RBM Partnership
To End Malaria

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# Vector Control Interventions in Pakistan

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# Background

- Approx. 2.1 million cases treated as malaria each year (90% clinical cases of EMRO region)
- An estimated 98% of the population is at **varying risk** of malaria
- 29% in **high risk** transmission areas; and 14% and 55% in **moderately** and **low** transmission areas respectively
- Estimated 1 M malaria cases annually; Approx. 350,000 are confirmed annually
- *Plasmodium vivax* (85%) and *P. falciparum* (15%) are the prevalent parasite species
- 2nd highest burden sharing Country in the world for *P. vivax.*
- >90% caseload is shared by 72 districts mostly located western border with Afghanistan and IR Iran

# Country Epidemiology

## Stratification of districts (NSP 2015 – 2020)
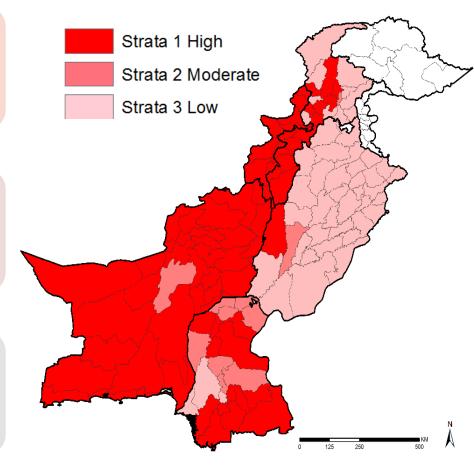
**Stratum – I (High Transmission)**
- **District/Agency: API/SPR >5**
- 72 Districts/Agencies
- Mainly in Balochistan, FATA, KP

**Stratum – II (Moderate Transmission)**
- **District: API between 1-5**
- 10 Districts
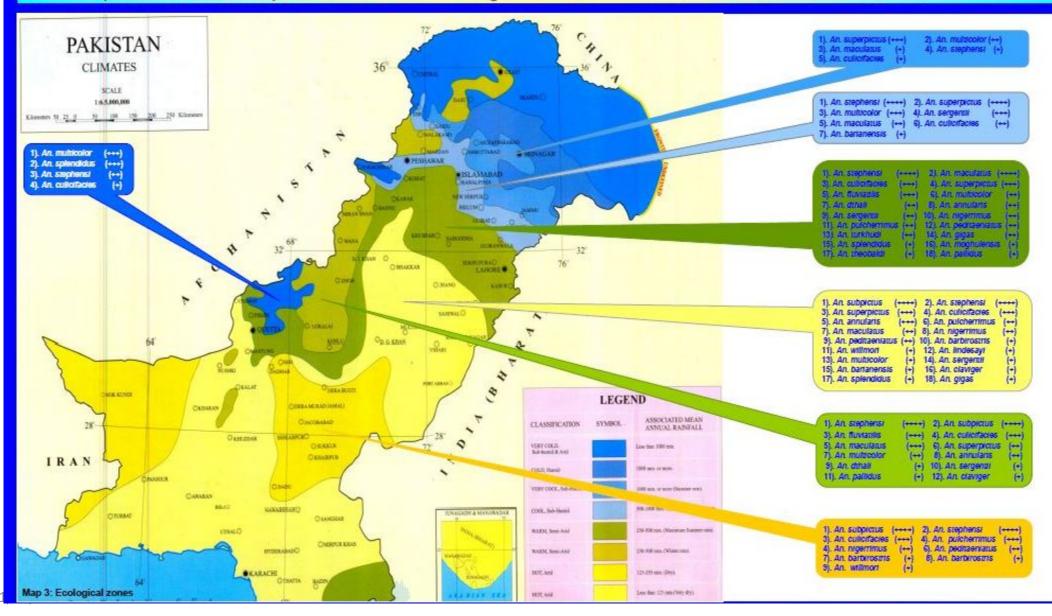- Mainly in Sindh, KP

**Stratum – III (Low Transmission)**
- **District: API<1**
- 47 Districts
- Mainly in Punjab



Strata 1 High
Strata 2 Moderate
Strata 3 Low

# Vector Surveillance & Mapping



Results: 1). Distribution of anophelines in different ecological zones of Pakistan (Scanty: +; Low: ++; Moderate: +++; High: ++++)

Map 3: Ecological zones

## 2). Habits and habitats of major *Anopheles* species of Pakistan

| Species | Breeding sites (Sequential order) | Resting habits | | | Feeding | | Biting timing | Seasonality | | Fluctuations in Abundance | Vectorial status |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Endophilic | Exophilic | Resting places | Zoophilic | Anthropophilic | | Spring (Mar-April) | Post monsoon (Aug-Oct) | | |
| An. culicifacies | Rural Agrarian <br> 1). Fish ponds 2). Rice fields 3). Water tanks 4). Wells 5). Canal seepage pools 6). Irrigation Channels <br> Note: Intolerant to organic pollution | ++++ | | 1). Sleeping rooms <br> 2). Animal sheds | ++ | +++ | Early and mid hours of the night | | ++++ | Uni-modal. Highly fluctuate. However, fluctuations depend upon the local climate | Primary Malaria vector in Pakistan |
| An. stephensi | Rural Agrarian & Peri-urban <br> 1). Rice fields 2). Water tanks 3). Wells 4). Fish ponds 5). Canal seepage pools 6). Irrigation Channels 7). Street pools 8). Animal ponds 9). Drains <br> Note: Wide range of tolerance organically pollutant habitats | ++++ | | 1). Sleeping rooms <br> 2). Store rooms <br> 3). Animal sheds | +++ | ++ | Early hours of the night | + | ++++ | Uni-modal. No fluctuation | Secondary Malaria vector in Pakistan |
| An. fluviatilis | Rural Agrarian: <br> 1). Wells 2). Irrigation Channels 3). Irrigated pools 4). Water tanks 5). Fish ponds <br> Note: Intolerant to organic pollution | ++++ | | 1). Sleeping rooms | ++ | +++ | Early hours of the night | | ++++ | Uni-modal | Suspected vector in province Balochistan & FATA. ELIZA positive |
| An. subpictus | Rural & Peri-urban <br> 1). Street drains 2). Septic tanks 3). Animal ponds 4). Street pools 5). Temporary pools <br> Note: Wide range of tolerance to different physio-chemical characteristics of habitats. Highly resistance to organically polluted habitats | | ++++ | 1). Animal sheds <br> 2). Store rooms <br> 3). Farmer resting places | ++++ | | Late evening and very early hours of the night | ++ | ++++ | Uni-modal. | No role in transmission. Note: Most abundant anophelines in Pakistan (46% of total) |
| An. annularis | Rural Agrarian <br> 1). Rice fields 2). Water tanks 3). Fish ponds 4). Canal seepage pools 5). Irrigation Channels 6). Field water courses <br> Note: Intolerant to organic pollution | ++++ | | 1). Sleeping rooms <br> 2). Animal sheds | +++ | ++ | Mid night hours | | ++++ | Uni-modal | Suspected vector in provinces Balochistan, Sindh, KPK and FATA |
| An. pulcherrimus | Rural Agrarian <br> 1). Rice fields 2). Water tanks 3). Fish ponds 5). Canal seepage pools 6). Irrigation Channels <br> Note: Intolerant to organic pollution | ++ | ++ | 1). Animal sheds <br> 2). Store rooms <br> 3). Sleeping rooms | ++++ | + | Late evening and very early hours of the night | ++ | ++++ | Uni-modal and highly fluctuation | Suspected vector in central Punjab |
| An. nigerrimus | Rural Agrarian <br> 1). Rice fields 2). Water tanks 3). Fish ponds 4). Irrigation Channels 5). Wells <br> Note: Intolerant to organic pollution | +++ | + | 1). Store rooms <br> 2). Animal sheds <br> 3). Sleeping rooms | +++ | ++ | Early hours of night | + | ++++ | Unimodal. Moderate fluctuation | Information not available |
| An. maculatus | Rural Agrarian <br> 1). Irrigation Channels 2). Water courses, 3). Rice fields 4). Water tanks 5). Canal seepage pools 5). Man-made ditches <br> Note: Intolerant to organic pollution | ++++ | | 1). Sleeping rooms <br> 2). Store rooms <br> 3). Sleeping rooms | ++ | +++ | Evening and very early hours of the night | | ++++ | Uni-modal | Suspected vector in provinces Balochistan, FATA, and KPK |

**CONCLUSIONS:** *An. culicifacies* and *An. stephensi* showed a wide range of tolerance to different ecological conditions of the country.
- All vector species (confirmed and suspected ones) showed a noteworthy association with agriculture-related clean water habitats. However, *An. subpictus* and *An. stephensi* also exhibited a wide range of tolerance to organically polluted habitats. They also showed endophilic resting and anthropophilic feeding behavior mainly in sleeping rooms.

# Vector Control Interventions

| Interventions | Targeting Criteria |
|---|---|
| ITNs/LLINs | • Protection through ITN is key malaria control intervention<br>• During 2018, NMCP revised its ITNs dist. strategy shifting from a *rolling distribution* to a *mass distribution* (MD) campaign<br>• Districts with API >5%<br>• 100% coverage through MD and supported by CD<br>• 2018 2.5 M distributed in 11 top burden sharing areas<br>• 2019 3.5 M distributed in 14 districts |
| Indoor residual spraying (IRS) | • Mainly limited to epidemic response<br>• Routine activity in non-GF supported districts |
| Larval Source management (LSM) | • Mainly for Dengue control<br>• Very limited role for malaria control |
| Space Spraying | • Mainly for Dengue control<br>• Not recommended intervention for malaria control |
| Personal Protection | • Mainly for Dengue control<br>• Very limited role for malaria control |

# A Big Thank All of You

## Also Thanks NMCP-Pakistan Team