of human immunodeficiency virus type 1 with zidovudine treatment. Pediatric AIDS clinical trials group protocol 076 study group. N. Engl. J. Med. 1994. 331: 1173-1180.
8. Cooper, D. A. and Merigan, T. C., Clinical treatment. Aids 1996. 10 Suppl A: S133-S134.
9. Blankson, J. N., Persaud, D. and Siliciano, R. F., The challenge of viral reservoirs in HIV-1 infection. Annu. Rev. Med. 2002. 53: 557-593.
10. Newell, M. L. and Barnighausen, T., Male circumcision to cut HIV risk in the general population. Lancet 2007. 369: 617-619.
11. Grant, R. M., Buchbinder, S., Cates, W., Jr., Clarke, E., Coates, T., Cohen, M. S., Delaney, M. et al., AIDS. Promote HIV chemoprophylaxis research, don't prevent it. Science 2005. 309: 2170-2171.
12. Mann, J.M. (1989) 'AIDS: A worldwide pandemic' in Current Topics in AIDS Volume 2, edited by Gottlieb, M.S. et al. John Wiley & Sons.
13. Hymes, K.B. et al (1981) 'Kaposi's sarcoma in homosexual men: A report of eight cases' Lancet 2(8247):598-600.

14. Centers for Disease Control (CDC) (1981) 'Kaposi's Sarcoma and Pneumocystis Pneumonia among Homosexual Men- New York City and California' MMWR Morbidity and Mortality Weekly Report 30(25):305-308.
15. Masur, H. et al (1981) 'An Outbreak of community acquired Pneumocystis carinii pneumonia: initial manifestation of cellular immune dysfunction' The New England Journal Of Medicine 305(24):1431-1438
16. Centers for Disease Control and Prevention (CDC) (1982) 'Epidemiologic notes and Reports Pneumocystis carinii Pneumonia among persons with haemophilia A' MMWR Weekly 31(27):365-367
17. Centers for Disease Control (CDC) 'Current Trends Update on Acquired Immune Deficiency Syndrome (AIDS) - United States' MMWR 31(37):507-508
18. Centers for Disease Control and Prevention (CDC) (1982) 'Opportunistic infections and Kaposi's Sarcoma among Haitians in the United States' 31(26):353-354,360-361
19. Centers for Disease Control and Prevention (CDC) (1983, 7 January) 'Epidemiologic notes and reports immunodeficiency among female sexual partners of males with Acquired Immune Deficiency Syndrome (AIDS) - New York' MMWR Weekly 31(52):697-698
20. The New York Times (1990, 9 April) 'Ryan White Dies of AIDS at 18; His Struggle Helped Pierce Myths'
21. Veronika, G. (2013) 'History of AIDS' [lulu.com](http://lulu.com)
22. The Henry J. Kaiser Foundation (2014) 'HIV Testing in the United States'
23. AIDSinfo (1987, 20 March) 'Approval of AZT'
24. AIDS.gov 'A Timeline of AIDS'
25. Cohen, M.S. et al (2011) 'Prevention of HIV-1 Infection with Early Antiretroviral Therapy' The New England Journal of Medicine 365(5):493-505
26. U.S. Food and Drug Administration (FDA) (2012) 'FDA Approves First Medication to Reduce HIV Risk'
27. How researchers cleared the name of HIV Patient Zero. Nature 538, 428 (2016).
28. A history of AIDS: Looking back to see ahead. Eur. J. Immunol. 2007. 37: S94–102
29. Ryan White: My own story. *Biography* (1991).