Diseases That Are Emerging And Re-Emerging: A Recent Update On The Situation In India

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Abstract: Emerging infections are those that have recently appeared in a population or that have existed in the past but are now rapidly extending their global network or prevalence.[1] Re-emerging infections are those that were formerly serious health issues, have drastically improved, but have only lately returned, posing serious health risks.[7] According to reports, some animal reservoirs are the source of around 75% of all known EIDs. Numerous elements, such as human behavior, microbial adaptations, the environment, globalisation, and public health infrastructure, have an impact on the formation of EIDs and REIDs. There should be a comprehensive national policy on infectious diseases that addresses the problems of newly and re-emerging illnesses and spans all pertinent governmental and non-governmental sectors.

Keywords: Emerging , Re-emerging, PCR, ELISA

INTRODUCTION

Emerging infections are those that have recently appeared in a population or that have existed in the past but are now rapidly extending their global network or prevalence. [1] There are three primary kinds of newly emerging viral diseases in India: respiratory viral infections, zoonotic viral infections and bat-borne viral diseases.[2] These viruses have caused the emergence of MERS, influenza (H5N1, H7N9), the Hendra virus, the Nipah virus, and swine flu in the Indian subcontinent.[3] A novel corona virus known as 2019 Novel Coronavirus is linked to an outbreak of viral pneumonia (2019-nCoV) [4]. Some of the most significant EID illnesses, which originated in animals and pose a worldwide pandemic danger as well as significant economic and social costs for humans today, include SARS, the Nipah Virus, and 2019-nCoV. Furthermore, the worldwide health system is severely burdened by the transmission of these illnesses to people.[5] Emerging zoonotic illnesses, particularly the dense accumulation and stifling of natural resources, are placing a rising burden on health systems and the global economy. [6]

Re-emerging infections are those that were formerly serious health issues, have drastically improved, but have only lately returned, posing serious health risks.[7] Examples of arthropod-borne viruses that frequently result in re-emergence illnesses include the West Nile virus, Dengue virus, Zika virus, Yellow Fever virus, Japanese encephalitis virus, Marburg virus, Rift Valley fever virus, Ebola virus, and Lassa fever.

It is now understood that one of the most significant pathways for the emergence of novel infectious illnesses in humans is through zoonotic diseases. According to reports, some animal reservoirs are the source of around 75% of all known EIDs. Several haemorrhagic fevers, Lyme disease, the plague, and influenza of avian or swine origin are examples of zoonotic diseases.[8] Numerous elements, such as human behaviour, microbial adaptations, the environment, globalisation, and public health infrastructure, have an impact on the formation of EIDs and REIDs. Additionally, the majority of these causes may be attributed to population increase, squalor in crowded cities, quick and continuous human interaction with vectors, and reservoirs of microorganisms in the natural environment.[9]

HISTORY & EPIDEMIOLOGY

There have been outbreaks of newly and re-emerging contagious diseases throughout recorded history. Yellow fever was first identified in a man patient in 1927. [10] For instance, there were around 20,000 fatalities between 1986 and 1991. Shortly after Shope succeeded in identifying the swine influenza virus in 1931 [11], the human influenza A virus was discovered. Ferrets were found to have the influenza A virus in 1933 by Wilson Smith and Christopher Andrew. [12] In Hong Kong, the first H5N1 human infection was documented in 1997. In 2003, the H5N1 virus became widespread in a number of countries in Asia, Africa, the Pacific, Europe, and the Middle East, and it is still responsible for poultry outbreaks today. [13] The West Nile Virus, which was first found in a woman in the West Nile region of Uganda in 1937, had periodic outbreaks in Israel, Egypt, India, France, and South Africa from the 1950s through the 1980s. These outbreaks were often accompanied by moderate febrile symptoms. [14–23] In Israel, older people were the target of the first WNV-related neuroinvasive disease (WND) outbreak in 1957. [18, 23].Beginning in the mid-1990s, WNV outbreaks were more frequent, more severe, and more widespread. As a result, epidemics of WNV meningitis and encephalitis that mostly affected adults occurred in 1996 in Bucharest, Romania; 1999 in Volgograd, Russia; and 2000 in Israel.[24-26] The dengue virus was discovered for the first time in 1943 by Ren Kim and Susumu Hotta. The illness, sometimes known as "water poison," was linked to flying insects. Early dengue-like epidemics with a comparable illness trajectory and distribution occurred in the West

Indies and Central America, respectively, as early as 1635 and 1699. [27] In the USA, epidemics started happening more often in the early 20th century after a significant outbreak in Philadelphia in 1780. The latest outbreak occurred in New Orleans in 1945. [27,28] It wasn't until the 20th century that the cause of the virus and its spread through mosquitoes were eventually identified. In 1969, a Yale epidemiologist recognised lassa fever. [29] Following the deaths of two missionary nurses in Lassa Town, Borno State, Nigeria, In 2018, there was an epidemic of LF that affected 18 states. There were 1081 suspected cases and 90 reported fatalities in that year; 317 of the cases and 72 deaths had LF43 as the cause. The year 2019 in Nigeria had 810 instances overall, 167 of which were fatal, the highest case fatality rate (23.3 percent) recorded up to that point. [30,31] The pandemic in 2020 started in the second week of January, and by week 10, there were 855 confirmed cases and 144 fatalities, for a case fatality rate of 16.8% .[31] SARS, or severe acute respiratory syndrome, was the first severe and easily disseminated illness to appear in the twenty-first century. It started in Guangdong Province, China, in 2002, and spread quickly to 46. The World Health Organization (WHO) revealed information from 33 nations on June 26, 2003, seven months later, totalling 8456 cumulative cases and 809 fatalities.[32]

CURRENT SITUATION OF EMERGING AND RE-EMERGING INFECTIONS

38 cases of avian influenza have recently been reported worldwide. On June 23, 2022, five cases of Indian origin were noted in Punjab. Odisha reported two confirmed instances on June 3, 2022. Kerala made a case record on June 2, 2022. Indore reported three instances on May 31, 2022. Two fatalities were recorded, one each from Kerala and Punjab [33–41], with the majority of the victims being Indian.

535,143,050 instances of COVID-19 have been documented as of June 18, 2022, and 6,328,694 fatalities have been reported globally. 43,230,101 confirmed cases and 524, 771 deaths reported from overall India [42]

As of June 14, 2022, ten cases of West Nile fever had been reported globally. As of June 3, 2022, Kerala has reported one case, and nine of these instances in America have been verified. There were also two fatalities in [43, 44] one in Kerala and one in America.There were no cases from the other nations.

Dengue has been verified to have caused 1,371,248 confirmed cases and 849 reported worldwide fatalities as of June 2, 2022. 8278 cases reported with one death from overall India[45]

Table:1 Showing the current outbreak situation of Emerging diseases

Emerging Diseases	Mortality and Morbidity
Avian Influenza	❖ 38 confirmed human cases in total, with 2 fatalities recorded globally in 2022. ❖ **Cases have been reported from Asian Countries:** Out of the 11 instances recorded, 2 were from Odisha, 3 were from Indore, 1 was from Kerala, and 5 were from Punjab in India. ❖ **India has documented two death cases: one from Kerala and one from Punjab** [33-41]
Sars-Cov-2	❖ There have been 535,143,050 instances of COVID- recorded overall, with 6,328,694 fatalities reported globally in 2022. ❖ **A total of 135,192,948 cases from Asian nations have been recorded:** Out of them, India reported 43,230,101 instances, South Korea 18,229,288 cases, Vietnam 10,731,812 cases, Japan 9,032,197 cases, and Iran 7,233,688 cases. ❖ **India has registered 524, 771** ❖ **No death instances in total.**[42]
Monkey Pox	A total 16007 human cases reported globally with 5 fatalities in 2022. ❖ **India has registered 4 cases ,3 cases from Kerala and 1 from Delhi** ❖ **No death instances in total from India** [43,44]

Table 2: Showing the current outbreak situation of Re-emerging diseases

Re-emerging Diseases	Mortality and Morbidity
West Nile Fever	10 confirmed human cases in total, with 2 fatalities recorded globally in 2022. ❖ One instance from Kerala, India, has been reported.

	❖ One death case has been recorded from Kerala, India [45,46]
Dengue Fever	1,371,248 confirmed cases in all, with 849 recorded fatalities worldwide in 2022. ❖ **90,282 instances in all have been recorded from Asia.** Asian countries: India reported 8278 cases, Afghanistan 14 cases, Bangladesh 352 cases, Cambodia 817 cases, China 5 cases, Indonesia 22,331 cases, Laos 342 cases, Malaysia 1361 cases, Maldives 159 cases, Pakistan 25 cases, Philippines 200,57 cases, Singapore 11,674 cases. Thailand reported 1584 instances, Timor Leste reported 4985 cases, Vietnam reported 25694 cases, and Sri Lanka recorded 18,298 cases. ❖ **One Death case have been reported from India.**[47]
Yellow Fever	43 confirmed instances in total, with 9 fatalities recorded internationally in 2022. But there have been no cases of this illness recorded in India to date. [48,49]
Laasa Fever	810 confirmed cases in total, with 160 recorded fatalities worldwide in 2022. But there have been no cases of this illness recorded in India to date. [50-53]

LABORATORY INVESTIGATION: [54-61]

S. No	Sample Type and Procedure	Specimen storage and shipment	Laboratory testing
1	THROAT SWAB Procedure: Swab the tonsillar pillars and posterior pharyngeal wall while holding the tongue out of the way with a tongue depressor. Put the swab into the VTM. Avoid wiping the soft palate and touching the tongue with the swab tip.	After collecting the samples, the specimen should be put in a VTM, maintained at 4 °C, and sent in refrigerant gel packs. If delay or store for longer period such as:- <72 hours:4˚C >72 hours: ≤-70˚C.	1. Isolation of Virus 2.Detection of antigen by Immunofluorescence or Rapid diagnostic kits 3. Molecular method: Polymerase Chain Reaction.
2	NASOPHARYNX GEAL SWAB Procedure: Use a flexible, fine-shafted polyester swab to clean the nasopharynx by inserting it into the nostril. The patient's head should be held slightly back when the swab is inserted straight into the nose. In order to ensure that the swab reaches the posterior pharynx in adults, it must be placed at least 5–6 cm past the base of the nostril and toward the auditory pit. Hold the swab in position for a few seconds. Remove slowly while spinning. Place the swab in the VTM.	After collecting the samples, the specimen should be put in a VTM, maintained at 4 °C, and shipped in refrigeration gel packs. If delay or store for longer period such as: - <72 hours:4˚C >72 hours: ≤-70˚C.	1. Isolation of Virus 2.Detection of antigen by Immunofluorescence or Rapid diagnostic kits 3. Molecular method: Polymerase Chain Reaction.
3	NASOPHARYNGEAL ASPIRATE Procedure Use an aspiration trap; it's easier and safer than swabbing in new-born and young children. Place a silicon catheter in the nose and direct it into the auditory pit to gently suction out secretions.	Specimens should be placed in sterile plastic containers once samples are collected, kept at 4 °C, and sent on refrigerant gel packs. If delay or store for longer period such as: - <72 hours:4˚C >72 hours: ≤-70˚C	1. Isolation of Virus 2.Detection of antigen by Immunofluorescence or Rapid diagnostic kits 3. Molecular method: Polymerase Chain Reaction.

4	NASAL SWAB Procedure: A flexible, fine-shafted polyester swab should be inserted. Swab the nasal mucosa (adults, about 2-3 cm from the nostrils) after moving the tip past the vestibule (anterior nares), then gently spin to collect nasal secretions from the front parts of the turbinate and septal mucosa.	Following sample collection, the specimen should be kept in a VTM at 4 °C and sent in refrigeration gel packs. If there is a prolonged delay or storage, such as:- <72 hours:4˚C >72 hours: ≤-70˚C	1. Isolation of Virus 2.Detection of antigen by Immunofluorescence or Rapid diagnostic kits 3. Molecular method: Polymerase Chain Reaction.
5	WHOLE BLOOD/SERUM Procedure: Venipuncture should be used to obtain a blood sample in an aseptic manner within the serum separator tube.	The proper way to collect samples is in SST Vials, maintain them at 4 °C, and send them in refrigerant gel packs. If there is a prolonged delay or storage, such as:- <72 hours:4˚C for Whole blood >72 hours: ≤-20˚C for separated serum.	Serology by Hemagglutinations and microneutralization
6	BRONCHOALVEOLAR LAVAGE Procedure: Using a bronchoscope collect the BAL in Sterile plastic container	Following sample collection, the specimen must be put in a sterile plastic container, kept at 4 °C, and shipped on refrigeration gel packs. If delayed or kept for a longer time, for as -≤48 hours :4˚C >48hours: -70˚C.	ELISA, PCR
7	CSF Procedure: By performing an aseptic lumbar puncture with a spinal needle between L3 and L4, CSF can be obtained.	Samples should be kept at 4 °C and sent in refrigerant gel packs after being collected. If there is a prolonged delay or storage, such as: - ≤48 hours 4˚C >48hours; -10˚C to 20˚C; ≥1 weeks at -70˚C.	ELISA, PCR
8.	EXUDATES Procedure Swab the exudates from the site with a dry, sterile polyester or Dacron swab. The entire swab should be placed in a sterile container, or the applicator end can be broken off and placed in a 1.5 or 2-mL screw-capped tube with an O-ring.	Samples should be kept at 4 °C and sent in refrigerant gel packs after being collected. If there is a prolonged delay or storage, such as: - ≤48 hours 4˚C >48hours; -10˚C to 20˚C; ≥1 weeks at -70˚C.	RT-PCR, Conventional PCR

VACCINATION AND TREATMENT

The U.S. FDA approved FLUZONE in April 2007, an inactivated quadrivalent vaccine use for treating avian influenza. According to the Centers for Disease Control, neuraminidase inhibitor antivirals such as oseltamivir (Tamiflu), peramivir (Rapivab), or zanamivir (Relenza) are suggested for treating avian influenza infection. The intramuscular method is used to provide this immunisation in a single dosage of 0.7 mL. [62-64]

Molnupiravir and Paxlovid, two oral antiviral medications for COVID-19, have received Emergency Use Authorization (EUA) from the Food and Drug Administration (FDA). The inactivated coronavirus is used to make the WHO-approved BBV152 (covaxin). This vaccination is given as a three-dose, 0.5 ml intramuscular injection (deltoid muscle) and is advised for age groups under 18 years and above. [65] ChAdOx1 (covishield), an adenovirus derivative, this vaccine is suggested for people ages 18 years and above [66]and is administered as a three-dose, 0.5 mL intramuscular injection (deltoid muscle). The components of Sputnik V are recombinant adenovirus particles (Serotype 26). The vaccination is given as a single intramuscular injection of 0.5 ml (deltoid muscle) and is advised for the age range of 18years and above.[67] Pfizer-BioNTech is produced using nucleoside-modified mRNA

that encodes the SARS-CoV-290 viral spike (S) glycoprotein. The vaccination is given as three 0.2 mL intramuscular injections (deltoid muscle) and is advised for children under the age of five. [68,69]

West Nile fever has no particular therapy. There are currently no oral or vaccination options.[70]

There isn't a particular antiviral medication on the market right now. tetravalent, live, and attenuated dengvaxia vaccines. This vaccine, designated.[71] TAK-003, is given in three doses of 0.5 mL each, spaced by six months. It is live, attenuated, and tetravalent. This vaccination is given in two doses of 0.5 ml separated by three months [72].

Yellow fever does not presently have a particular antiviral medication. In order to create the live attenuated vaccine known as YF-VAX, the 17D-204 strain of yellow fever virus was cultured in living chicken embryos devoid of the avian leukosis virus (ALV).[73] supplied as a single injection of 1 dosage (0.5 mL) using the subcutaneous route.[74]

Patients with Lassa fever have been successfully treated with the antiviral medication ribavirin. It has been demonstrated that early in the course of the illness is when it is most effective.[75] There isn't a vaccine for Lassa fever yet, but there are some options in clinical trials, such as INO-4500.[76]

The viral infection that causes monkeypox has no specific cure, but it can be managed. [77] Smallpox vaccination, cidofovir, ST-246, and vaccinia immune globulin (VIG) can all help to prevent this pandemic. [77] Tecovirimat (ST-246) and Vaccinia Immune Globulin Intravenous (VIGIV) are two therapies.[78]

JYNNEOS, also known as IMVAMUNE, IMVANEX, and MVA, is a live vaccine derived from the attenuated, non-replicating orthopox virus strain Modified Vaccinia Ankara-Bavarian Nordic (MVA-BN).[78] The FDA has approved this vaccination in September 2019. It is recommended for individuals 18 years of age and older who have been determined to be at a high risk of developing the disease in order to avoid smallpox and monkeypox illness.[79] JYNNEOS is administered subcutaneously in two doses separated by 28 days. [79]

The FDA approved ACAM2000, a live vaccinia virus vaccine, in August 2007. [80] The CDC-held Emergency Access Investigational New Drug Protocol enables usage during the monkeypox epidemic.[80] For patients who have been determined to be at a high risk for contracting the disease, ACAM2000 is approved for active vaccination against smallpox sickness. Using a multiple puncture technique, this vaccine is given percutaneously in a single dose. [80] The JYNNEOS vaccine carries no risk of accidental inoculation or autoinoculation (i.e., ocular infections), but the ACAM2000 vaccination carries a significant risk of accidental inoculation and autoinoculation (i.e., ocular infections). [80]

The FDA has approved TECOVIRIMAT, an antiviral drug, to treat human smallpox disease in adults and children who weigh at least 3 kg. It is also known as TPOXX or ST-246 for people who have been shown to be at a high risk for getting the disease. [81] The FDA approved both the oral capsule and IV formulations in July 2018 and May 2022, respectively. It permits pediatric patients who weigh less than 13 kg to open an oral capsule and mix the contents with liquid or soft food.[81]

VACCINIA IMMUNE GLOBULIN INTRAVENOUS (VIGIV) has been approved by the FDA for the treatment of vaccinia vaccination complications such as eczema vaccinatum, progressive vaccinia, severe generalized vaccinia, vaccinia infections in people with skin conditions, and vaccinia virus-related aberrant infections. [82]

CONTROLLING STRATEGIES

- Considering the ecosystem of the illness within the framework of "one health".
- Developing or improving monitoring methods to better reflect the relevant national and global system of emerging and re-emerging infections.
- Preventative measures should be implemented to make it easier to identify infectious disease outbreaks of major concern globally.[83]

CONCLUSION

Severe diseases caused by infections that are developing or redeveloping raise the risk of morbidity and mortality. In order to treat and eradicate infections, several antiviral drugs and vaccines are currently being researched. It is challenging to forecast, let alone control, infectious illnesses that are developing or reemerging. India is a large and populous country, yet the threat posed by new illnesses is still very real and immediate. A genuine answer must tackle the issue from a systems perspective. There should be a comprehensive national policy on infectious diseases that addresses the problems of newly and re-emerging illnesses and spans all pertinent governmental and non-governmental sectors.

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