Human-Induced Disease

Why in news?

The study "A meta-analysis on global change drivers and the risk of infectious disease," published in Nature, provides a comprehensive look at how human-induced global changes impact the spread of infectious diseases across the globe.

What are the key highlights of the study?

- **Spike in disease outbreak**- Human-induced environmental changes are spiking the risk of disease outbreaks.
- **Human induced global changes**- As per the study biodiversity loss, introduction of non-native species, climate change, and chemical pollution are the leading drivers of disease spread not just among humans but also plants and animals.
- **Biodiversity loss-** It emerged as the most significant driver of disease spread.
- **Dilution effect hypothesis**- The study supports the dilution effect hypothesis, as biodiversity diminishes the prevalence of common host species increases, escalating the risk of disease outbreaks.

  The 'dilution effect' hypothesis suggests that the net effects of biodiversity (including host and non-host species) reduce the risk of certain diseases in ecological communities

- **Rise in Lyme disease**- In US, the reduction in larger mammals due to habitat destruction has led to an increase in white-footed mice which are prolific carriers of the disease.
- **Climate change**- It affects the distribution and behaviour of various species, often forcing them into new areas where they encounter different species and pathogens potentially leading to new outbreaks.
- **Migration pattern**- The altered migration patterns due to climate change can expose species to new areas and pathogens.
- **Mosquito borne diseases-** This dynamic in climate change is particularly evident in the altered distribution patterns of mosquitos and the spread of diseases like *malaria and dengue*.
- **Chemical pollution**- Pollution can weaken the immune system of various species, making them more susceptible to infections. Pollutants can create environment that facilitate the proliferation of certain pathogens.
- **Introduction of non-native species**- It can bring along new pathogens, leading to outbreaks in previously unaffected regions.
  - For example- The *Asian tiger mosquito's* arrival in Europe has introduced diseases like dengue and chikungunya.

- **Habitat loss-** When a habitat is no longer able to a particular species, or group of species it appears to reduce the disease spread.
- **Urbanization-** The reason of habitat loss could be the rapid pace of urbanisation, which reduces habitat for wild hosts and parasites, and urban areas with better sanitation and health infrastructure can mitigate disease transmission.
- **Limitations-** The study primarily examined individual global change drivers, but in reality, these factors often interact.
- For instance, climate change and chemical pollution can jointly lead to habitat changes and biodiversity loss, these combined effects can significantly impact disease spread.
- **Future research**- To understand disease dynamics comprehensively, future research should explore how these factors interact.
- Researchers need to investigate whether these interactions add, subtract, or multiply the risk of infectious disease outbreaks.

What lies ahead?

- Future research needs to explore interactions among the global change drivers to understand their combined impact on disease dynamics comprehensively.
- Policymakers and public health officials should consider environmental factors in their strategies to prevent and respond to disease outbreaks.

Quick facts

Dengue
• Dengue (break-bone fever) is a viral infection and is the world's fastest-growing vector borne disease. • **Caused by** – Dengue virus (DENV), a RNA virus • **Vector** - Aedes aegypti mosquito (which also spreads Chikungunya and Zika virus) • **Treatment** - No specific treatment but early detection and access to proper medical care greatly lower fatality rates of severe dengue. • **Vaccines –** Dengvaxia and Qdenga • **Dengvaxia** –It is the 1st vaccine for dengue to receive a nod in 2015. It has been licensed in 20 countries but not licensed in India.
Malaria
• **Caused by**- Plasmodium parasite • **Vector**-It is usually transmitted by the bite of infected *female Anopheles mosquitoes*. • **Species**- The severity of malaria varies based on the species of Plasmodium – Plasmodium falciparum and Plasmodium vivax are fatal • It is both *preventable and curable*.

Reference

Indian Express- Environmental changes disease outbreak

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