Member experience on prevention and control for Vector Borne Diseases: Bangladesh

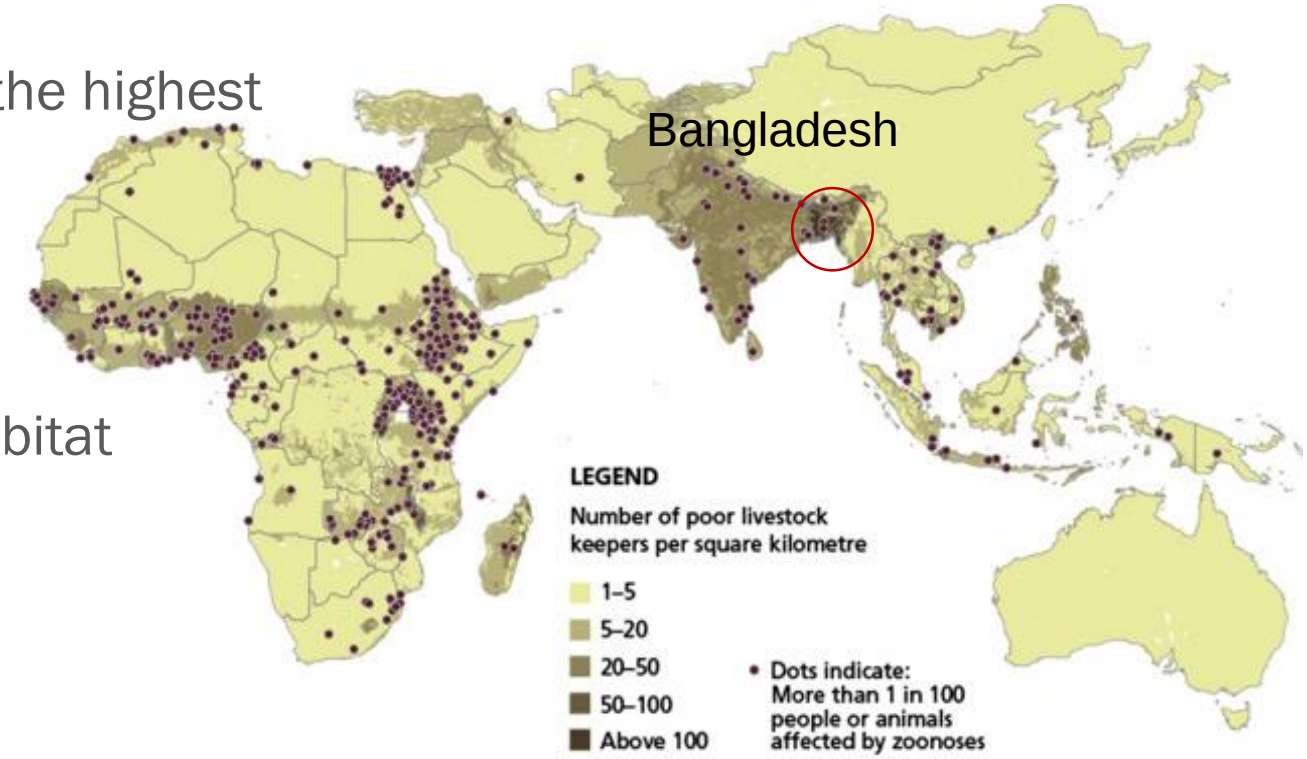
Dr. Abdul Aziz Al Mamun
Director, Central Veterinary Hospital(CVH)

19 – 20 September 2024
Tokyo, Japan

World Organisation for Animal Health
Founded as OIE

Bangladesh venerable to emerging, reemerging and zoonotic diseases

- Bangladesh is in the eastern part of South Asia
- The highest population density, along with the highest livestock and poultry density, in the world.
- Hot spots for EIDs and rEIDs
- People are exceptionally close to animal habitat
- Most fragile ecosystems



Major Vector borne diseases(VBDs) in Bangladesh

Disease	Primary implications(host)	Distribution
Dengue fever	Human	Urban areas
Lumpy Skin Diseases	Animal(cattle and buffalo)	All over the countries
Hemoprotozon infection (e.g. Babesia, anaplasma,)	Cattle	Northern districts

Other neglected VBDs
Lesmaniasis(kala azar)
Malaraia, Chikungunya, Japanese encephalitis

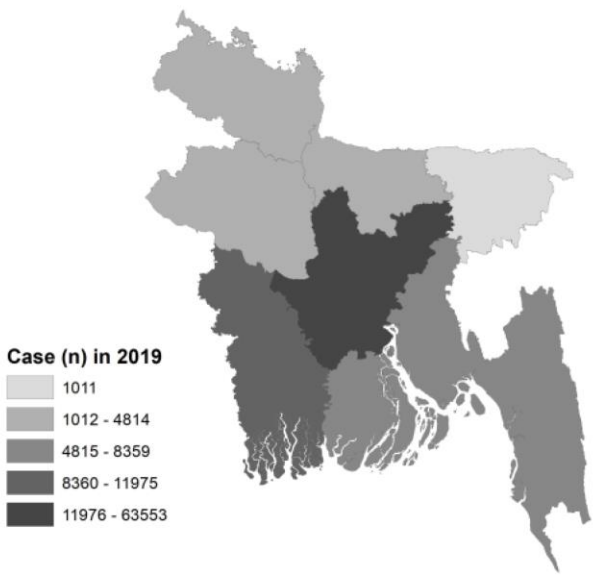
Dengue fever

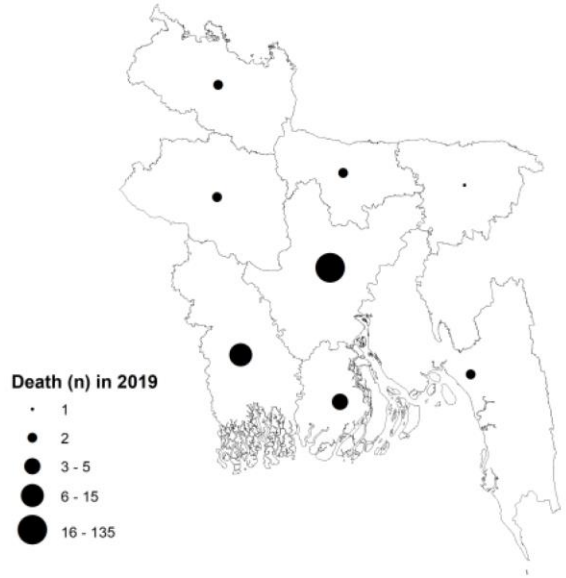
- Dengue is a public health problem in many tropical and subtropical countries even in Bangladesh particularly in urban and peri-urban areas.
- Population growth, high population density, unplanned rapid urbanization and construction, climate change, absence of reliable piped water, and ineffective vector control strategies are the contributing factors for dengue occurrence
- The rapid global spread of dengue is also associated with increased human mobility through air travel
- Seventy five percent of the global dengue burden lies in Southeast Asia and the Western Pacific region.

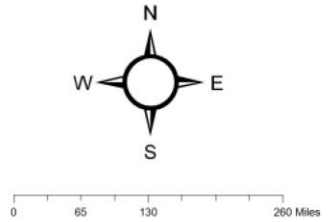
Dengue fever (..cont'd)

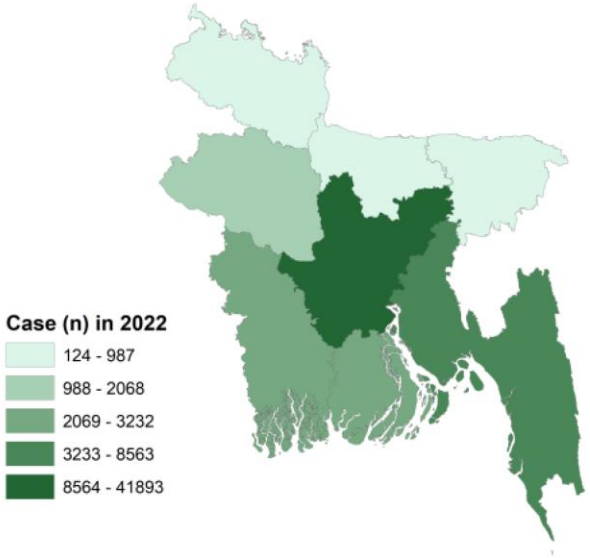
- The first dengue outbreak in Bangladesh was reported in 1964 in East Pakistan
- The first official dengue outbreak in Bangladesh occurred in 2000, with 5,551 cases and 93 deaths reported.
- As of 7th November 2023, **283,593 dengue cases** (40 %-women and 17% 0-15 yrs) with **1,425 deaths** (57%- female, 10%-15 years old) recorded.
- Bangladesh encountered the deadliest outbreak of dengue in 2023/24 once largely limited to Dhaka, spreads countrywide as higher rainfall and heat lead to fivefold rise in cases.
- Recent major outbreaks are found to be associated with the emergence of serotype DENV-3, which was undetected for a long time in this territory.
- Consequently, changes in serotypes might be attributed to increased severity in clinical manifestation in recent years.

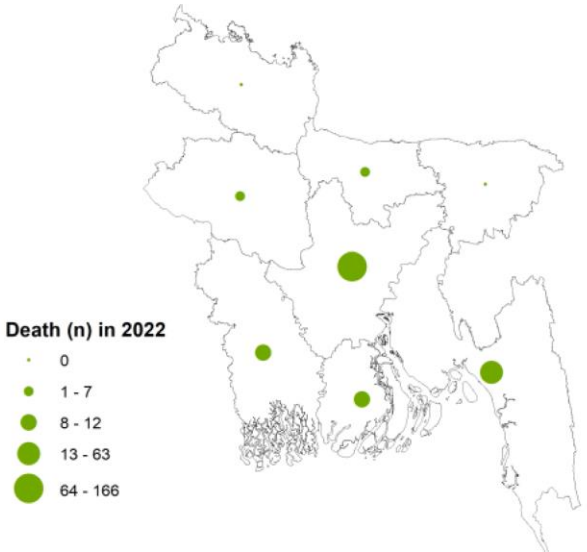
Dengue case and dengue-related death reported in 2019 and 2022 in different divisions of Bangladesh







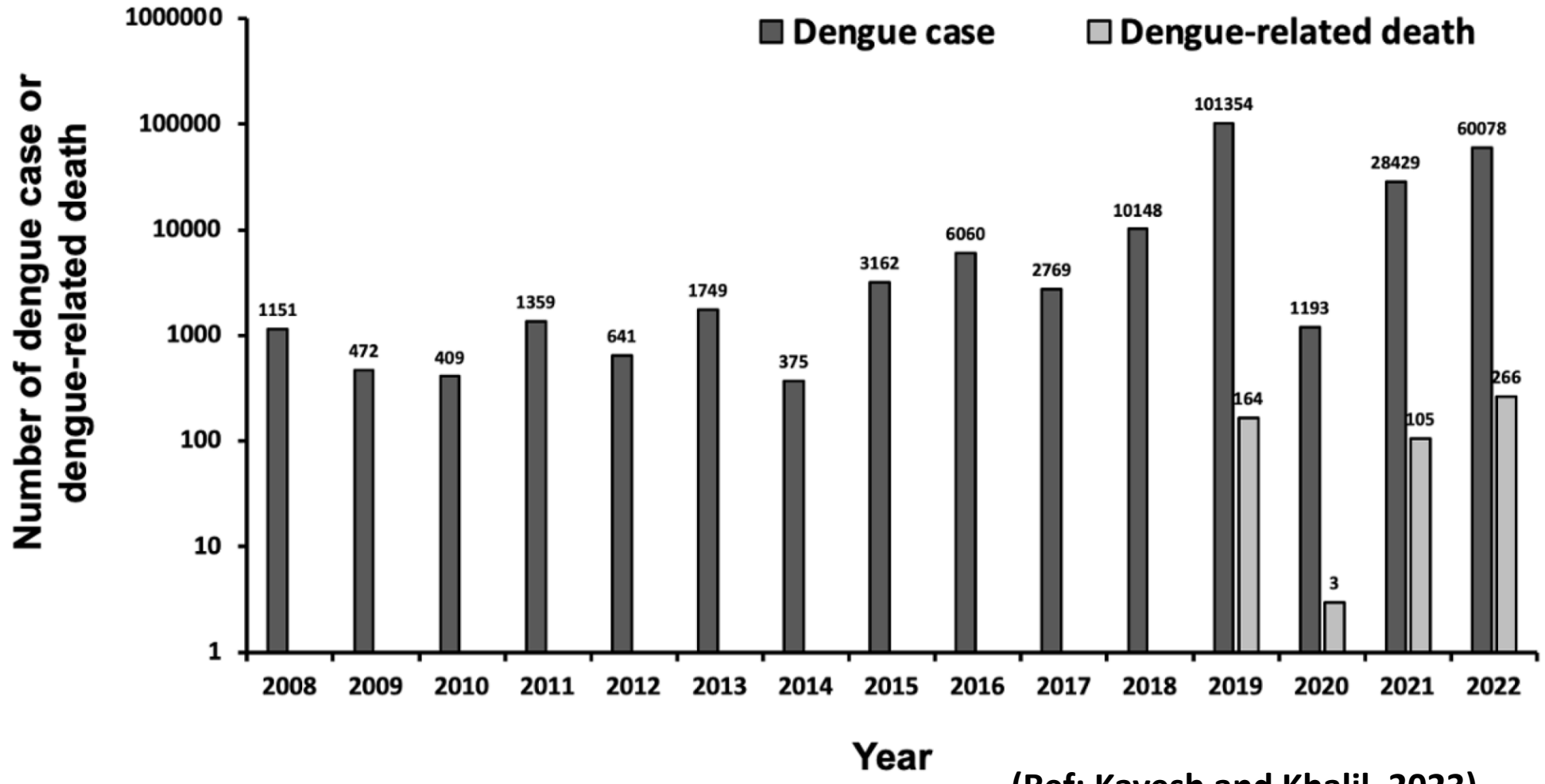




(Ref: Kayesh and Khalil, 2023)

World Organisation for Animal Health
Founded as OIE

Dengue case or dengue related death by year (2008 to 2022)

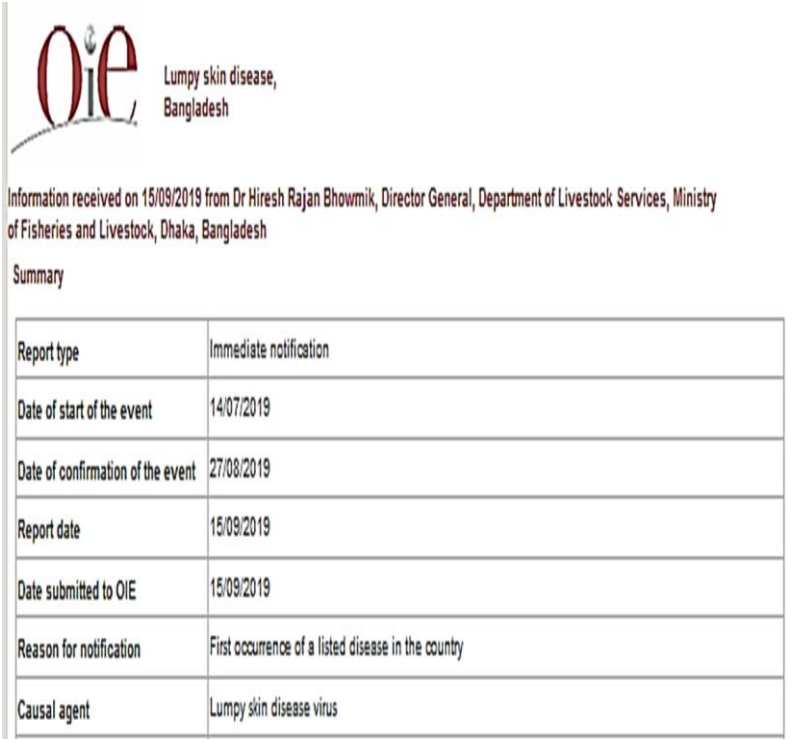


(Ref: Kayesh and Khalil, 2023)

World Organisation for Animal Health
Founded as OIE

Lumpy Skin Disease

- Lumpy skin Disease (LSD) is vector borne, devastating transboundary viral disease of all aged of cattle
- During the wet summer and autumn months, blood-feeding insects emerge in large numbers, leading to a high prevalence of disease.
- The disease was first identified in mid 2019 in Bangladesh
- Bangladesh first notified on presence of LSD on15 September 2019 to the WOAH.
- Later, the occurrence of the LSD confirmed in throughout the country.



Lumpy skin disease, Bangladesh

Information received on 15/09/2019 from Dr Hiresh Rajan Bhowmik, Director General, Department of Livestock Services, Ministry of Fisheries and Livestock, Dhaka, Bangladesh

Summary

Report type	Immediate notification
Date of start of the event	14/07/2019
Date of confirmation of the event	27/08/2019
Report date	15/09/2019
Date submitted to OIE	15/09/2019
Reason for notification	First occurrence of a listed disease in the country
Causal agent	Lumpy skin disease virus

Susceptible animal populations

Bangladesh has 24.86 million cattle and 1.52 million buffalo

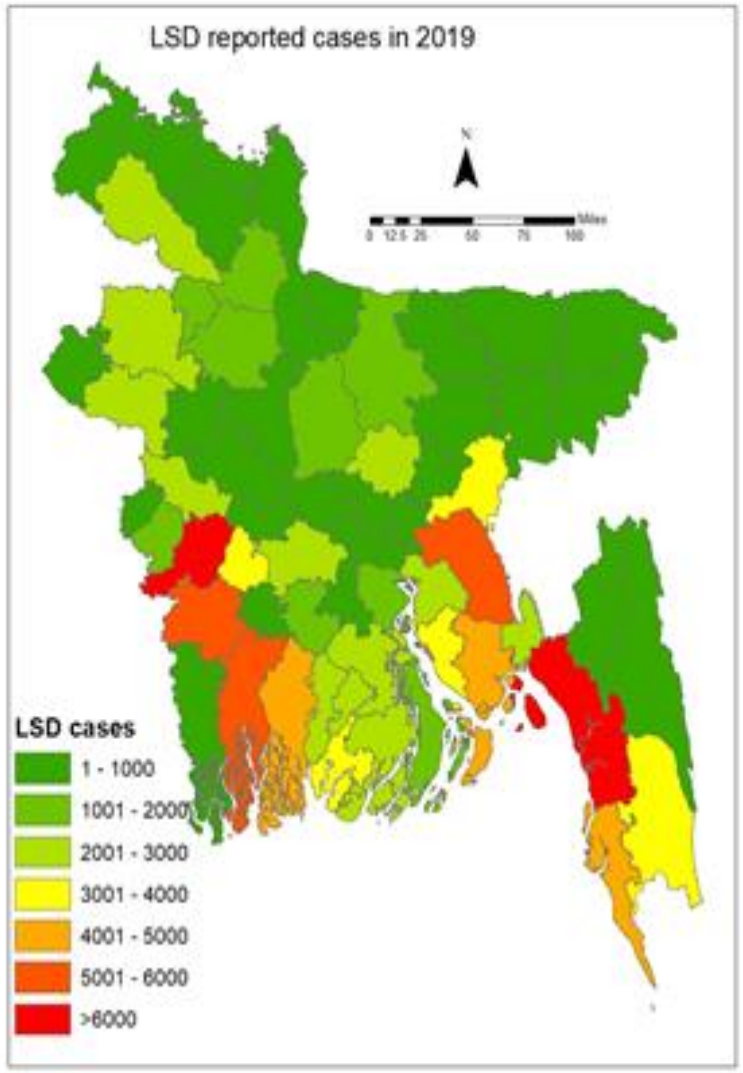
Both species are susceptible to LSDV

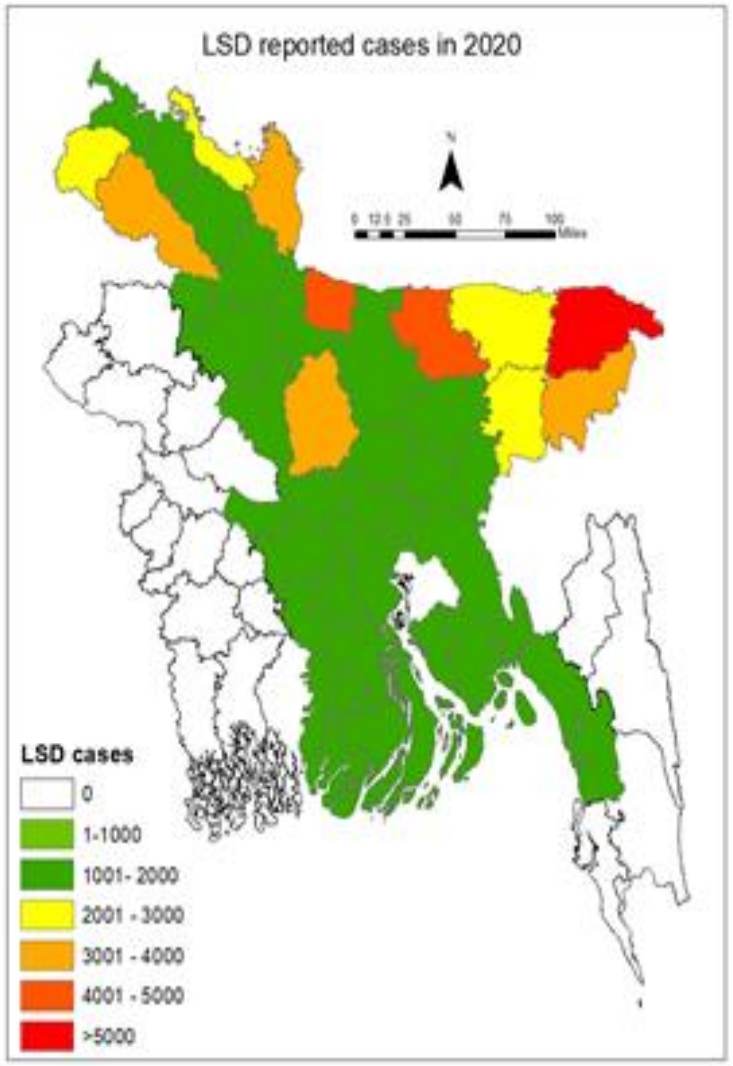
Other domestic ruminants like sheep, goat etc. are not susceptible

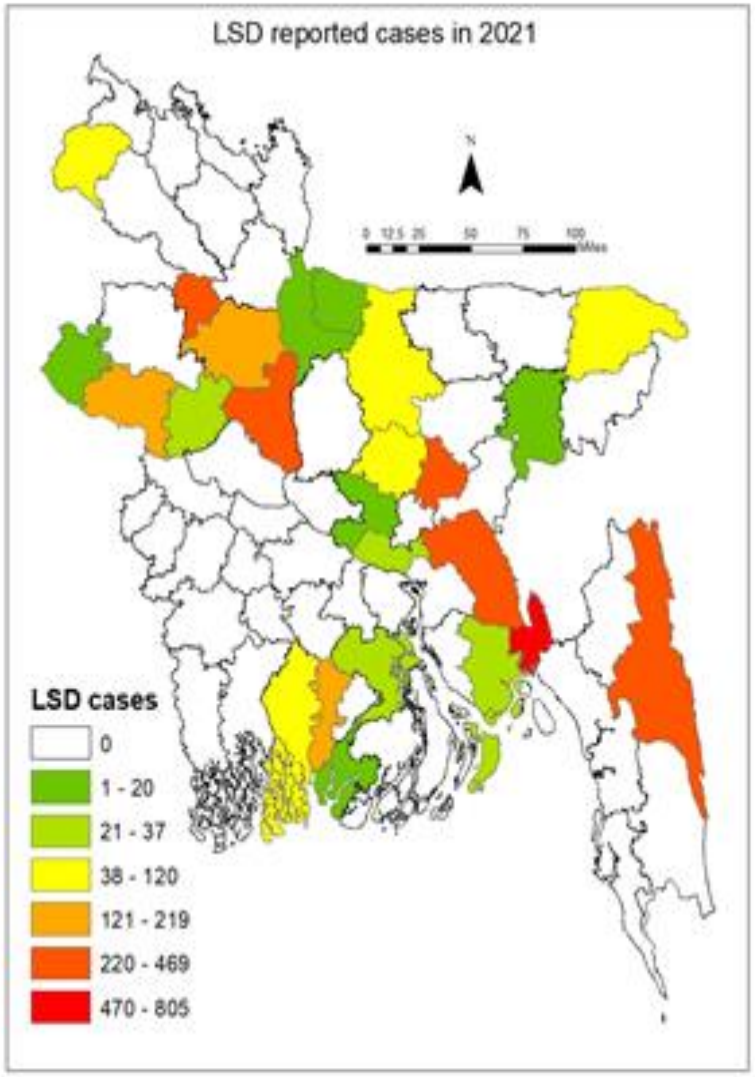
Impala, giraffe, blue wildebeest, African Buffalo, common eland, kudu can show clinical disease with infection with LSDV

Fig. LSD infected a crossbred calf and an indigenous cow

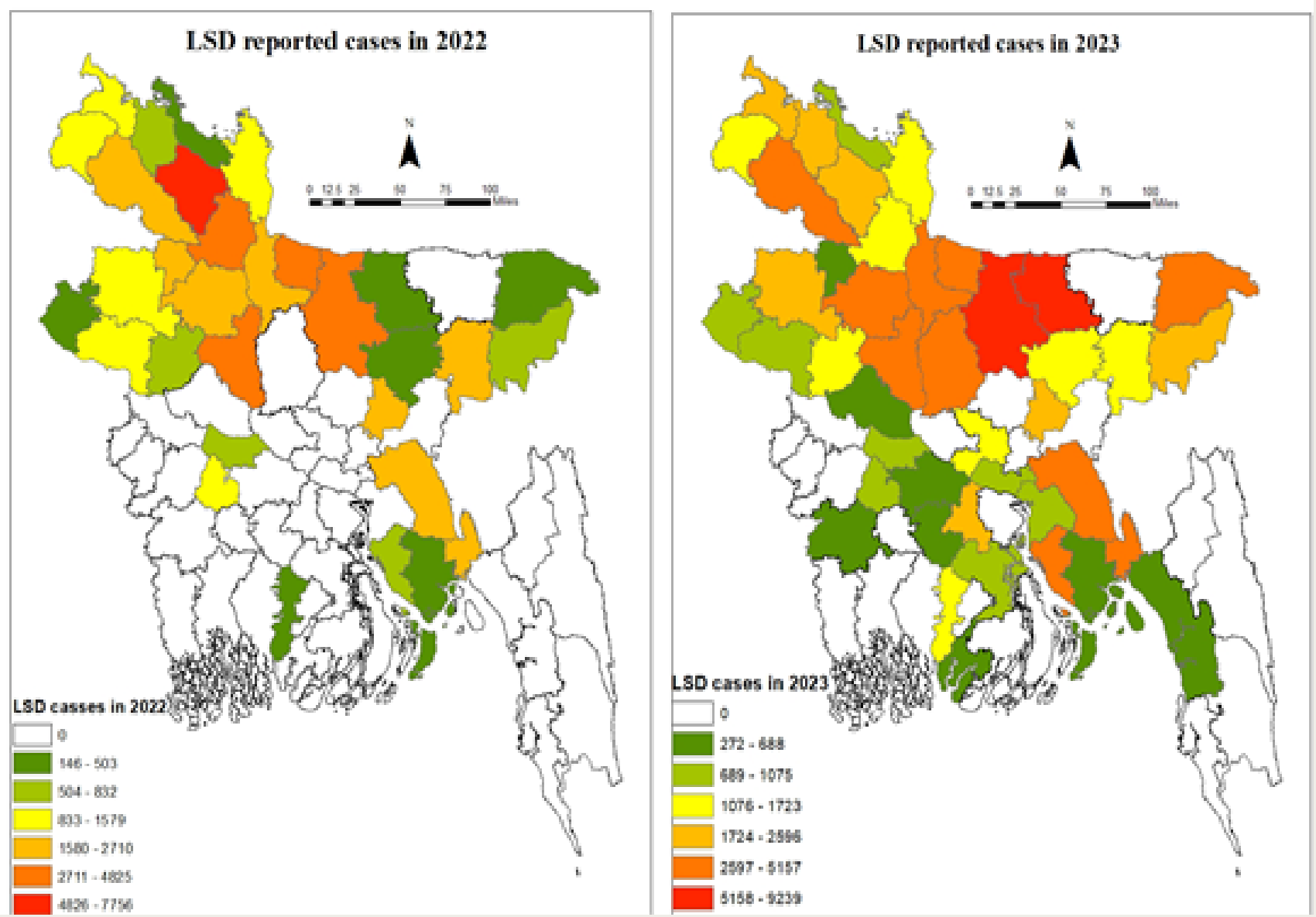
Spatial distribution of reported LSD cases in Bangladesh (2019-2021)



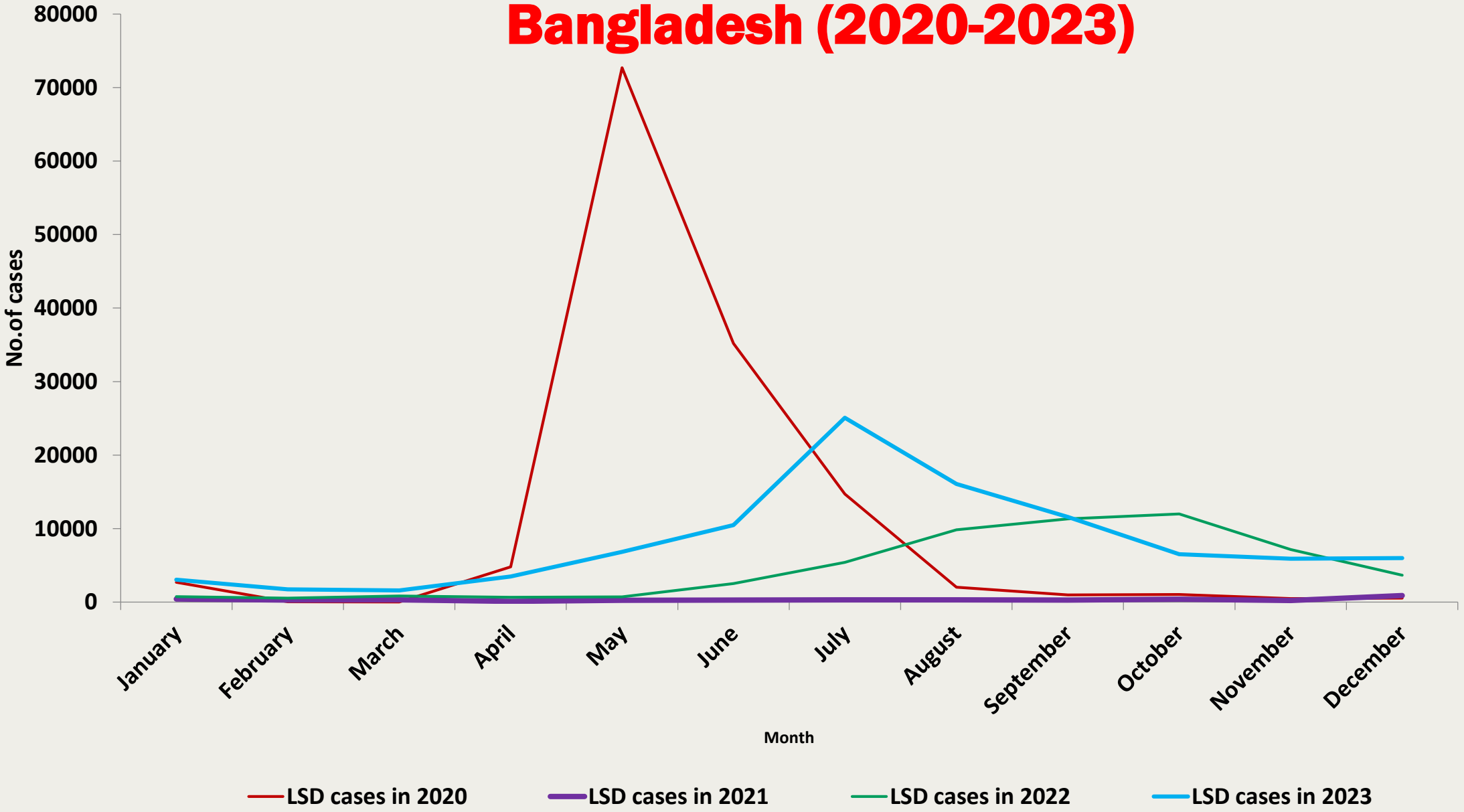




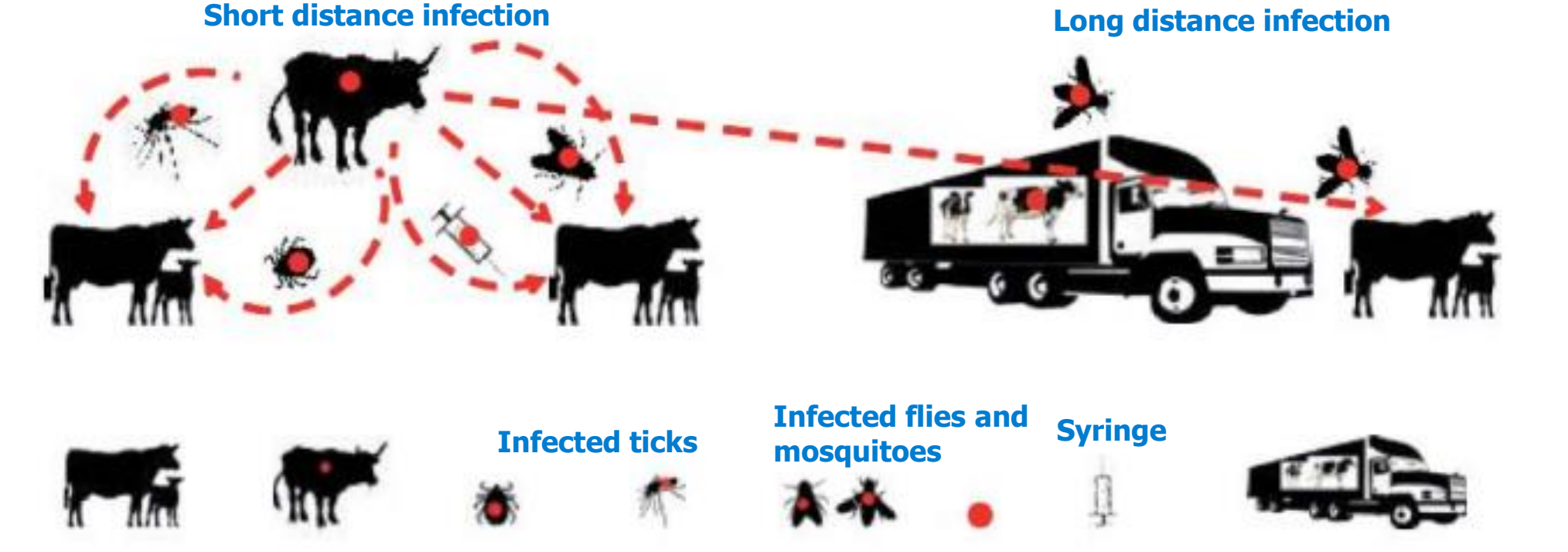
Spatial distribution of reported LSD ..... (2022-23) (Cont'd)



Temporal distribution of reported LSD cases in Bangladesh (2020-2023)



Mode of transmission... (cont'd)



Hemoprotozoa infection

- Hemoprotozoan infection is a major health hazards in livestock across tropical regions even in Bangladesh
- Transmitted primarily by ticks
- As a tropical country, Bangladesh's livestock are severely affected by hemoprotozoan infections such as: *Babesia spp*. (19%), *Anaplasma spp.* (43%) and *Theileria spp*. (33%) (Bary et al., 2018).

Prevalence in Cattle:

- Cross-breed cattle show significantly increased susceptibility compared to indigenous breeds (Bary et al., 2018).
- High-yielding cross-breed cattle are more susceptible (50%)
- Indigenous cattle are less susceptible (22%)
- Blood protozoa infestation spikes during the summer season, leading to increased cases in Bangladesh cattle (Bary et al., 2018).
- *Boophilus microplus* (92%) and *Amblyomma testudinarium* (21.6%) and two species of blood protozoa like *Babesia bigemina* (16.63%) and *Anaplasma marginale* (14.94%) (Mohanta et al. (2011)

Disease diagnosis: Dengue

Dengue is challenging to diagnose as it is sometimes misdiagnosed by influenza, typhoid, malaria, or Zika.

Ministry of Health and Family Welfare provides a cheap confirmatory testing system in the health care centers for early diagnosis and proper treatment to reduce case fatalities at upazila (subdistrict) level hospitals

Rapid confirmatory tests, such as DENV NS1 antigen detection tools are available

Dengue serotyping has been conducted.

A total of 184 000 non-structural protein (NS1) diagnostic kits have been distributed to all Upazila health complexes, district hospitals and medical college hospitals.

UNICEF delivered 15,553 combo dengue test kit boxes for 155,530 tests

Surveillance: Dengue

- Officially initiated the hospital-based dengue surveillance system during the first major outbreak in 2000, where all suspected, probable, and confirmed cases were considered (Sharmin et al., 2015).
- The case definition was updated in 2010 to include only serologically confirmed cases in the surveillance system.
- The surveillance system was mostly Dhaka city-based until the 2019 outbreak, when the DGHS systematically started collecting district-wise (64) dengue cases.
- In Dhaka city, only 50 hospitals (17 public and 33 private) out of several hundred hospitals/clinics are assigned to report dengue cases to the current surveillance system.

Disease diagnosis: Lumpy skin disease

- Based on clinical features of the diseases
- Central disease investigation laboratory(CDIL) has the advance level of competency for diagnosis the LSD clinical samples through RT-PCR
- Bangladesh Livestock Research Institute(BLRI), Savar, Dhaka has advance level capacity of LSD disease diagnosis and research(vaccine development).

Surveillance for LSD and memoprotozoa

- Recently web-based disease reporting system(passive surveillance) called Bangladesh Animal Health Intelligence Service (BAHIS)
- This system been developed to replace the paper-based disease reporting system.
- Around 60% subdistricts utilize this system.

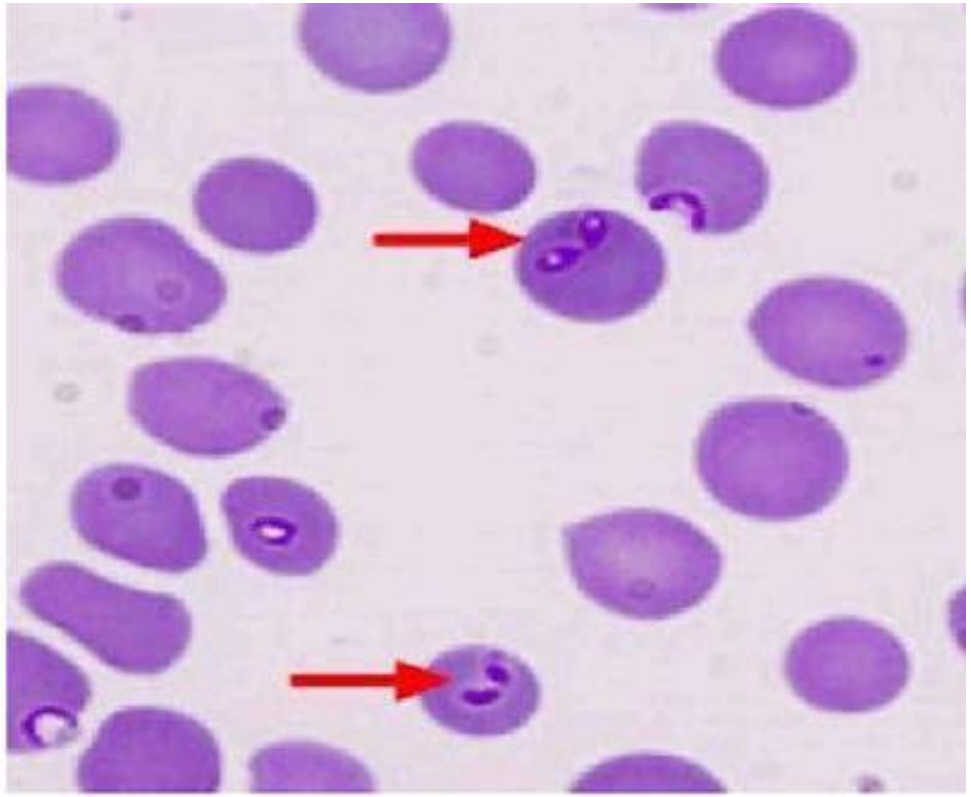
- FAO-ECTAD funded “Effectiveness of a pilot vaccination programme against Lumpy skin disease (LSD) in selected areas of Bangladesh” was carried out
- Active surveillance was conducted for 12 months (February 2021-January 2022) in both vaccinated and unvaccinated areas.

Passive surveillance

- Upazila Veterinary Hospital monthly report the surveillance data → districts → divisions → Epidemiology Unit of the Department of Livestock Service (DLS) collect and analysis.

Disease diagnosis: Hemoprotozoa infection

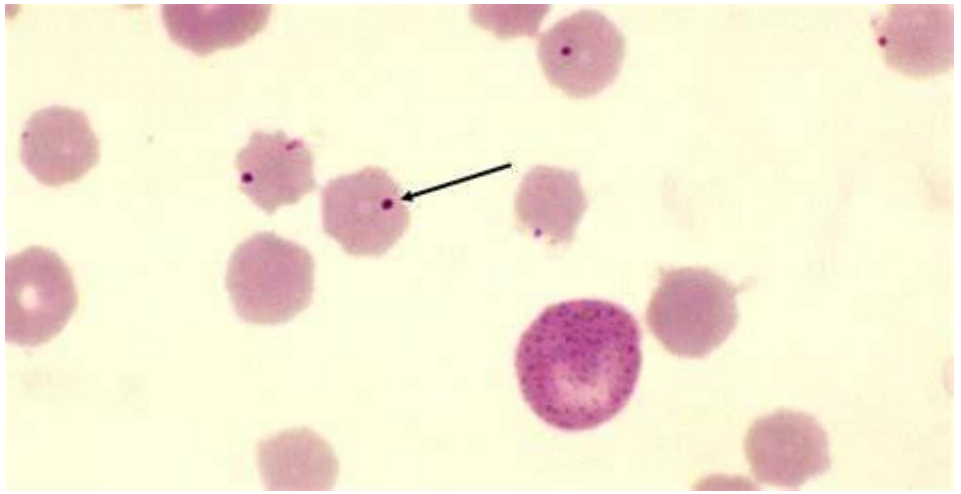
- Based on clinical features the diseases is diagnosed (fever(41-42 °C), red urine, diarrhoea, increase pulse rate.
- Blood smears prepared from collected peripheral blood are examined under a microscope.
- Detection of parasites can be accomplished by using Giemsa-stained blood smears



Babesia parasites inside red blood cells stained with Giemsa stain

Disease diagnosis: Hemoprotozoa infection-Anaplasma

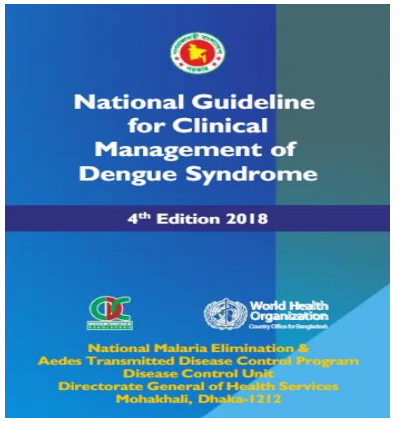
- Based on clinical features the diseases is diagnosed (severe anemia, fever, weight loss, decreased milk production, and, in some cases, death)
- Blood smears collected from peripheral blood and examined under a microscope.
- Blood smears are often used to identify the Anaplasma organisms in red blood cells.
- Anaplasma appears as tiny, round inclusions located near the margin of the red blood cells



Anaplasma inside red blood cells stained with Giemsa stain

Prevention and control measures (Dengue)

- Pocket guidelines for dengue case management & National guideline for clinical case management of Dengue syndrome developed and disseminated
- The Directorate General of Health Services (DGHS) has taken the following actions:
  - Health Emergency Operation Centre and Control Room at DGHS
  - Repurposed six COVID-19 hospitals in Dhaka for dengue case management.
  - Established dedicated dengue wards/corners in Medical College hospitals.
  - Activated Control Rooms in district and Medical College hospitals for local updates and awareness.
  - Conducted capacity-building for clinical case management, training 250 doctors and 300 nurses.
  - District and Upazila(subdistrict) hospitals equipped with Dengue testing and treatment facilities
- WHO distributed a total of 284 000 non-structural protein (NS1) diagnostic kits to all the Upazila health complexes
- UNICEF distributed 15,553 combo dengue test kit boxes for 155,530 tests

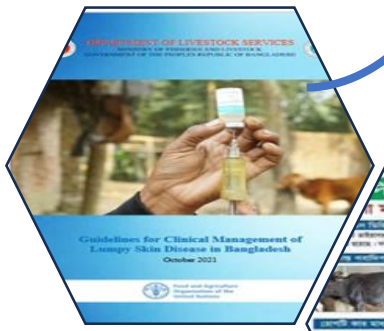


World Organisation for Animal Health
Founded as OIE

Prevention and control measures (Dengue)

- Supplied IV Saline and supportive medicines from WHO emergency stock to health facilities nationwide.
- Blood banks mobilized to provide platelets for hemorrhagic dengue patients.
- Strengthened mass awareness campaigns via TV, media, and community training; fines imposed on properties with Aedes larvae.
- LGED leading vector control with insecticides and eliminating breeding sites.
- Dhaka City Corporation, have taken awareness programs to push citizens to drain household clean water every week.
- WHO supported a pre-monsoon entomological survey and provided technical guidance for the outbreak response.
- 270 health care providers throughout the country have been trained on dengue case management and review via WHO support.
- WASH-organized nationwide clean-up campaign targeting clearing of mosquito-breeding spots was conducted in 64 districts with 400,000 people reached through this program
- SBC section-supported Risk Communication and Community Engagement (RCCE) activities had reached 12.78 million people (51.46 per cent women) nationwide

Response: Prevention and control measures (LSD & protozoan diseases)



Farmers awareness programs: FFS, yard meeting were carried out in all subdistricts(492)

Clinical management guidelines for LSD: Developed and distributed at the field levels for veterinarians

BCC marterials: Poster, leaflets developed and distributed among the farmers for vector control

World Organisation for Animal Health
Founded as OIE

Prevention and control measures (LSD)

1 Cattle vaccination

+ Cattle are vaccinated with antigenically related Goat pox vaccine produced by LRI

2 Increased vaccine production

+ Goat pox vaccine production has been increased to 4.0 million doses usually for cattle vaccination

LRI Goat Pox vaccine

3 Vaccine imports

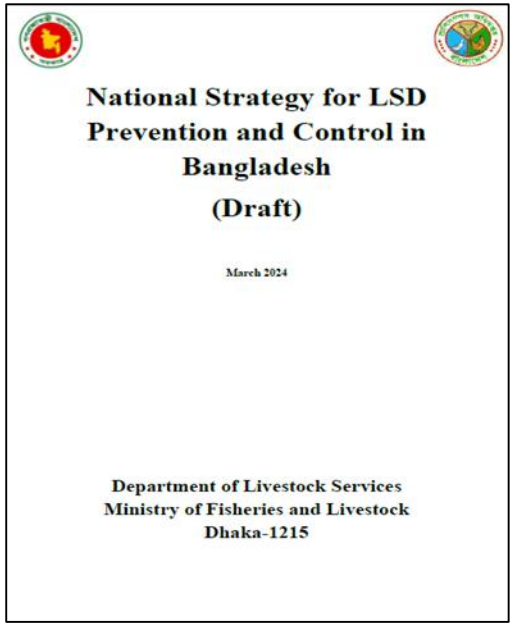
+ 5.0 million doses of Neethling strain vaccine import-permits given each year (2022 and 2024)

4 Vaccine development

+ BLR developed LSD vaccine using the circulating strain, technical committee evaluated and yet to handover to DLS for mass vaccine production.

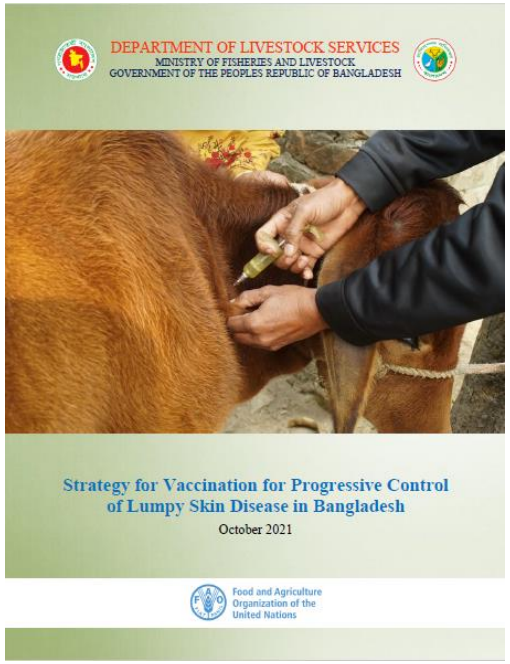
Prevention and control measures (LSD)

A National strategy for LSD prevention and control (draft)



- DLS developed LSD control strategy and yet to approve

B Formulation of LSD vaccination strategy for progressive control of LSD in Bangladesh



- DLS developed a vaccination strategy via FAO support
- Risk-based vaccination approach is recommended for progressive control of LSD in Bangladesh

C Outbreak investigation

- If any outbreak notifies, Epidemiology CELL investigates it subsequently for controlling the disease.
- From 2019- to date six outbreaks were investigated.

Impact of the actions

- Due to initiatives taken through various programs, the number of vector borne diseases are decreased in recent years

Challenge and possible solutions

- Several barriers could contribute to the profoundly under-ascertainment include a lack of healthcare infrastructure at the district level, limited financial resources, and cultural beliefs that may discourage seeking medical care
- Under-reporting of dengue in Bangladesh
- Even though Dhaka city is hyperendemic to dengue, no coordinated vector control policy has yet been devised.
- The city corporation lacks the necessary resources (infrastructure and workforce), and community engagement is also inadequate for dengue prevention
- Although an efficient vector control strategy can limit the spread of a dengue outbreak

Challenges/constraints in LSD control

Vector control

Quality Vaccine and Vaccination coverage

Uncontrolled animal movement

Manpower & Logistics

Collaboration with other sectors under One Health approach - Dengue

- WHO supported development of the National Strategic Plan (NSP) for Surveillance, Prevention and Control of Dengue which demands multisectoral engagement of different sectors and local authorities under OH approach.
- In this regard, WHO supported the Ministry of Health and Family Welfare Bangladesh to organize the national workshop aimed at integrating One Health approach to surveillance, prevention and control of dengue in Bangladesh with multi stakeholder participation.

Collaboration with other sectors under One Health approach

- There is a need of enhancing data-driven entomological intervention and vice versa.
- Community awareness and engagement, behavioral and cultural insights of communities should be taken into account for vector control.

Thank you

Dr. Abdul Aziz Al Mamun
Director, Central Veterinary Hospital
Pehone + 88 02-7319971, email:azizmamun73@gmail.com

World Organisation for Animal Health
Founded as OIE