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Climate Change Effects on Dengue Disease in District Narsingpur, Madhya Pradesh

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ABSTRACT
Dengue has emerged as a climate-sensitive vector-borne disease significantly affecting tropical regions of India. This study analyzes the influence of climate change variable- rainfall, temperature, humidity an flooding- on dengue incidence in Narsinghpur district, Madhya Pradesh. The district's Proximity to Narmada basin, seasonal flood patterns, high monsoon rainfall, rising temperatures and unplanned water storage make it highly vulnerable to Aedes aegypiti breeding. In hence suggests peak dengue transmission occurs during monsoon and post-monsoon months, correlating with increased humidity (>60%) and temperature.
(28-340C.) Challenges include water stagnation, Inadequate drainage and limited climate-integrated health surveillance. The paper emphasizes climate-linked disease forecasting, strengthened vector control, community adaptation strategies and early warning systems. This research supports the integration of climate health resilience into district public health planning.

INTRODUCTION

Dengue fever is a rapidly emerging mosquito-borne viral disease transmitted primarily by Aedes Aegypti and Aedes Albopictus. WHO estimates show dengue incidence has increased 30-fold in the last 50 years. Climate change has intensified dengue transmission by acceleration vector breeding and virus replication. Narsinghpur district, located in the Narmada river basin of Madhya Pradesh, is environmentally predisposed to dengue transmission due to-

- Rising summer temperatures (40-450 C)
- Monsoon humidity > 60%
- Frequents floods and water Stagnation
- Semi-urban growth and unsafe water storage
- Agriculture-based water use patterns.

The present study evaluates the connection between climatic variation and dengue epidemiology in Narsinghpur and proposes climate-adaptive public health solutions.

2. Study Area –

Parameter	*Description*
District	*Narsinghpur, Madhaya paresh*
Geography	*Located along Narmada basin*
Climate Type	*Sub-tropical: hot summers, humid monsoon*

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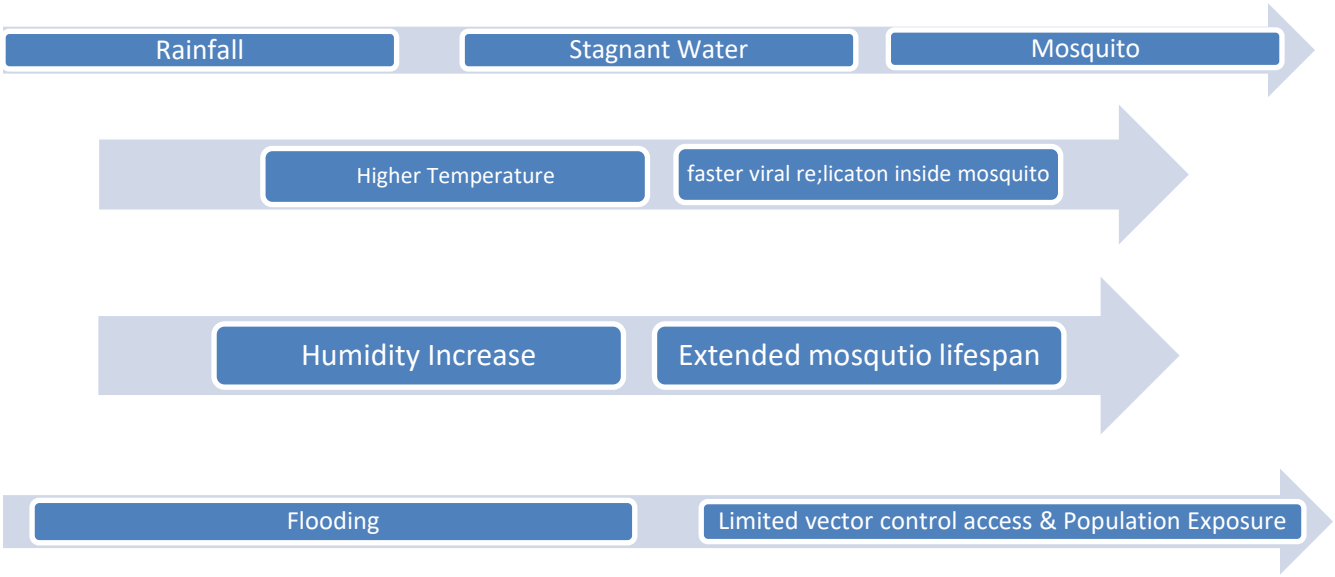
Major Rivers	*Narmada, Shakkar, Sher*
Vulnerable Blocks	*Narsinghpur, Kareli, Gadarwada, Gotegaon, Chawarpatha, Saikheda,Babai chichli.*
High-risk Zones	*Riverine villages, Pre urban clusters, foods-prone settlements*

3. Climate Change Indicators Relevant to Dengue *:*

Climate Indicator	*Effects on dengue*
Rising Temperature	*Reduces mosquito life cycle, increase biting rate*
High Humidity	*Reduces mosquito survival*
Heavy Rainfall	*Creates Breeding habitats (containers, stagnation, drains)*
Flooding	*Disrupts sanitation, increases exposure*
Water Storage Practices	*Household breeding sites for Aedes*

4. Mechanism : How Climate change Drives Dengue in Narsinghpur-



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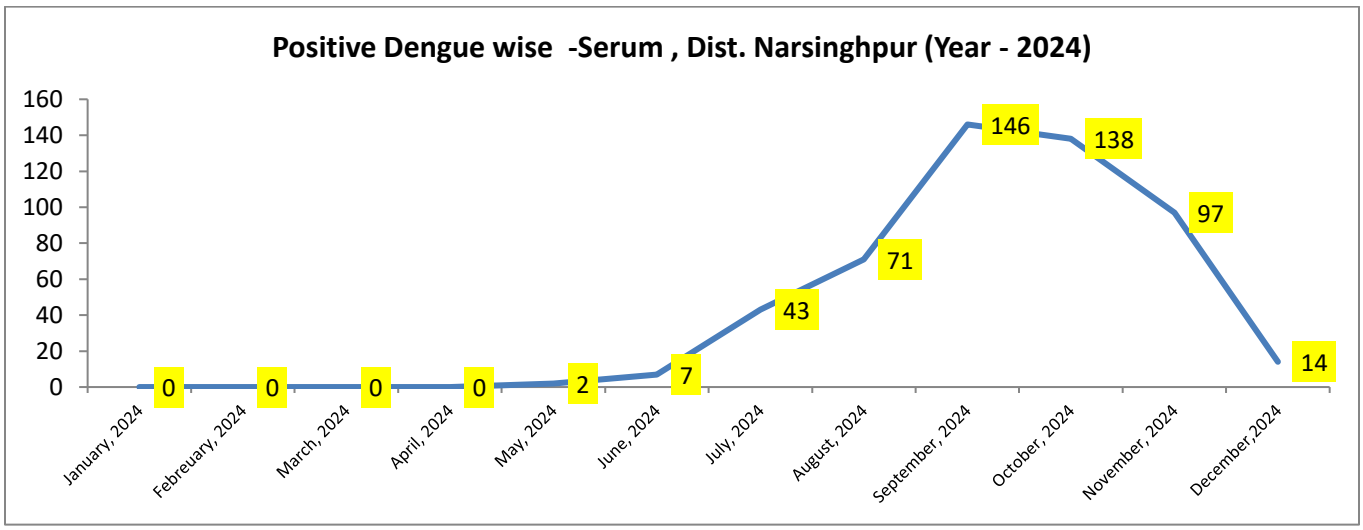
5. Seasonal Dengue Transmission Pattern

Seasonal	*Climate Condition*	*Dengue Risk*
Pre-Monsoon (Mar.-Jun.)	*Water Storage, rising temperature*	*Vector Build-up*
Monsoon (Jul.-Sep.)	*Heavy rain, humidity>60%*	*Peak dengue transmission*
Post-Monsoon (Oct.-Nov.)	*Stagnant Water Persists*	*Secondary peak*

6. Data Analysis -

(A) Month wise data analysis- Starting of dengue case in month-May, 2024, pick dengue case found in – Month September and October, 2024 and closing spreading season has December, 2024 in district Narsinghpur.



(Graph no. -01- Month wise dengue wise data)

(B) Temperature and Month wise data analysis- Starting of dengue case in between the month-May, 2024 July 2024 has 25℃ Minimum - 45℃ Maximum temperature in dist. Narsinghpur.

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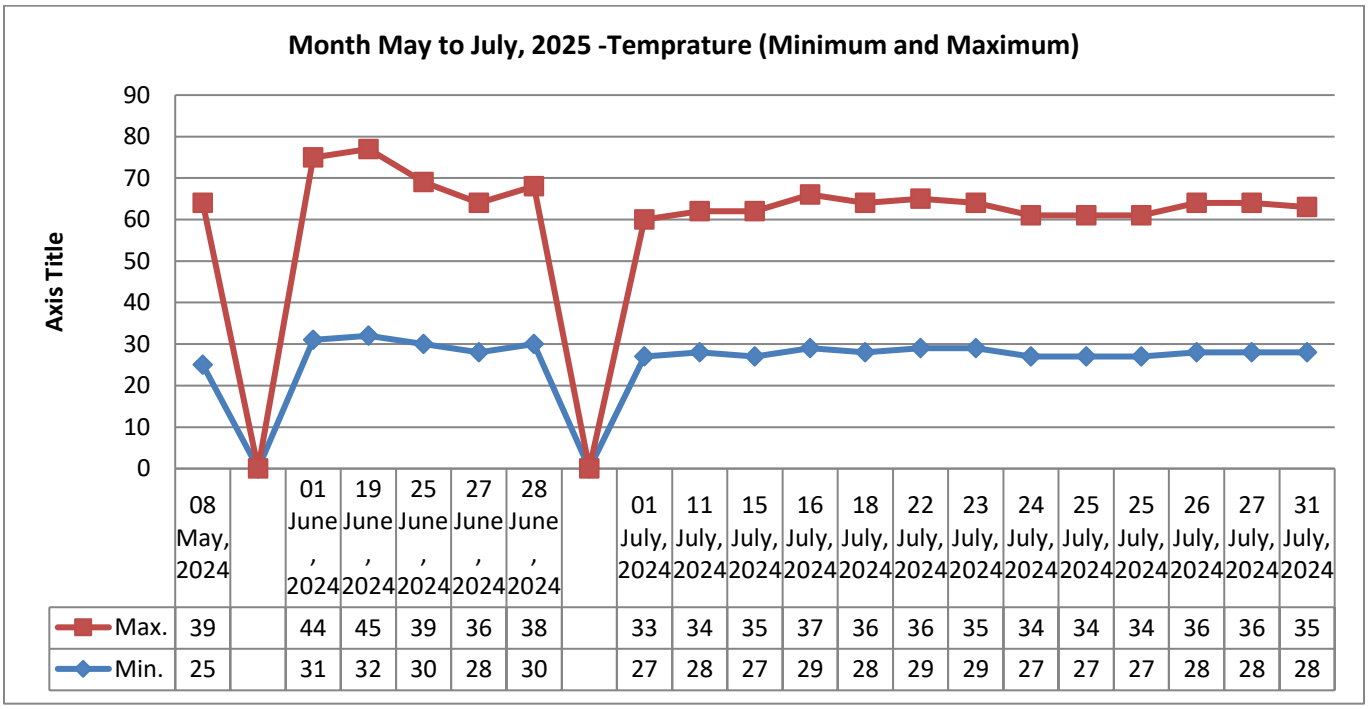
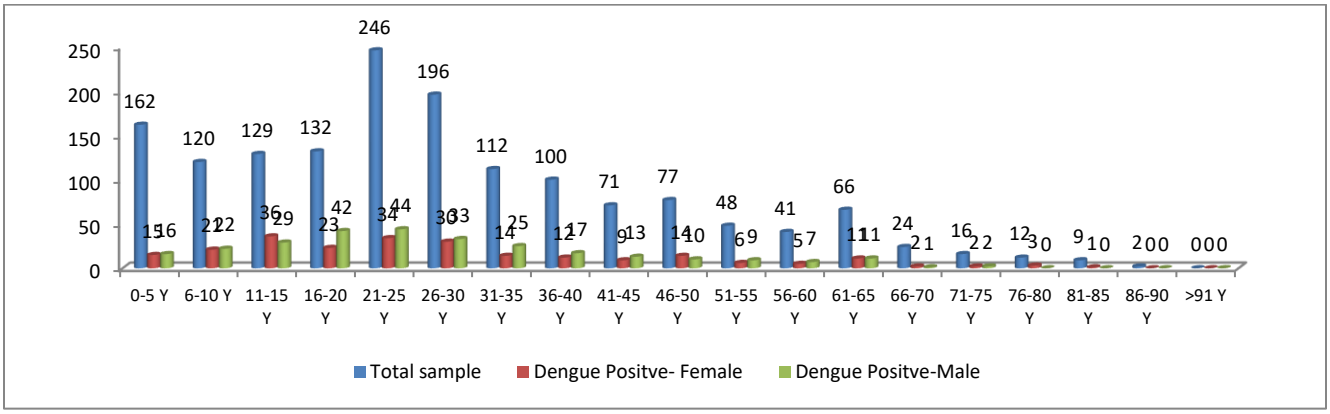


	08 May, 2024		01 June, 2024	19 June, 2024	25 June, 2024	27 June, 2024	28 June, 2024		01 July, 2024	11 July, 2024	15 July, 2024	16 July, 2024	18 July, 2024	22 July, 2024	23 July, 2024	24 July, 2024	25 July, 2024	25 July, 2024	26 July, 2024	27 July, 2024	31 July, 2024
Max.	39		44	45	39	36	38		33	34	35	37	36	36	35	34	34	34	36	36	35
Min.	25		31	32	30	28	30		27	28	27	29	28	29	29	27	27	27	28	28	28

(Graph no. -02- Temperature wise data)

(C) Age group wise data analysis- 21-25 year-44 male, 16-21 year- 42 female has maximum dengue positive case found in dist. Narsinghpur.



(Graph no. -03- Age group wise data)

(D) Age and Gender wise data analysis- 21-25 year-44 male, 16-21 year- 42 male has maximum found in dist. Narsinghpur.

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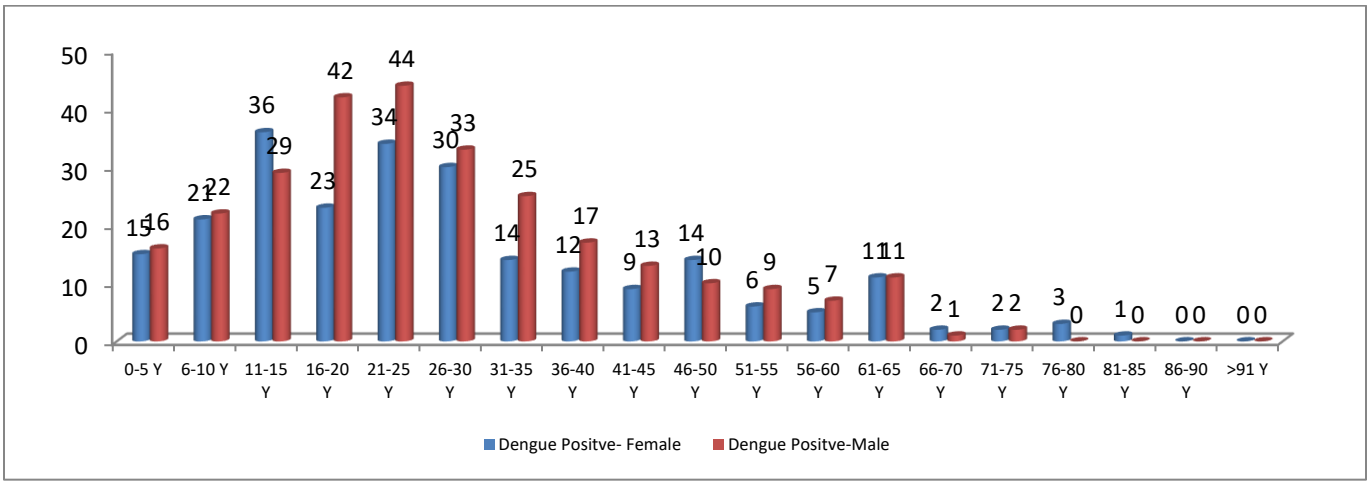
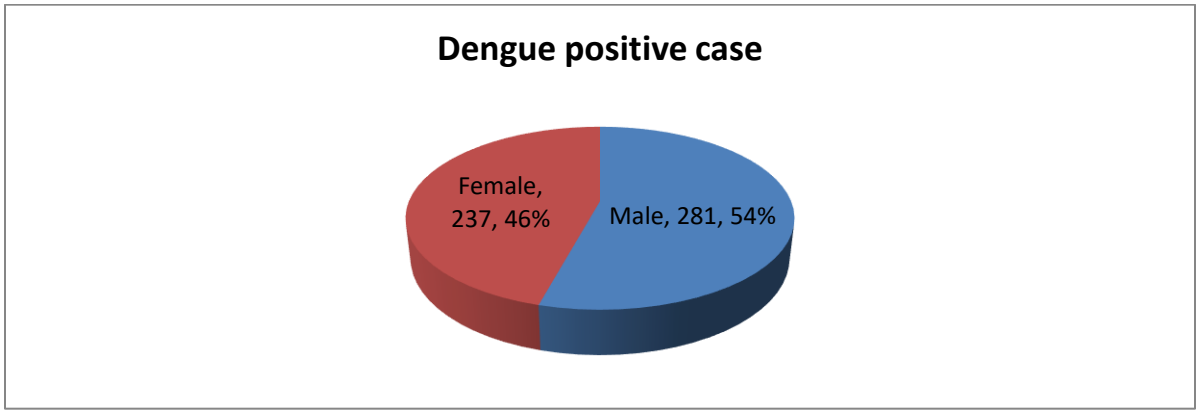


(Graph no. -04- Age group wise data)

(E) Gender wise data analysis- Sample collection - Dengue positive case in male-54% maximum case and Dengue positive case in male-46%, case found in dist. Narsinghpur.



(Graph no. -05- Gender and lab result wise data)

(F) Gender and sample result wise data analysis- Male- Sample collection -798 which have dengue positive – 281 case and female sample collection -780 which have dengue positive -237 case found in dist. Narsinghpur

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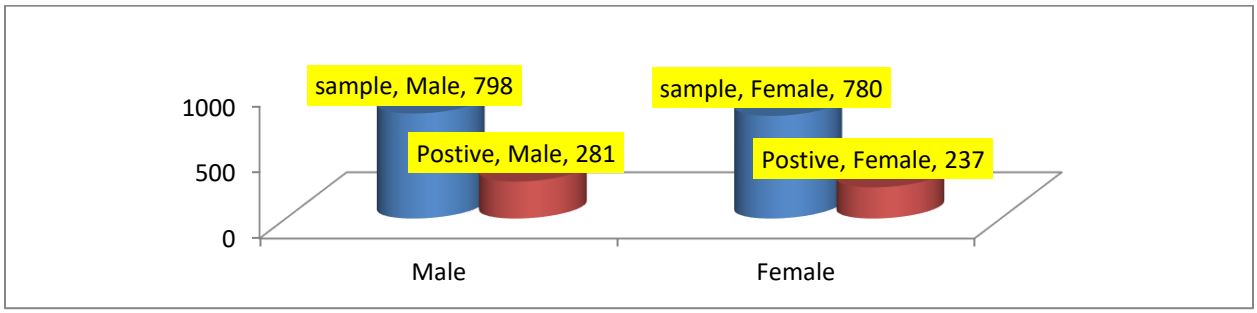
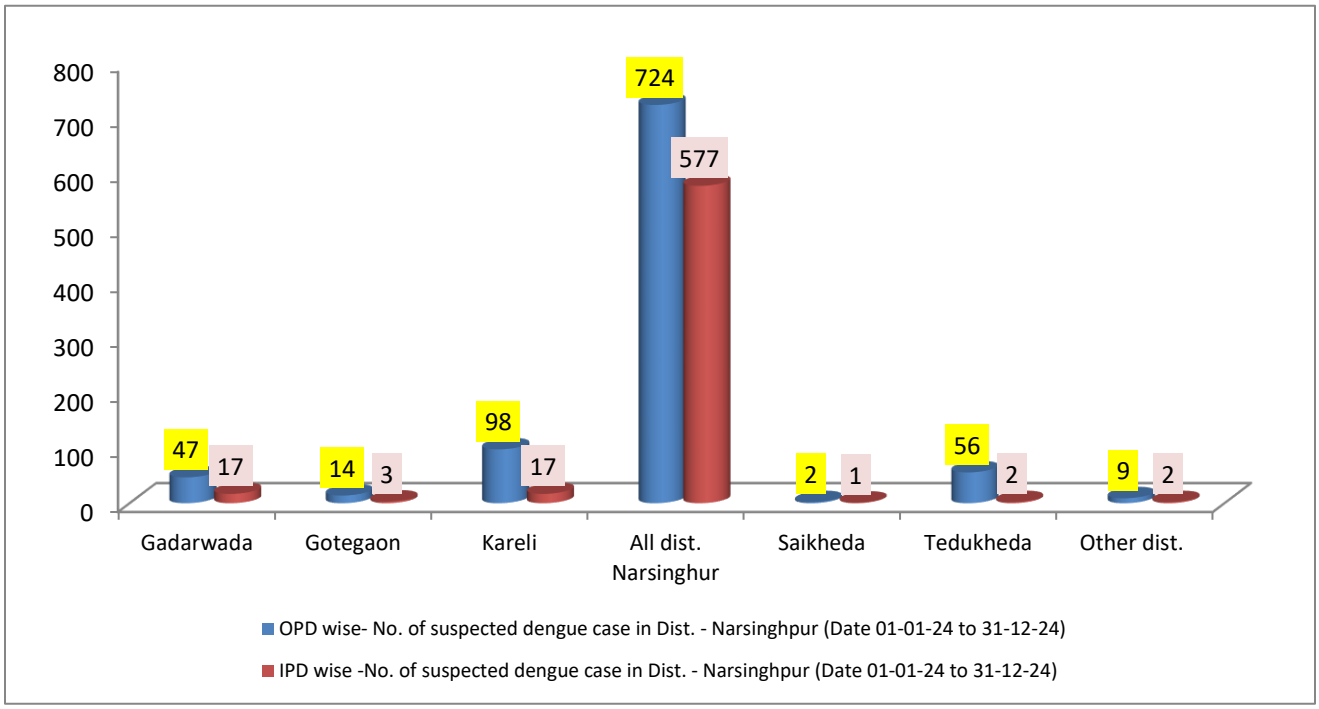


(Graph no. -06- Gender wise data)

(G) Block/health facility and OPD/IPD wise data analysis- OPD-724 case IPD-577 case suspected case has taken the OPD services/ treatment in dist. Narsinghpur.



(Graph no. -07- Block/health facility and OPD/IPD wise)

(H) OPD/IPD wise data analysis- OPD-95 (61%)case IPD-619 (39%) suspected case has taken the OPD services/ treatment in dist. Narsinghpur.

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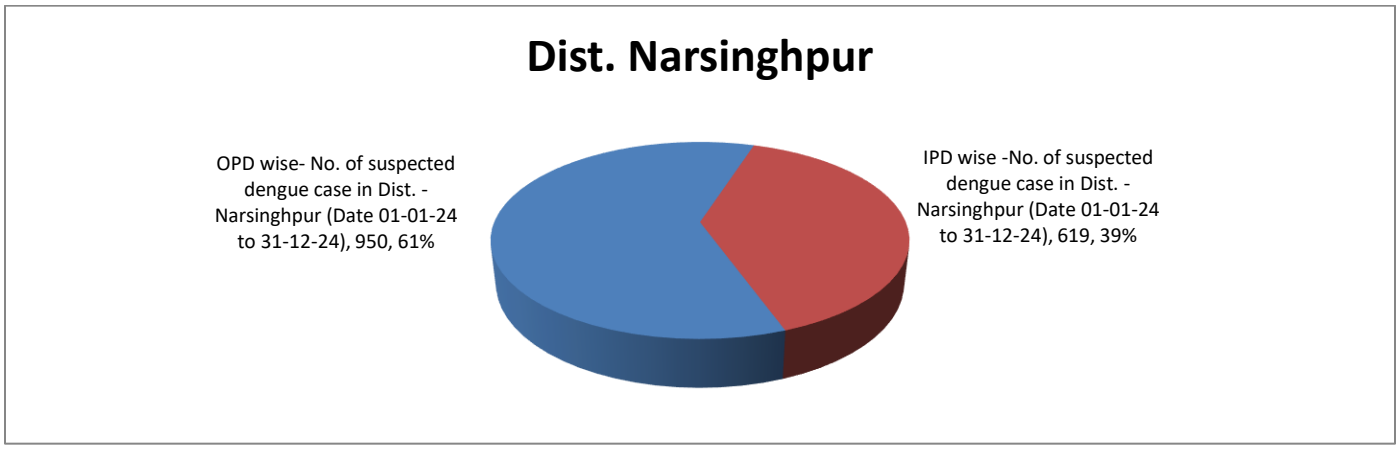
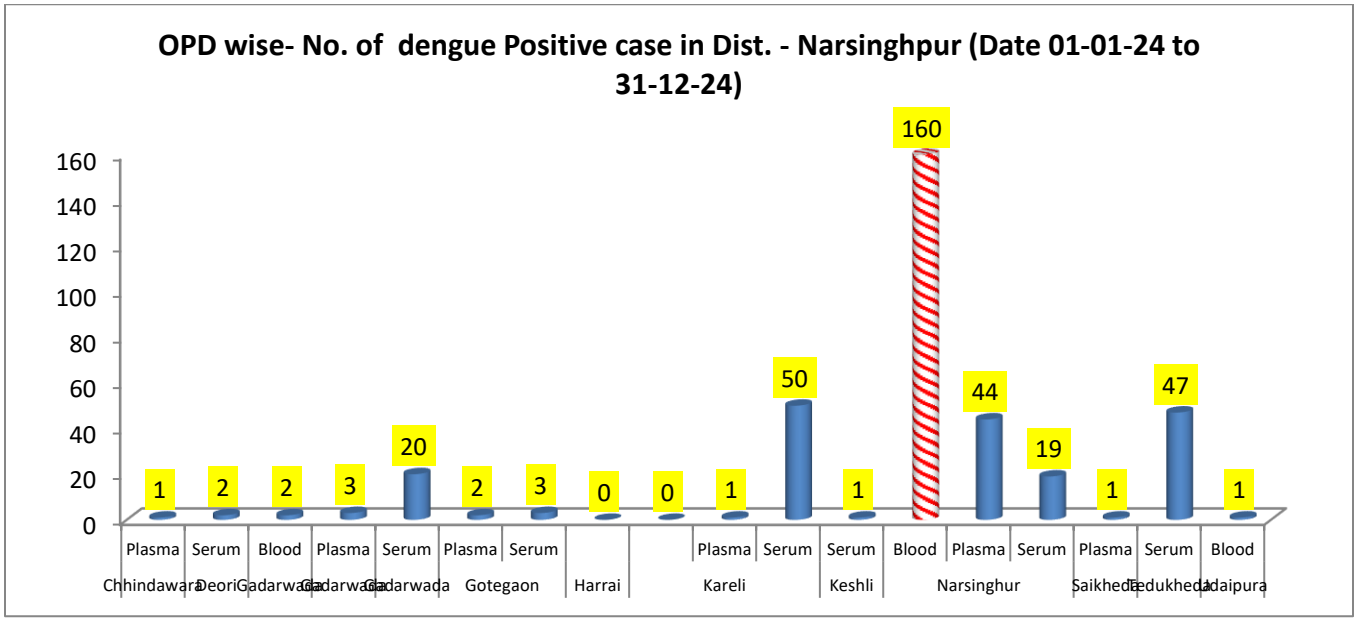


(Graph no. -08- OPD/IPD wise)

(I) Block and Blood/serum/Plasma wise data analysis- Dengue lab in investigation through blood-160 case OPD - maximum in dist. Narsinghpur.



(Graph no. -09- Block and Blood/serum/Plasma wise)

(J) Block and Blood/serum/Plasma wise data analysis- Dengue lab in investigation through blood-113 case IPD -maximum in dist. Narsinghpur

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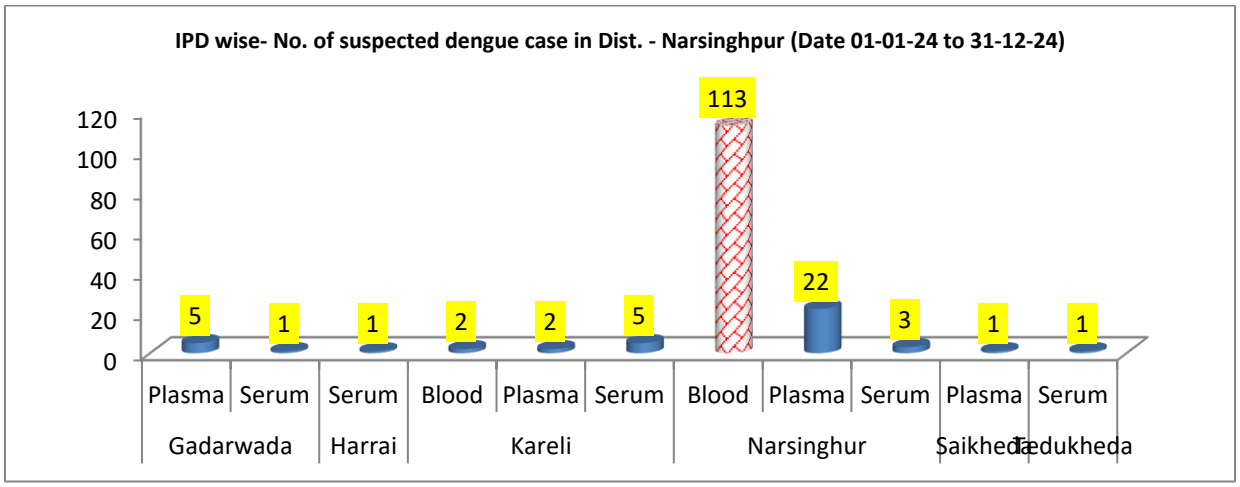
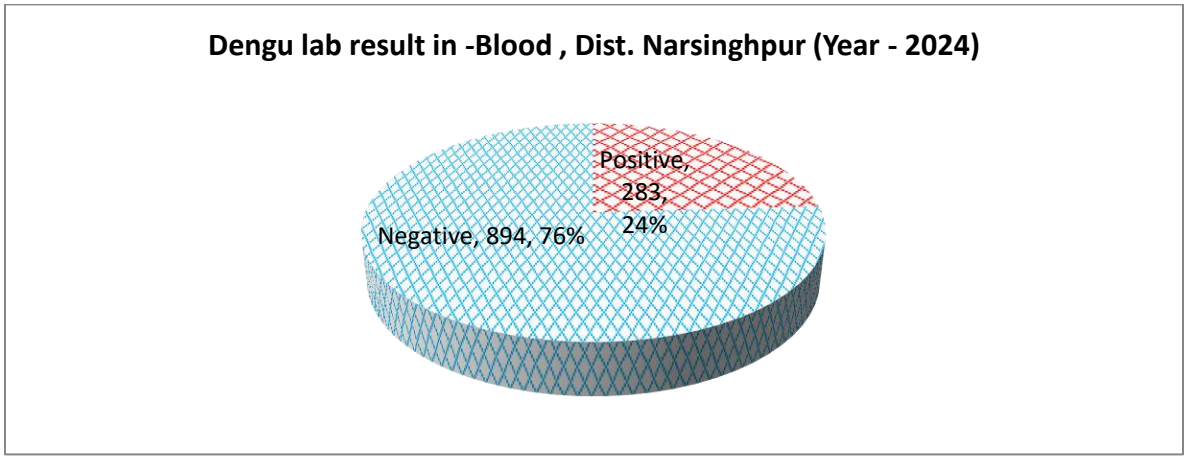


(Graph no. -10 - Block and Blood/serum/Plasma wise)

(K) Blood investigation wise data analysis- Total blood sample collection – 1177, Positive-283 (24%) Negative - 894 (76%) case dengue lab in investigation through blood in dist. Narsinghpur



(Graph no. -11 – Blood wise sample collection and result)

(K) Plasma investigation wise data analysis- Total Plasma sample collection – 105 , Positive-82(78%) Negative - 23 (22%) case dengue lab in investigation through blood in dist. Narsinghpur

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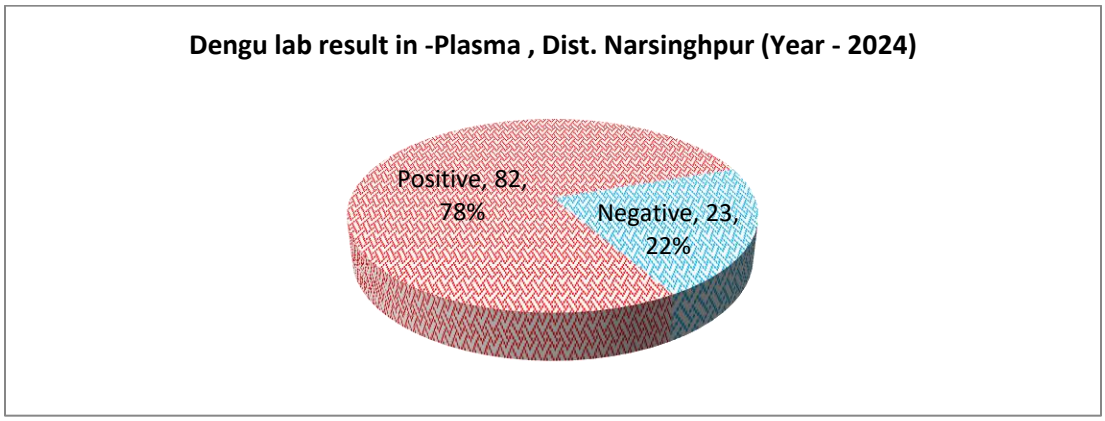
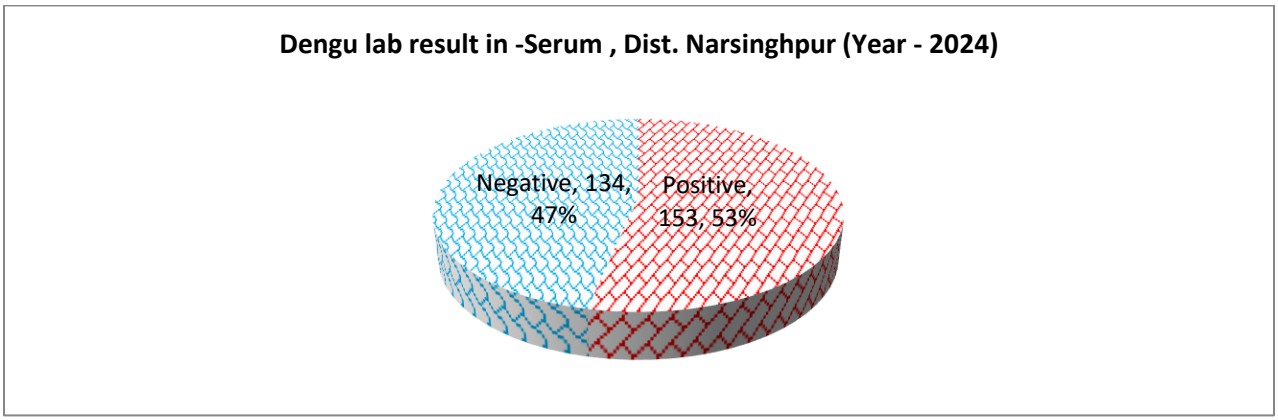


(Graph no. -11 – Plasma wise sample collection and result)

(L) Serum investigation wise data analysis- Total Plasma sample collection – 289, Positive-153 (53%) Negative - 134 (47%) case dengue lab in investigation through blood in dist. Narsinghpur



(Graph no. -12– Serum wise sample collection and result)

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6. Local Risk Factors in Narsinghpur

- *Water storage in tanks, coolers, barrels, agriculture containers.*
- *Poor drainage in urban and peri-urban settlements.*
- *Flood-affected villages in the Narmada belt.*
- *Construction sites and uncovered cement tanks.*
- *Limited solid waste and water waste management.*
- *Inconsistent household vector control awareness.*

7. Public Health System Response (Existing Evidence):

- *Vector surveillance and fogging.*
- *Rapid response medical teams.*
- *Ambulance readiness.*
- *Chlorine distribution for safe water.*
- *Flood area disease monitoring and alert systems.*

8. Key Challenges Identified

Challenge	*Impact*
No climate-disease early warning system	*Delayed outbreak prediction*
Limited micro-level hot spot mapping	*Inefficient vector control*
Recurrent flooding	*Increased exposure, disease spike*
Lack of entomological monitoring	*No local breeding index data*
Community gaps in source reduction	*Continuous Domestic breeding.*

9. Recommendations

A. Climate-based Early Warning System (EWS)

- *Integrate rainfall, humidity, and temperature data with dengue surveillance.*

B. Pre-Monsoon Vector Control Drive

- *Door-to-door cooler/tank checks.*
- *Larvicide and source reduction (April-June)*

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C. Post-Rain Rapid Response

- *Fogging within 48-72 hours of major rainfall/floods.*

D. Hotspot Mapping

- *GIS Mapping of flood and high-incidence villages.*

E. Community Behavior Intervention

- *7-day dry day strategy.*
- *Awareness Campaign in school, Panchayat and market.*

F. District Dengue Task Force

- *Rapid response team, medical kits, entomology unit, reporting dashboard.*

10. Proposed Framework for climate-Resilient Dengue Control

Component	*Action*
Predication	*Climate based dengue risk forecast*
Prevention	*Larval source reduction, IEC campaigns*
Preparedness	*Medical team & fever clinics*
Response	*Rapid diagnosis, fogging, isolation, treatment*
Recovery	*Post-outbreak assessment, hotspot reduction.*

11- Conclusion: - The study confirms that dengue transmission in Narsinhgpur is strongly climate-dependent and peaks during monsoon and post-monsoon months. Rising temperatures, extreme rainfall, humidity, and flooding significantly enhance vector survival and disease outbreaks; public health planning must integrate climate- driven surveillance, early warning systems, hotspot mapping and community behavior change for sustainable dengue control in the district.

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