Int J Pharm Bio Sci 2015 Oct ; 6(4): (P) 178 - 185

Research Article **Pharmaceutics**

International Journal of Pharma and Bio Sciences **ISSN 0975-6299**

A STUDY OF AVAILABLE BRANDS OF ANTIVIRAL AND ANTITUBERCULOSIS DRUGS IN INDIA

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ABSTRACT

During the last few decades the continuous emergence and re-emergence of viruses, due to evolution of virus, viral latency, improper diagnosis, viral resistance, toxicity and immunosuppression caused by antivirals, is a serious public health concern. There has been tremendous progress in understanding of molecular mechanisms and genetic basis of diseases and virus in the recent years. Many new drugs have been developed and a lot more are in the process of development. Still, we are struggling against viruses and lack foolproof antiviral therapies against them. In order to intensify our fight against deadly disease tuberculosis, we need to further strengthen our surveillance programs to accurately estimate the burden of all kinds of TB (childhood, HIV/TB, MDR-TB). There is a dire need to regulate the rational use of first- and second-line anti-TB drugs. They should absolutely not be sold as *over the counter* drugs. More than 1.5 million people currently receive free drugs at the 13,000 Indian government centres across the country. The Indian government's Revised National TB Control Programme (RNTCP) started in India in 1997, extend out a helping hand to all people diagnosed with TB, and in addition, provide better quality services and improve on therapy for these patients.

KEYWORDS: **emergence of viruses, antiviral, deadly disease tuberculosis, anti-TB drugs, etc.**

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INTRODUCTION

ANTIVIRAL DRUGS

Antiviral drugs are a class of medication used specifically for treating viral infections, like antibiotics for bacteria. Specific antivirals are used for specific viruses. Antiviral drugs do not destroy their target pathogen, instead they inhibit their development. Antiviral drugs are one class of antimicrobials, a larger group which also includes anibiotic, antifungal and antiparasitic drugs. They are relatively harmless to the host, and therefore can be used to treat infections. They should be distinguished from viricides, which are not medication but deactivate or destroy virus particles, either inside or outside the body. Antivirals also can be found in essential oils of some herbs, such as eucalyptus oil and its constituents. Most of the antiviral drugs now available are designed to help deal with HIV, herpes viruses (best known for causing cold sores and genital herpes, but actually the cause of a wide range of other diseases, such as chicken pox), the hepatitis B and C viruses, which can cause liver cancer, and influenza A and B viruses. Researchers are working to extend the range of antivirals to other families of pathogens.[1]Designing safe and effective antiviral drugs is difficult, because viruses use the host's cells to replicate. This makes it difficult to find targets for the drug that would interfere with the virus without also harming the host organism's cells. Moreover, the major difficulties in developing vaccines and anti-viral drugs are due to viral variation. The emergence of antivirals is the product of a greatly expanded knowledge of the genetic and molecular function of organisms, allowing biomedical researchers to understand the structure and function of viruses, major advances in the techniques for finding new drugs, and the intense pressure placed on the medical profession to deal with the human immunodeficiency virus (HIV), the cause of the deadly acquired immunodeficiency syndrome (AIDS) pandemic.[2]

KEY POINTS OF VIRAL TREATMENT

- Clinical trials and observational data show that early antiviral treatment can shorten the duration of fever and illness symptoms, and may reduce the risk of complications from influenza (e.g., otitis media in young children, pneumonia, and respiratory failure) and death, and shorten the duration of hospitalization. Clinical benefit is greatest when antiviral treatment is administered early, especially within 48 hours of influenza illness onset.[3]
- Antiviral treatment is recommended as early as possible for any patient with confirmed or suspected influenza who
  - is hospitalized;
  - has severe, complicated, or progressive illness; or
  - is at higher risk for influenza complications.
- Persons at higher risk for influenza complications recommended for antiviral treatment include:
  - Children aged younger than 2 years.
  - adults aged 65 years and older;
  - persons with chronic pulmonary (including asthma), cardiovascular (except hypertension alone), renal, hepatic, hematological (including sickle cell disease), metabolic disorders (including diabetes mellitus), or neurologic and neurodevelopment conditions (including disorders of the brain, spinal cord, peripheral nerve, and muscle such as cerebral palsy, epilepsy [seizure disorders], stroke, intellectual disability [mental retardation], moderate to severe developmental delay, muscular dystrophy, or spinal cord injury); [4]
- When indicated, antiviral treatment should be started as soon as possible after illness onset, ideally within 48 hours of symptom onset. However, antiviral treatment might still be beneficial in patients with severe, complicated or progressive illness and in hospitalized patients when started after 48 hours of illness onset, as indicated by observational studies. For example, antiviral treatment of pregnant women (of any trimester) with influenza A (2009 H1N1) virus infection has been shown to be most beneficial in preventing respiratory failure and death when

started within less than 3 days of illness onset, but still provided benefit when started 3– 4 days after onset compared to 5 or more days. Another systematic review and observational studies of neuraminidase inhibitor treatment of patients with 2009 H1N1 virus infection, primarily oseltamivir treatment, concluded that early initiation of treatment reduced the likelihood of severe outcomes compared to late or no treatment. This review found a 65% mortality reduction in early-treated versus untreated patient. [5,6,7]

CLASSIFICATION

1. Anti-Herpes Virus

Idoxuridine, Acyclovir, Valacyclovir, Famicyclovir, Ganciclovir.

2. Anti-Retrovirus

(a).Nucleoside reverse transcriptase inhibitors

Zidovudine, Lamivudine, Abacavir, Stavudine

(b). Nonnucleoside reverse transcriptase inhibitors

Nevirapin, Efavirenz, Delavirdine

(c). Protease inhibitors

Amprenavir, Ritonavir, Indinavir, Lopinavir, Nelfinavir

2. Anti-Influenza virus

Amantadine, Rimantadine

3. Nonselective antiviral drugs

Lamivudine, Adefovir dipivoxil, Ribavirin.[8]

ANTITUBERCULOSIS DRUGS

It is medicines used to treat tuberculosis, an infectious disease that can affect the lungs and other organs. Tuberculosis is a disease caused by Mycobacterium tubercular, a bacterium that is passed between people through the air. The disease can be cured with proper drug therapy, but because the bacteria may become resistant to any single drug, combinations of antituberculosis drugs are used to treat tuberculosis (TB) are normally required for effective treatment. At the start of the 20th Century, tuberculosis was the most common cause of death in the United States, but was largely eliminated with better living conditions. It is most common in areas of crowding and poor ventilation, such as crowded urban areas and prisons. In some areas, the AIDS epidemic has been accompanied by an increase in the prevalence of tuberculosis.[9] In June 2013, it was reported that shortages were occurring particularly of the paediatric doses used to treat children with TB. In addition to paediatric dosages being in short supply, the central government was also unable to provide sufficient quantities of the TB drugs rifampicin, streptomycin and kanamycin. Some antituberculosis drugs also are used to treat or prevent other infections such as Mycobacterium avium complex (MAC), which causes disease throughout the bodies of people with AIDS or other diseases of the immune system. Antituberculosis drugs are available only with a physician's prescription and come in tablet, capsule, liquid and injectable forms.[10]

KEY POINTS OF TUBERCULOSIS

World TB Day is an opportunity to raise awareness about the burden of tuberculosis (TB) worldwide and the status of TB prevention and control efforts. It is also an opportunity to mobilize political and social commitment for further progress. World Tuberculosis Day, 24 March 2013. Progress towards global targets for reductions in TB cases and deaths in recent years has been impressive: TB mortality has fallen over 40% worldwide since 1990, and incidence is declining. New TB tools such as rapid diagnostics are helping transform response to the disease. To eliminate the potential zoonotic sources of TB, pasteurization of milk before marketing and organized goat/sheep abattoirs should be made mandatory under law; where milk samples and carcasses can be routinely tested/examined for TB; and the cause of TB possibly traced to the infected herds. Vaccination of our livestock against TB and routine screening of livestock (e.g., on a yearly basis at the farms and also at the animal fairs) should be made mandatory. Our fight against TB will be incomplete without considering this zoonotic aspect of this deadly disease.[11, 12]

But the global burden remains huge and significant challenges persist:

- In 2011, there were an estimated 8.7 million new cases of TB and 1.4 million people died from TB;
- Over 95% of TB deaths occur in low- and middle-income countries. Poor communities and vulnerable groups are most affected, but this airborne disease is a risk to all;
- TB is among the top three causes of death for women aged 15 to 44;
- There were an estimated 0.5 million cases and 64 000 deaths among children in 2011;
- There is slow progress in tackling multi-drug resistant TB (MDR-TB): with 60 000 patients enrolled in treatment by end 2011 – this is only one in five of the notified TB patients estimated to have MDR-TB;
- Provision of antiretroviral therapy (ART) for TB patients known to be living with HIV needs to double to meet WHO's recommendation that all TB patients living with HIV promptly receive ART; and
- The African and European regions are not on track to meet the target of halving deaths from TB between 1990 and 2015. [13, 14]

CLASSIFICATION

Anti-TB drugs can be divided into

First line

These drugs have high antitubercular efficacy as well as low toxicity are used routinely. Ex.

1. Isoniazid (H),
2. Rifampin (R),
3. Prazinamide (Z),
4. Ethambutol (E),
5. Streptomycin (S)

Second line

These drugs have either low antitubercular efficacy or high toxicity or both are used in special circumstance only. Ex.

1. Thiacetazone(Tzn)
2. Paraaminosalicyclic acid (PAS)
3. Ethionamide (Etm)
4. Cycloserine (Cys)
5. Kanamycine
6. Amikacin (Am)
7. Capreomycine [8]

RESEARCH METHODOLOGY

THE STUDY

The present investigation is a study of various brands of drugs of some categories with a survey being used as method for collecting data to complete the study.

SAMPLING DESIGN

1. Sample population: population included medical store
2. Sampling Frame: since the data collected through personal contact the sample frame was the different medical store.
3. Sampling element: individual respondence was the sampling element.
4. Sampling size: medical stores of Gwalior region

TOOLS USED FOR DATA COLLECTION

Self design oral questionnaire was administered for evaluating a study of various brands of drugs of some categories.

RESULTS

ANTIVIRAL PRODUCT

S. N.	Drugs	Brands	Company name	Strength	Dosage Form
1.	Zidovudine	1. Duovir	Cipla	300mg	Tab
		2. Retrovir	GSK	100mg	Cap.
		3. Viro-Z	Ranbaxy	100mg	Tab.
		4. Zidovir	Cipla	100mg	Cap.
		5. Zidomax	Alkem	300 & 100mg	Tab. & Cap.
		6. Zidine 100	Emcure	1oomg	Cap.
		7. ZVD	McNeil & Argus	1oo & 300mg	Tab.
		8. Zido-H	Hetero HC	1oo & 300mg	Cap.
		9. Zilion	Cadila	300mg	Tab.
		10. Zydowin	Zydus (Biogen)	100 & 300mg	Cap.
2.	Acyclovir	1. Acivir DT	Cipla	200mg	Tab.
		2. Axovir	Samarth pharma	250mg	Inj.
		3. Herpesafe DT	Alkem	200mg	Tab.
		4. Herpex	Torrent	800mg	Tab.
		5. Ocurax	Innova	400mg	Tab.
		6. Ocuvir	FDC	200mg	Tab.
		7. Optiviral	Entod	200mg	Tab.
		8. Zovirex	Glaxo smithkline	400mg/5ml	Susp.
		9. Zoylex DT	Cronus	200mg	Tab.
		10. Cyclovir	Cadila-H	5gm	Cream
3.	Abacavir	1. Abamune	Cipla	300mg	Tab.
		2. Abec	Emcure	300mg	Tab.
		3. Abavir	Genx	300mg	Tab.
		4. Virol	Ranbaxy	300mg	Tab.
		5.Abcavir	Taj pharma	300mg	Tab.
		6. Synabac	Synmedic lab.	300mg	Tab.
		7. Ziagen	GSK	300mg	Tab.
4.	Lamivudie	1. Hepitec	Glaxo	100mg	Tab.
		2. Ladiwin	Zydus vaccicare	150mg	Tab.
		3. Lamda	Le Sante	150mg	Tab.
		4. Lamidac	German Remedies	100mg	Tab.
		5.Lamivir	Cipla	150mg/5ml	Syr.
		6. Lamuvid	Nicholas Piramal	150mg	Tab.
		7. Retrolam	Cytomed (alkem)	150mg	Tab.
		8. Shanvudin	Shantha Biotech	100mg	Tab.
		9. Virolam	Croslands	100mg	Tab.
5.	Efavirenz	1. Efavir	Cipla	200mg	Cap.
		2. effervin	Croslands	200 & 600mg	Cap.
		3. evirenz	Cytomed	200mg	Cap.
		4. Retrocare	Chemo HC	600mg.	Tab.
		5. Viranz	Aurobindo	200mg	Tab.

ANTITUBERCULOSIS PRODUCT

S. N.	Drugs	Brands	Company name	Strenght	Dosage Form
1.	Ethambutol	1. Albutol	Alkem	800mg	Tab.
		2. Anacox-E	Ajanta pharma	800mg	Tab.
		3. Biobutol	Biochem	800mg	Tab.
		4. Cavibutol	Merind	200mg	Tab.
		5. Combutol	Lupin	800mg	Tab.
		6. Coxytol	Stadmed	800mg	Tab.
		7. Isotol-800	Zee lab.	800mg	Tab.
		8. Themibutol	Themis	800mg	Tab.
		9. Dybitol-800	Dynamic	800mg	Tab.
		10. Mycobutol	Le Sante	800mg	Tab.
2.	Streptomycine	1.Ambistryn S	Abbott Healthcare	1000mg	Inj.
		2. Cipstryn	Cipla	750mg	Inj.
		3. Isos	Neon lab.	750mg	Inj.
		4. Merstrep	Merind Ltd	1000mg	Inj.
		5. Strepto - Mycine	Shalina lab.	5000mg	Inj.
3	Pyrazinamide	1.Comide 750	Chemo Drugs	750mg	Tab.
		2. Gempyra-750	Genetic pharma	750mg	Tab.
		3.P-Zide	Le Sante	750mg	Tab.
		4. Pizamax	Ind Swift	750mg	Tab.
		5. Pyzina	Lupin	750mg	Tab.
		6. Tibimide	Themis	750mg	Tab.
		7. Zypyra	Zydus Cadila	750mg	Tab.
		8. Cavizide	Merind	750mg	Tab.
		9. Ticimide	Themis Medicare	750mg	Tab.
		10. PZA-Ciba	Novartis	750mg	Tab.
4.	Rifampicin	1. Cavidin	Merind	450mg	Tab.
		2. Coxid-450	Aristo	450mg	Cap.
		3. Gocox	IPCA	300mg	Cap.
		4. Rcin	Lupin	450mg	Cap.
		5.Montomycin	Shreya	450mg	Cap.
		6. Ticin	Themis	300mg	Cap.
		7. Tricin	Zee lab.	450mg	Cap.
		8. Rimpacin	Zydus cadila	450mg	Cap.
		9. Rifampila	Albert	300mg	Cap.
		10. Kemorifa	David Chemo drugs	450mg	Cap.
5.	Isoniazid	1. Isonex	Pfizer	100mg	Tab.
		2. Lup-INH	Lupin	300mg	Tab.

DISCUSSION AND CONCLUSION

At the end of our study, we reached on following conclusion Infectious diseases are well known since ancient time to human civilization and put heavy toll on social health as well as healthcare system. Among different infections agents viruses are the most notorious ones. Even in 21st century word, virus creates a panic in well educated society and among healthcare professionals. Our increasing knowledge about viruses, mechanism of their infections and the rapid involvement of novel antiviral strategies and techniques has enabled us to develop various antivirals. Development of antiviral is very costly, complex, risky, tedious, time consuming and multistage process. Inspite of recent development in technology, identification of novel antivirals and stern regulation in quality control measures; till date there is no fool proof treatment (vaccines and drugs) available against viruses and due to viral resistance and/or drug toxicity, the rate of antiviral drugs coming to the market for human

application is very low probably. Moreover, the failure of drugs in human trials is also a common phenomenon that needs to be addressed and worked out. Many new technologies, targets and approaches have emerged that are expected to show promising results but at present have some limitations. As we are able to understand the viruses better, it will be possible to develop effective measures for combating the viral diseases, and the researchers all over the world are trying their best that this time comes soon and we live in the world which is free from viral diseases. At present, current antiviral therapies are restricted to a limited number of viral diseases and emerging viruses are potential threats to humans. Therefore, the development of efficient and cost-effective antivirals against all viruses still remains a challenge. Tuberculosis (TB) is one of the most ancient diseases of mankind and has co-evolved with humans for many thousands of years or perhaps for several million years. Even today in India, two deaths occur every three minutes from TB. Major challenges to control TB in India include poor primary health-care infrastructure in rural areas of many states; unregulated private health care leading to widespread irrational use of first-line and second-line anti-TB drugs; spreading HIV infection; poverty; lack of political will; and, above all, corrupt administration. In India and in other developing countries, local governments should put in and encourage wholehearted efforts for local manufacturing of anti-TB drugs, thus resulting in more efficient monitoring of their manufacturing and quality control standards. Monitoring the quality of products available in the marketplace should involve identifying products that are defective because of poor manufacturing practices; deteriorated because of inadequate distribution and storage; and adulterated, tampered or counterfeit because of vested interests. Working association between physicians; private sector; religious bodies; and other local nonprofit organizations, e.g., Lions Club, Rotary International, should be strengthened for better dissemination of awareness about diagnosis, management and control of this disease. Existing diagnostic laboratories need to be strengthened with routine training/refresher courses for the involved personnel for better utilization of these already scarce resources. Better diagnostic tests for quick screening of this disease at the field level should be developed and made available at the grass-root level. The links between primary health centers and DOTS centers should be strengthened, and special attention should be given to prioritizing the groups which need to be followed first; utilizing human resources of related public health programs, e.g., programs for HIV/malaria; promoting development of new drugs and vaccines against TB; and discouraging the use of homeopathy medicines for treating TB and HIV. In conclusion, the survey measured the availability of a basket of essential medicines. The present survey has shown that while the governments are procuring medicines at a very reasonable price, the availability of medicines was very low. This means that many patients have no option but to go to the private sector where there was generally better availability of generic products but at a higher price. Further investigation is needed to quantify price components. While India has a deserved reputation for being an efficient producer of low-priced generic medicines, much could be done to improve availability in the public sector and to reduce medicine prices in the private sector. The availability of anti-HIV/AIDS medicines were very low in all three sectors surveyed. Treatment regimens for a selection of conditions were affordable for the lowest paid government worker, but a large proportion of the population earns much less.

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