

Zika Virus Vaccine: How Close Are We?

Nitika Sharma^{*1}, Neelam Kumar², Srishti Singh¹, Anuj Jangra¹

1. Junior Resident, Department of Community Medicine, Pt. B D Sharma PGIMS, Rohtak
2. Professor, Department of Community Medicine, Pt. B D Sharma PGIMS, Rohtak.

ABSTRACT

Introduction: Zika virus has been prevalent for a long time but it came to attention recently when it was linked with the development microcephaly in the newborns of pregnant females. It is caused by *Aedes aegypti* mosquito. The spectrum of illness varies from mild illness to Guillain-Barre syndrome. An Indian company has pioneered in the vaccine development against Zika, however, it may take few years to hit the market.

Conclusion: Zika virus disease is seen in the tropical and subtropical regions of world. Integrated vector management and personal protective measures are the key to its prevention.

Keywords: Microcephaly, Prevention, Vaccine, Zika.

INTRODUCTION:

The Zika virus has been around for decades, but its prevalence has exploded since 2014. Zika virus is a mosquito-borne flavivirus that was first identified in

Uganda in 1947 in monkeys through a network that monitored yellow fever. It was later identified in humans in 1952 in Uganda and the United Republic of Tanzania. Zika virus is a mosquito-borne virus transmitted by *Aedes* mosquitoes [1]. The same mosquito also transmits 3 other vector-borne diseases- dengue, chikungunya and yellow fever – across tropical and subtropical regions around the world. Zika virus is primarily transmitted to people through the bite of an infected mosquito from the *Aedes* genus, mainly *Aedes aegypti* in tropical regions. Sexual transmission of Zika virus is also possible. Other modes of transmission such as blood transfusion are being investigated. Infection with Zika virus may be suspected based on symptoms and recent history of travel (e.g. residence in or travel to an area with active Zika virus transmission) [2]. A diagnosis of Zika virus infection can only be confirmed through laboratory tests namely RT-PCR on blood or other body fluids, such as urine, saliva or semen [3].

The virus itself, which is spread by the *Aedes aegypti* mosquito, is believed to cause relatively minor symptoms for adults, including rash, fever, headaches, muscle and joint pains and inflammation of the underside of the eyelid. These symptoms normally last for 2-7 days. However, in pregnant women it is linked to abnormally small heads in their babies (a birth defect called Microcephaly) [2]. As a matter of fact only one in five infected develops these symptoms [4]. However, research from CDC states that the impact of zika virus may be worse than expected for both pregnant and non-pregnant persons. The spectrum of impact includes microcephaly, which is scientifically proven and documented, besides increase in Guillain-Barre syndrome, acute myelitis, meningoencephalitis and acute disseminated encephalomyelitis [2]. The WHO had in February declared the Zika virus outbreak as an “International Public Health Emergency” [5].

Zika virus disease has the potential for further international spread given the wide geographical distribution of the mosquito vector, a lack of immunity among population in newly affected areas and the high volume of international travel. As of now, the disease has not been reported in India [6]. Worldwide, an estimated 2.6

billion people live in areas where the presence of competent mosquito vectors and suitable climatic conditions could support local transmission of Zika virus and the highest numbers of susceptible are in India being 1.2 billion [7].

Given the severity of this infectious disease as new data comes to light, an alarm has been raised among the public health officials around the world and there are also a fair number of drug developers looking into a possible Zika virus cure. India is among the five countries where projects are underway to develop vaccines to fight Zika virus affecting newborns in 38 countries [8].

In this race, Bharat Biotech, a Hyderabad based Indian vaccines and bio-therapeutics manufacturer claims to have made a breakthrough in developing the world’s first vaccine against Zika virus codenamed as ZIKAVAC. According to the MD, Bharat Biotech Ltd., their company is probably the first in the world to file a vaccine candidate patent about a year ago. The company used a live Zika virus, imported officially, to develop two candidate vaccines which are ready for the pre-clinical trials. Bharat Biotech is well ahead of French and Japanese companies that have just announced to start a research for a vaccine [9].

The company was working on potential Zika virus vaccines for the past 18 months since it was declared an IPHE, as it complemented the research into vaccines for Chikungunya and dengue fever both of which are also spread by the *Aedes aegypti* mosquito.

The first vaccine candidate for patent is a recombinant vaccine created through genetic engineering contains the DNA of the Zika virus but not the virus itself ^[8].

The second potential vaccine is “inactivated” and contains whole particles of Zika virus that have been tweaked so that they no longer able to replicate or cause infection but can still bring about an immune response. This vaccine is said to have reached the stage of pre-clinical trials for animals ^[8].

Testing these vaccines on animals is expected to take around five months and after that they will need to be tested in humans to know if they are going to work or not. So there is still a long way ahead before we have an effective Zika virus vaccine on table ^[8].

At present, the consistency in the process of development of vaccines has been achieved at 40 L pilot scale by the company. The company says if the vaccine is approved, it can make upto 1 million doses in 4 months.

The Indian Council of Medical Research (ICMR), the apex body which operates under Health Ministry and oversees clinical trials in the country- says it is still examining the vaccine.

Considering that women of childbearing age and pregnant women are the prime target group for the Zika virus vaccine, safety is considered as the overriding factor in the development of new vaccine for this virus ^[8].

The DNA vaccine (GLS-5700) developed by the U.S-based Inovio Pharmaceuticals and GeneOne Life Science, South Korea that has already been tested on animals is set to enter in the phase 1 of human trials among other vaccine developments ^[10].

Among the other pharmaceuticals working on the development of a vaccine for Zika virus are Inovio pharmaceuticals, NewLink Genetics, Sanofi, GlaxoSmithKline , Intrexon and Cerus ^[11].

Since there is currently no vaccine available to protect against or cure Zika virus infection, the mainstay to avoid the infection is prevention from the mosquito bite. This can be done by wearing clothes (preferably light-coloured) that cover as much of the body as possible; using physical barriers such as window screens or closing doors and windows; sleeping under mosquito nets; and using insect

repellent containing DEET, IR3535 or icaridin. Special attention and help should be given to those who may not be able to protect themselves adequately, such as young children, the sick or elderly ^[2].

It is important to cover, empty or clean potential mosquito breeding sites in and around houses such as buckets, drums, pots, gutters, and used tyres to control the vector breeding ^[2].

Also sexual transmission of virus is possible. The sexual partners of pregnant women, living in or returning from areas where local transmission of Zika virus occurs, should practice safer sex by using condoms or abstain from sexual activity throughout the pregnancy to minimize the risk of transmission. People living in areas where local transmission of Zika virus occurs and people returning from such areas should also practice safer sex or abstain from sexual activity for at least 8 weeks after their return, even if they don't have symptoms ^[2].

However, at this time, there is no evidence that Zika virus is spread to people from contact with animals ^[12].

CONCLUSION:

Zika virus disease is reported in the tropical and subtropical regions of the world. The symptoms are usually mild

but in pregnant females it catches attention as it may become the reason for microcephaly among the new born. Presently there is no vaccine available to tackle this disease. Although pharmaceutical companies are working diligently to develop a vaccine against Zika virus but a successful vaccine may take years to come to the market. So as for now, personal protective measures, vector control and screening of pregnant females in the endemic areas remain the mainstay of prevention.

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Community Medicine, Pt B D Sharma
PGIMS, Rohtak

Third Author: Dr. Srishti Singh is currently pursuing her postgraduate degree in Community Medicine from University of Health Sciences, Rohtak

Fourth Author: Dr. Anuj Jangra is currently pursuing her postgraduate degree in Community Medicine from University of Health Sciences, Rohtak

First Author: Dr. Nitika Sharma is currently pursuing her postgraduate degree in Community Medicine from University of Health Sciences, Rohtak

Second Author: Dr. Neelam Kumar is Professor in the Department of