



Micro Strategic

Action Plan for Malaria

Elimination in the State
of Punjab, India

2018-2020



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Executive summary

India targets to eliminate malaria by 2030 in phased manner. The National Vector Borne Disease Control Programme (NVBDCP) has stratified the 36 states and union territories of the country based on annual parasite incidence to set targets for malaria elimination at state level. The state of Punjab, situated in the north-west part of the country, is a Category 1 state with an Annual Parasite Incidence (API) <1 per 1,000 population in all its districts. In sync with the National Framework for Malaria Elimination 2016-2030, Punjab targets to stop indigenous transmission of malaria by 2020 and prevent the reintroduction of malaria in the state till 2030 and beyond.

In 2017, NVBDCP launched the National Strategic Plan for Malaria Elimination (NSPME) in India 2017-2022, to provide strategic roadmap for the next five years. In alignment with the NSPME, Government of Punjab has launched a state-specific Strategic Action Plan (SAP) for Malaria Elimination.

Goal of SAP:

To achieve zero indigenous malaria transmission by year 2020 and ensure readiness for prevention of reintroduction beyond 2020.

Objectives of SAP:

- Reduce malaria incidence to zero indigenous cases to achieve malaria free status
- Reduce numbers of active malaria foci to zero level
- Maintain zero malaria deaths

Punjab has seen a continuous decline in the number of total Malaria cases since 2010 and the decline has been witnessed in all the districts of the State. Taking 2015 as base year, the state has witnessed a decline of total Malaria cases of 42% since 2014 and approximately 82% since 2010. Punjab has been reporting <1 API and zero malaria deaths in all the 22 districts of the state for the last five years. In 2017, 796 malaria cases were reported from the state. Most of the cases were reported as *P. vivax* Malaria; the proportion of *P. falciparum* was recorded as 2.30% in year 2012 and declined to 1.50% in 2017.

Based on the last three years epidemiological data, ten districts, based on higher proportion of contributed cases, have been prioritized for core vector management intervention and case management. These districts are Hoshiarpur, Mansa, SAS Nagar, Jalandhar, Bhatinda, Muktsar Sahib, Ludhiana, Patiala, Faridkot and Amritsar. Out of the total 13208 villages in Punjab, only 26 villages consistently reported one or more Malaria cases in the past three years. These villages have been prioritized for foci investigation and intervention measures, including, vector control should be undertaken to stop malaria transmission in these foci. There should be regular follow up of these foci on fortnightly basis till they become inactive or cleared.

There is a need to strengthen malaria surveillance, as a core intervention, to eliminate malaria from Punjab. Both passive case detection by the Accredited Social Health Activists (ASHAs) at community level and active case detection (ACD) will be strengthened to end malaria transmission in state. PCD should cover the entire population, including people living in remote areas. Each Malaria endemic district in the state, therefore, should identify, by mapping or another means, any community in receptive areas that are far from public health facilities;

add additional alternative health volunteers other than ASHA to extend the reach of PCD network. Imported cases may occur both in receptive and no-receptive areas and should be correctly managed.

The state currently has 72 passive surveillance centers and other public health hospitals that conducts malaria microscopy. Universal access to passive case detection, through all public health facilities (irrespective of the microscopy availability) and providers will be ensured by point-of-care RDT in areas with unavailable microscopic facility or delay in case detection. ASHAs in villages situated at a distance of 10 km or more from the nearest SC and/or villages and ASHAs in forested villages will conduct RDTs for malaria diagnosis.

At low transmission intensity, Malaria cases are highly aggregated. Reactive case detection (RCD) strategy will be chosen for a given area depending on local epidemiology and the health system to prevent aggregation of cases following detection of even a single case.

Malaria treatment in the state should follow the national policies and guidelines. For cases of *P. vivax*, in addition to clearance of blood infection, anti-relapse therapy (primaquine), and for all infections caused by *P. falciparum* parasite, a gametocytocidal drug (primaquine) should be administered to prevent relapse or recrudescence. Treatment should be placed through all channels of service delivery– public health facilities, private health providers and community outreach through health workers and ASHA.

Population in Punjab has a strong preference for private health sector. All private facilities and/or providers must ensure point-of-care malaria diagnosis prior to treatment and presumptive treatment without testing for malaria is not allowed in Punjab. All malaria cases at private sector must be notified. All such practitioners should be listed and should be involved in Malaria diagnosis, treatment and surveillance.

Quality assurance in malaria case management will be strictly ensured. At the state level, quality assurance in malaria microscopy will require upgrading one existing laboratory to State Reference Laboratory (SRL). The SRL will be located in a secondary or tertiary care hospital or ICMR body and should be accredited by the National Vector Borne Disease Control Programme as the reference center for malaria diagnosis.

Each confirmed Malaria case should be investigated and characterized based on patient's age, sex, occupation, residence, history of current illness; including diagnostic test results and treatment, as well as travel history to assess how and where the infection might have been acquired and possibility of onward transmission. After the case has been characterized, it should be classified as imported, introduced and indigenous. Relapsing, recrudescence or induced; an adequate response should be made to a case detected in a receptive area where it could generate secondary cases for all imported cases. In reporting to WHO, only cases reported from other countries should be considered "imported". Local cases can be indigenous or introduced. This distinction becomes more important during the interval just before certification of Malaria free status; when the occurrence of some introduced cases, rigorously validated, is not an impediment to certification. In elimination settings, a person infected locally before the transmission was interrupted could have a relapse or a late primary attack of *P. vivax* Malaria. A relapsing case requires radical cure according to national guidelines, which includes an anti-Malaria drug for asexual stage and primaquine at a dose of 0.25mg per Kg body weight daily for 14 days. Further, investigation should be carried out in case household and neighboring households, as for imported cases described above. A locally acquired Malaria case may be detected after transmission has been interrupted because of long latency in the blood, such cases have been described for *P. falciparum*. If careful investigation of such a case provides strong evidence that it was indeed acquired locally by mosquito infection before presumed interruption of transmission, it may be classified as "recrudescence", and its occurrence should not preclude certification. Such cases should be treated according to national treatment guidelines. "Induced" cases, those origin of which can be traced to a blood transfusion or other parenteral inoculation of parasite is not due to mosquito borne transmission, should be managed, promptly. If there is a risk of ongoing transmission in the area, surveillance staff and the case household and neighbors should be alerted and asked to report any suspected Malaria illness. Cases which cannot be classified should be reported separately.

Foci investigation and response are critical to stop malaria transmission. An initial ACD survey should be carried out and completed within 7 days of identification of detection of the focus. Once the field investigation is completed, the team should be able to determine the extent and factors driving the local transmission and to characterize the focus. Response plan will be prepared by local health workers in consultation with the supervisor and other experts. Copies of the completed case, focus investigation forms and line list of records of all cases identified in the focus should be sent to the state, national level and the reporting health facility. The situation and response plan will be communicated to local health staff, community leaders and relevant local actors. The district Malaria officer is responsible for ensuring that a register of foci is established, all foci are investigated, and reports on all foci are available and kept up to date.

Once investigated, the focus may be classified into one of the three types, i.e. active, residual non-active and cleared. Response measure are required to be undertaken in all the three types of Malaria foci. However, the nature and extent of intervention measure may vary. Following principles should be observed while considering response to foci:



State programme officer should identify active foci in different parts of the state and cover them with appropriate vector control measures. Before selection of Insecticide for IRS, susceptibility to currently used insecticide should be evaluated. Similarly, before procurement of ITNs/LLINs, behaviour of the people should be assessed in respect of their acceptability and usage of such nets. Supplementary vector control may be justified for some settings. Soon after liquidation of foci has been achieved, vector control coverage should be maintained in receptive areas where there is substantial risk of reintroduction (vulnerable areas). WHO recommends that:

1. In areas with recent local Malaria transmission (residual non-active foci), continuation of vector control is recommended. Optimal coverage with effective malaria vector control of all people in such areas should be pursued and maintained.
2. In areas where transmission has been interrupted for more than three years cleared foci, discontinuation of any vector control should be based on a detailed analysis, including assessment of receptivity and vulnerability of the area and the capacity for active disease surveillance and response.

Malaria elimination in Punjab would depend on a high level performing health system, especially, primary health care system including front line health activists like ASHA that can deliver malaria interventions of good quality and coverage. Effective coverage depends not only an access to intervention but also on provider compliance, patient adherence and individual benefits. For elimination of malaria to succeed, health system in Punjab should be evaluated for basic health infrastructure, commodity delivery system, pharmacological regulations, human resources and their capacity and vital registration system to improve the environment in which the state malaria elimination programme operates. For interruption of malaria transmission, well trained entomological teams with adequate equipment and tools should be in place at state and zonal levels for entomological surveillance and determine the appropriateness of vector control measures being undertaken in the programme.

Malaria elimination also needs to be embedded in, and supported through, a strong enabling environment. High level political commitment, robust health sector response, enacting the necessary legislations and regulations, intersectoral coordination, strategic partnerships and targeted behavior change for community engagement are critical for malaria elimination in Punjab.



Overview

India currently accounts for 6% of the global Malaria burden and houses about 90% of the Malaria cases in the South-East-Asian region of the World Health Organization (WHO). Plagued by the disease, it aims to eliminate Malaria by 2030.¹

There is significant heterogeneity in the Malaria burden and risk of transmission between and within the states of India, mainly due to large diversity in ecotypes and vectors. The responsibility for Malaria control is divided between the Central and State Governments; technical and operational guidance is provided by the National Vector Borne Disease Control Programme (NVBDCP); while delivery of services by the State Vector Borne Disease Control Division is ensured through the State Public Health Care delivery system. The key elements of India's Malaria control strategy include Early Case Detection and complete Treatment (EDCT) based on parasitological diagnosis of all suspected cases and complete treatment of all confirmed cases, along with vector control measures and surveillance.²

1.1 Introduction to the State of Punjab

The state of Punjab lies in North-west part of India, bounded by four Indian states (Jammu & Kashmir, Himachal Pradesh, Haryana and Rajasthan) and the international border with Pakistan. Of the total land area of 50,362 sq. km., which covers 1.53% of the country's land area, more than 95% is rural and the cultivable area is under assured irrigation.³

Census 2011 recorded Punjab's population of 27.7 million, which is less than 2.5% of the country's population. Sikhs account for more than 60% of the total population in the state, as Sikhism or Sikh Religion forms the most of population in state of Punjab.⁴

The state's population reside in 143 towns and 12575 villages, while administratively the state has 22 districts, 82 tehsils and 146 blocks.⁵

1.1.1 Demographic, economic and socio-cultural characteristics

Punjab reports a decadal growth rate of 13.89% and a population density of 550 per sq. km. Economically the state ranks among the top five states of the country with regard to per capita income, and only 8.3% population live below poverty line. However, the land inequity is high as the state houses highest percentage of landless population (43.34%) among the northern provinces of the country. Although improving, the sex ratio of the state is also dismal with 893 females per 1000 males, reflecting gender disparity and male dominance. The gender disparity in health in the state is also reflected in morbidity predominance in women, as the estimated number (per 1000) of ailing persons (PAP) in Punjab has a gross difference between male (124 in rural and 143 in urban) and female (203 in rural and 196 in urban). The rural women are at higher risk of morbidity due to any cause in Punjab.⁶

¹ WHO (2017). World Malaria Report 2017.

² NVBDCP (2017). National Strategic Plan for Malaria Elimination in India 2017-2022.

³ Government of Punjab. State Profile. Available at <http://punjab.gov.in/state-profile>

⁴ Government of Punjab. State Profile. Available at <http://punjab.gov.in/state-profile>

⁵ Government of Punjab. Basic Statistics of Punjab. Available at http://www.pbplanning.gov.in/pdf/basicStat2011in_eng.pdf

⁶ Government of Punjab. Basic Statistics of Punjab. Available at http://www.pbplanning.gov.in/pdf/basicStat2011in_eng.pdf

Despite the land and gender inequity, reflected in some general statistics, developmentally Punjab has shown monumental progress, pioneering the Green Revolution in India. Since historical period, the state has an agrarian economy, that expanded further following the Green Revolution and revamping of the irrigation system in India in late 90s. Wielding the products and commercial commodities of agriculture; the state has flourished in the field of small scale enterprises. Paralleling the economic development, Punjab also features adequate roads network, 100% rural electrification, wider availability of safe drinking water and availability of large number of schools and health centers. The state also has a literacy rate of 76.7%. The gross enrollment ratio is higher than the national average.⁷



Image: District Map of Punjab, 2018

⁷ Government of Punjab. Basic Statistics of Punjab. Available at http://www.pbplanning.gov.in/pdf/basicStat2011in_eng.pdf

Punjab, bearing the ancient glory of Indus valley civilization, has a rich cultural context. Sikhism is the most popular religion and culture in Punjab. The Punjabi language, also known as Gurmukhi, is the official language of the state. Jat Sikhs forms a larger part of Sikh community in Punjab; Hindus form the second largest community with 34% population. People following Islam religion makes up 2% of population whereas Christians, Jains and other religions makes up the rest of population in the state.

1.1.2 Climate and ecology of Punjab

Punjab experiences continental semi-arid to sub-humid climate with three main seasons—

- Hot Season (mid-April to the end of June)
- Rainy Season (early July to the end of September)
- Cold Season (early December to the end of February).

Apart from these three, the transitional seasons include—

- Pre-summer season (March to mid-April): This is the period of transition between winter and summer.
- Post-monsoon season (September to end of November): This is the period of transition between monsoon and winter seasons.

The geography and subtropical latitudinal location of Punjab lead to large variations in temperature from month to month. The maximum temperatures usually occur in mid-May and June; the temperature remains above 40 °C (104 °F) in the entire region during this period. Punjab experiences its minimum temperature from December to February; the lowest temperature was recorded at Amritsar (0.2 °C (32.4 °F)) and Ludhiana stood second with 0.5 °C (32.9 °F). Even though only limited regions experience temperatures below 0 °C (32 °F), ground frost is commonly found in the majority of Punjab during the winter season. The highest minimum temperature of the colder regions in June is more than the daytime maximum temperatures experienced in January and February. E.g. Ludhiana experiences minimum temperatures above 27 °C (81 °F) for more than two months. The annual average temperature in the entire state is approximately 21 °C (70 °F). Further, the mean monthly temperature range varies between 9 °C (48 °F) in July to approximately 18 °C (64 °F) in November.^{8,9}

The average annual rainfall in Punjab has increased over the decade. From the annual average of 43.76 cm during 2006-2010, rainfall increased to 47.99 cm per annum during the period of 2012-2016. 70% of the annual rainfall occurs between July to September, with a district-wise variation. The districts along the Shivalik hills are wettest, while the south-west region is semi-arid. Average annual rainfall of Gurdaspur district in the Shivalik hills is more than 6 times higher than the rainfall recorded in Firozpur district in the southwest Punjab.¹⁰

Punjab does not have any large-scale diversity in its physiography. The state has a more or less physical homogeneity with the exception of scattered and low ranges of the Shivaliks in the north and northeast. Physiographically, the state may be divided into three regions: i) Hilly tract ii) Foothills, and iii) Flat plains. The hilly tract, forming part of the Siwalik hills, extends along the north and northeastern border of the state. The foothill plains are located between the hilly tract and the flat plains in the north and northeastern parts of the state. The major part of the state's physiography is dominated by flat plains; these plains are the result of the alluvium deposits of rivers and are very fertile. Punjab surpasses all other states of India in possessing a large level topography. The flat physiography of the state has proved beneficial for laying roads and creating infrastructure at a low cost, which is very difficult in hilly tracts. Higher accessibility to services and the strong linkage between rural and urban areas are partly due to the flat physiography.

⁸ <http://www.punjabdata.com/Rainfall-In-Punjab.aspx>

⁹ Department of STE, Punjab. Punjab State Action Plan for Climate Change. <http://www.moef.nic.in/sites/default/files/sapcc/Punjab.pdf>

¹⁰ <http://www.punjabdata.com/Rainfall-In-Punjab.aspx>

The plains of Punjab do not have any thick forests. The state has only 6% area under forest against the national average of 19.4 per cent.

Soils in the state are generally sandy loam to loam in texture, which are deficient in nitrogen and organic matter and, therefore, need heavy manuring for good yields

The rivers -- the Ravi, the Beas and the Sutlej -- are perennial streams. All-time availability of water is the major requirement of the state. To cope with the shortage of water, which fluctuates from one season to another; dams and barrages were constructed for regulating the water supply needed to feed irrigation and powerhouses throughout the year. The state has developed a good network of canals. Overall, the physical setting of the state makes it conducive for agricultural development. Punjab has a physiography, which has provided an opportunity for the mechanization of agriculture. This has further helped in achieving rapid strides in agricultural production. Its location on a generally hostile international border since partition, has had its own impact on the development process of the state.

1.1.3 Public health infrastructure in Punjab

Punjab has 2950 sub-centers, 432 PHCs, 151 CHCs and 682 government hospitals. Average population served per government hospital bed is 1638, which is much lower than the national average of 1844.¹¹ Under NRHM, against the target of 17360 ASHAs, the state has 17071 ASHAs working in villages as the frontline health workers.¹²

¹¹ MoHFW, Government of India. National Health Profile 2018

¹² MoHFW, Government of India. pdate on ASHA Programme– January 2017



Epidemiological situation of Malaria in Punjab

The State of Punjab has the history of high number of cases of Malaria in the past, though proportion of falciparum Malaria has been less and the case fatality rate due to Malaria has been insignificant. Punjab has seen a decline in the number of total Malaria cases since 2010 and the decline has been witnessed in all the districts of the State. Taking 2015 as base year, the state of Punjab has witnessed a decline of total Malaria cases of 42% since 2014 and approximately 82% since 2010.

The epidemiological data of the State over the years shows that there has been a sharp decline of Malaria in the rural areas while in urban areas are static. As per NFME (National Framework for Malaria Elimination), API (Annual parasite Incidence) must be taken as a yardstick for measuring the progress towards Malaria elimination. The State has seen a decline in number of areas falling in high API over the years, thus paving the way for Malaria elimination.

With the launch of India's Malaria elimination initiative, the states and UTs have a remarkable opportunity to get rid of this disease and contribute to better health and socio-economic development especially among the country's most vulnerable populations. Punjab is one of the states which is reporting API<1 per 1,000 population in all the 22 districts for the last five years and thus qualifies for Malaria elimination under Category 1 (pre-elimination phase). The Malaria case load for the last ten years is shown in the following graph. The epidemiological data of the Punjab state for the last five years is given in Table 1.

Case Load Malaria, Punjab

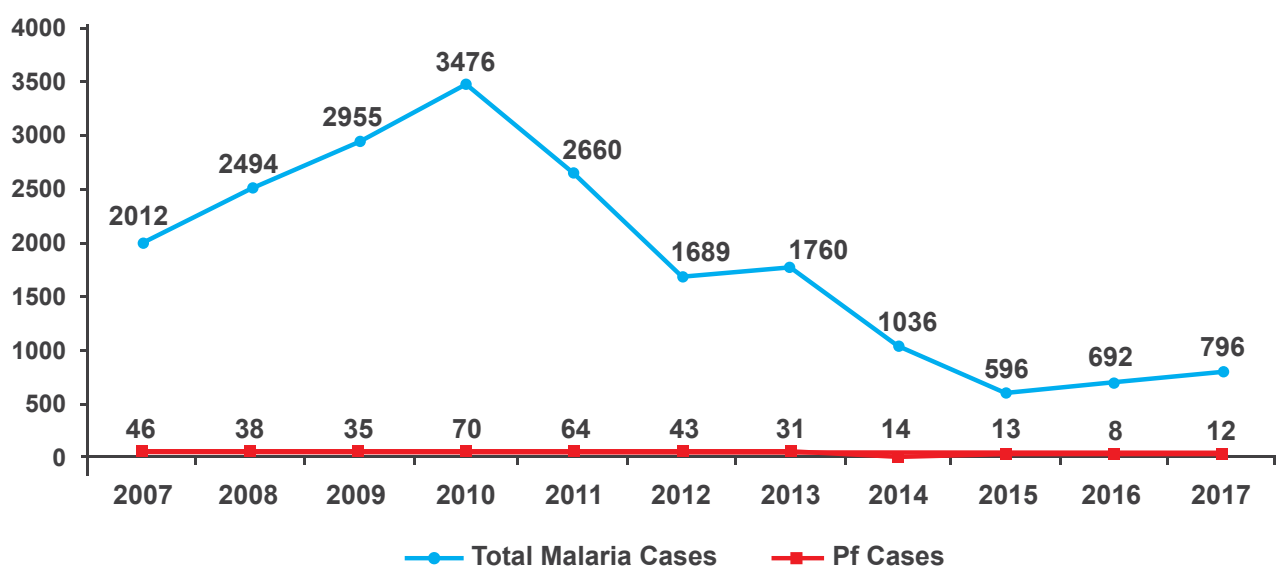


Table 1: Malaria situation in Punjab (2012-2016)

Year	Pop.	BSC	ABER	Tot Pos (Pf)	SPR	API	Death
2012	28589419	2911780	10.2	1689 (43)	0.06	0.059	0
2013	28645496	2971013	10.4	1761 (31)	0.06	0.061	0
2014	28778576	3092693	10.8	1036 (11)	0.03	0.036	0
2015	28984965	3000940	10.4	596 (13)	0.02	0.020	0
2016	29081922	2900640	10.0	692 (8)	0.02	0.020	0
2017*	29641531	2430999	8.2	796 (12)	0.03	0.026	0

Punjab has shown decline in Malaria cases during the last five years from 1689 cases in year 2012 to 796 cases in 2017 (a decline by 57.4%). Most of the cases were reported as P.vivax Malaria, the proportion of Pf was recorded as 2.30% in year 2012, and declined to 1.50% in 2017.

2.1 District wise distribution of Malaria Cases

Review of district wise Malaria incidence during year 2015 – 2017 revealed that eight most affected districts in year 2015 were Mansa, Patiala, Ludhiana, SAS Nagar and Bhatinda which reported more than 50 Malaria cases, while the other three districts were Faridkot, Amritsar and Muktsar Sahib which reported between 30 to 50 cases. In all, 74.2% cases were contributed by these eight districts out of the total 596 cases reported by the state in year 2015. In year 2016, from the list of eight districts, Amritsar reported only 15 cases. However, Hoshiarpur was added to the list as it reported 43 cases. Total contribution of these eight districts was 74.1% of the total cases reported in 2016. In year 2017 the eight most affected districts were Hoshiarpur (189), Mansa (157), SAS Nagar (128), Jalandhar (56), Bhatinda (55), Muktsar sahib (45), Ludhiana (35) and Patiala (31). Of the total cases 796 recorded in year 2017, 691 (86.81) cases were reported by these eight districts. Thus, considering last three years epidemiological data, State of Punjab should have focused attention on ten priority districts for core vector intervention and case management. These districts are Hoshiarpur, Mansa, SAS Nagar, Jalandhar, Bhatinda, Muktsar Sahib, Ludhiana, Patiala, Faridkot and Amritsar.

Malaria Cases 2017

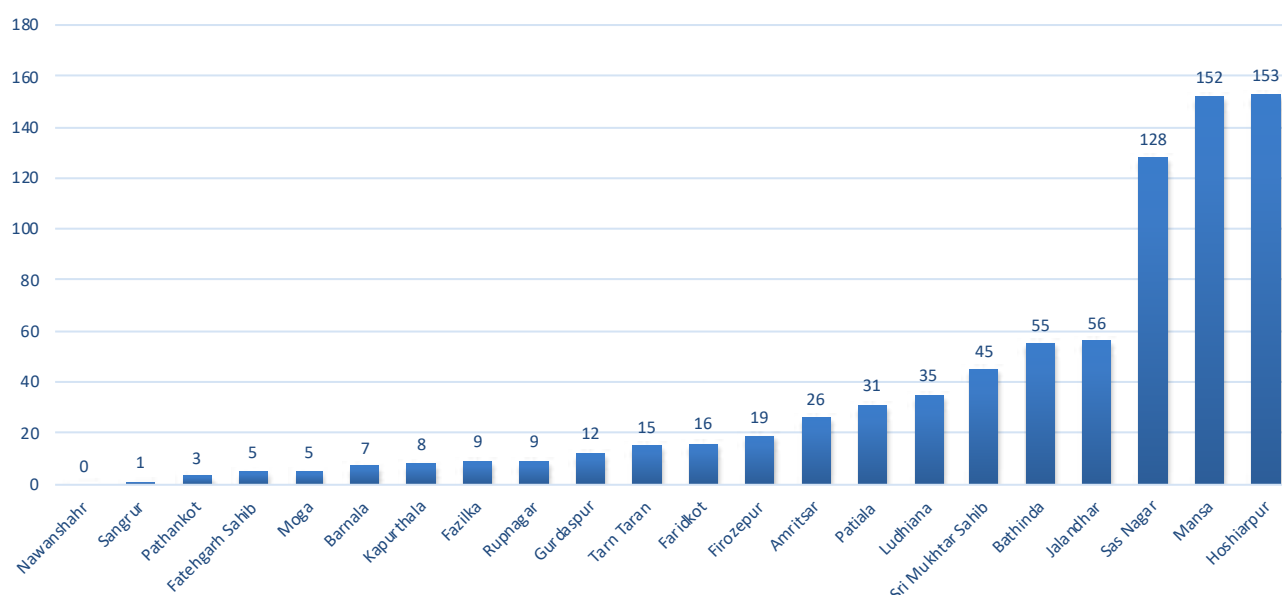


Table 2: below shows district wise distribution of Malaria cases (2015 -2017)

District	No.PHCs	No. SCs	No.Villages	2015			2016			2017		
				Pv	Pf	T	Pv	Pf	T	Pv	Pf	T
1.Mansa	3	107	242	92	0	92	82	0	82	152	0	152
2.Patiala	6	185	948	68	4	72	44	0	44	28	3	31
3.Ludhiana	10	265	926	59	1	60	83	0	83	35	0	35
4.SAS Nagar	3	76	460	58	1	59	107	2	109	128	0	128
5.Bhatinda	6	136	277	56	0	56	89	1	90	53	2	55
6.Faridkot	3	62	184	41	0	41	37	1	384	16	0	16
7.Amritsar	7	179	851	31	3	34	14	1	15	26	0	26
8.Muktsar Shaib	4	102	240	29	0	29	16	0	16	43	2	45
9.Tarn Taran	10	152	531	28	0	28	26	1	27	14	1	15
10.Hoshiapur	9	244	1445	21	0	21	43	0	43	151	2	153
11.Jalandhar	9	198	953	19	1	20	21	1	22	55	1	56
12.Ferozpur	4	122	765	19	0	19	17	0	17	19	0	19
13.Fazilka	4	109	309	19	0	19	7	0	7	9	0	9
14.Barnala	2	71	142	15	0	15	9	1	10	7	0	7
15.Sangrur	7	190	581	11	0	11	15	0	15	6	0	6
16.Gurudaspur	10	222	1324	10	0	10	12	0	12	12	0	12
17.Rupnagar	4	85	652	4	0	4	4	0	4	8	1	9
18.Moga	5	122	332	2	0	2	17	0	17	5	0	5
19.Kapurthala	6	88	580	2	0	2	1	0	1	8	0	8
20.Fatehgarh	2	73	445	1	0	1	0	0	0	4	1	5
21.SBS Nagar	5	95	466	1	0	1	4	0	4	1	0	0
22.Pathankot	3	68	494	0	0	0	0	0	0	3	0	3

2.2 District and PHC wise analysis of Malaria cases

PHC wise analysis was carried out in each district of the state to determine the Malaria Endemicity. Only those PHCs were considered in analysis which consistently reported Malaria cases in year 2015, 2016 and 2017 except PHC Bhunga in Hoshiarpur district that reported 25 and 11 cases in 2015 and 2016 respectively but no case in 2017.

Out of 22 districts in the state, PHCs in 18 districts reported Malaria cases during last three years (2015-2017). In four districts namely Mansa, Hoshiarpur, SAS Nagar and Faridkot all the PHCs reported Malaria cases consistently during last three years, while in other districts variable number of PHCs reported Malaria cases. Out of 125 PHCs, 43 PHCs consistently reported cases during last three years. Distribution of these PHCs table is given below.

District	No. of PHCs	Name of PHC reporting cases for last three years	No. of cases reported		
			2015	2016	2017
1.Mansa	3	1.Khiala Kalan	55	36	27
		2.Sardulgarh	19	11	13
		3.Budhlada	8	4	9
2.Patiala	6	4.Kalomajra	6	10	13
		5.Bhadson	7	5	15
		6.Harpal Pur	2	3	13
		7.Kamli	2	7	4
		8.Shutrana	3	3	1
		9.Dudhan-Sadhan	2	3	1
3.Ludhiana	10	10.Maloud	9	12	5
		11.Sahenewal	5	9	9
		12.Pakhowal	3	4	2
4.SAS Nagar	3	13.Derabassi	11	26	15
		14.Boothgarh	9	10	17
		15.Gharaun	10	6	13
5.Bhatinda	6	16.Sangat	12	9	7
		17.Talwandi	8	4	12
		18.Sabo	2	13	5
		19.Goriana	4	3	5
		20.Nathana Balliawali	9	3	1
6.Faridkot	3	21.Bajakhana	8	15	17
		22.Jand Sahib	1	4	1
		23.Panigrain Kalan	2	1	2
7.Amritsar	7	24.Ramdas	6	8	2
		25.Manawala	1	4	3
		26.Lopoke	1	4	4
		27.Tariska	4	2	1
8.Muktsar Sahib	4	28.Doda	6	3	6
		29.Aalamwala	6	4	4
		30.Lambi	5	1	2
9.Tarn Taran	10	31.Sarhali	4	8	8
		32.Mianwind	2	2	4
10.Hoshiapur	9	33.Bhurga	25	11	0
		34.Harta Badla	20	4	6
		35.Chakowala	8	4	2
		36.Possi	4	5	1

11.Jallandhar	9	37.Shahkot	1	1	2
12.Firozpur	4	38.Mamdot	4	5	5
		39.Ferozeshah	4	5	5
13.Fazilka	4	40.Dabwala	5	1	1
		41.Kalan	2	1	1
		42.Jandwala B.S			
14.Barnala	2	43.Dhauala	1	2	4
15.Sangrur	7	44.Bhawanigarh	2	5	4
		45.Kauhrin	1	1	3
16.Gurudaspur	10	46.Bham	1	5	3
17.Rupnagar	4	47.Chamkaur Sahib	3	1	2
18.Moga	5	48.Kot Ise Khan	2	2	1
19. Kapurthala	6	--	-	-	-
20. Fatehgarh	2	-	-	-	-
21. SBS Nagar	5	-	-	-	-
22. Pathankot	3	-	-	-	-

2.3 Subcenter wise distribution of Malaria cases during last three years

SubCenter Name	Table: Distribution of Subcenter reported Malaria cases consistently for last three years		
	2015	2016	2017
1.Sangatpura	2	2	3
2.Thuthianwali	2	1	3
3.Kalomajra	3	2	1
4.Matorda	3	1	2
5.Guduwala	2	2	2
6.Dalel 7.Singh 8.Wala Khiala	1	1	3
9.Malakpur	2	2	1
10.Bhadonjia	2	2	1
10.Nangle Kalan	1	2	2
	2	2	1

11.Mehta	2	1	2
12.Chauni Kalan	1	1	3
13.Dehton	1	2	2
14.Kotra	1	1	2
15.Burj Rathi	1	1	2
16.Ran Singh Wala	1	2	1
17.Lalru	2	1	1
18. Atla Kalan	1	2	1
19.Mour Mandi	2	1	1
20.Bhadson	2	1	1
21.Nawan Pind	2	1	1
22.Rurka	1	2	1
23. Dulowal	1	1	2
24.Jhakarwala	1	1	2
25.Sarhali	1	1	1
26.Ubha	1	1	1
27.Boha	1	1	1
28. Hoshiarpur Urban	1	1	1
29.Burj Hari	1	1	1
30.Aganpur	1	1	1
31.Bir Bheman	1	1	1
32.Ballianwali	1	1	1
33.Khiala Kalan	1	1	1
34.Burj Dhilwan	1	1	1
35.Kilaraipur	1	1	1
36.Ramdas	1	1	1
39. Bhaini Bhagha	1	1	1
40.Barnala	1	1	1
41.Mansa-1	1	1	1
42.Gharaghna	1	1	1
43.Balad Kalan	1	1	1
44.Wajidpur	1	1	1
Grand Total	57	53	59

Out of 2950 functional subcenters in the state of Punjab 1.5% reported consistently one or more Malaria cases during last three years (2015 -2017). Average number of cases reported per subcenter was 1.4 in 2015, 1.3 in 2016 and 1.44 in year 2017 respectively.

2.4 Distribution of villages reported consistently Malaria cases during last three years

Out of the total 13208 villages in Punjab, 26 villages consistently reported one or more Malaria cases as indicated in the table below. It appears that foci of Malaria persist in these villages, which may be the trigger for new Malaria cases every year. These foci should be investigated to ensure the nature and intervention measures, including, vector control should be undertaken to liquidate them. There should be regular follow up these foci on fortnightly basis till they become inactive or cleared.

Table 3 : Distribution of Villages reported Malaria cases consistently during last three years (2015 – 2017)

Name of Villages	2015	2016	2017
Atla Kalan	5	4	3
Ballianwali	2	1	1
Parolbhatthe	2	12	2
Bhadson	1	2	1
Bhaini Bhagha	9	2	7
Bir Talab	1	1	1
Boha	2	1	7
Burj Hari	1	2	6
Bhai Desa	1	4	4
Guram	1	6	1
Guduwala	1	1	7
Jhakkarwala	4	1	1
Khiala Kalan	8	3	2
Khiala Malakpur	5	2	3
Kilaraipur	4	1	2
Kotra	1	1	1
Mehta	1	2	1
Mour Mandi	2	1	5
Nangle Kalan	2	2	3
Sarhali	7	7	3
Ubha	3	5	2
Boothgarh	4	1	1
Gopalpur	1	2	1
Manakpur Sarff + Bhatte	5	6	7
Toffapur	1	1	1
Uddat	1	1	1
Grand Total	75	72	74



Malaria surveillance needs to be strengthened in the above mentioned subcenters and villages through capacity building of ASHA /MPHW-M in detection of suspected Malaria fever cases and complete treatment of confirmed Malaria cases.

2.5 Migrant population

In-migration has been a consistent phenomenon in the state of Punjab from Malaria endemic states such as Jharkhand, Bihar, Eastern U.P, Odisha and Chhattisgarh in search of livelihood, making the indigenous population vulnerable to Malaria infection. As per report of the state, the proportion of migrant populations varies from year to year basis. Most of the labor populations come during the crop harvesting season, or to work in brick kilns and factories. During the last three years (2015 – 2017), the proportion of Malaria cases among migrants increased to many folds as indicated in the table given below:

Table 4 : Proportion of total malaria cases contributed by the migrant populations

Year	Total Malaria case	Cases in indigenous Pop.	Cases in migrant pop.	Proportion of cases in migrant pop.
2015	594	544	52	8.8%
2016	692	582	119	15.9%
2017	796	533	263	33.0%

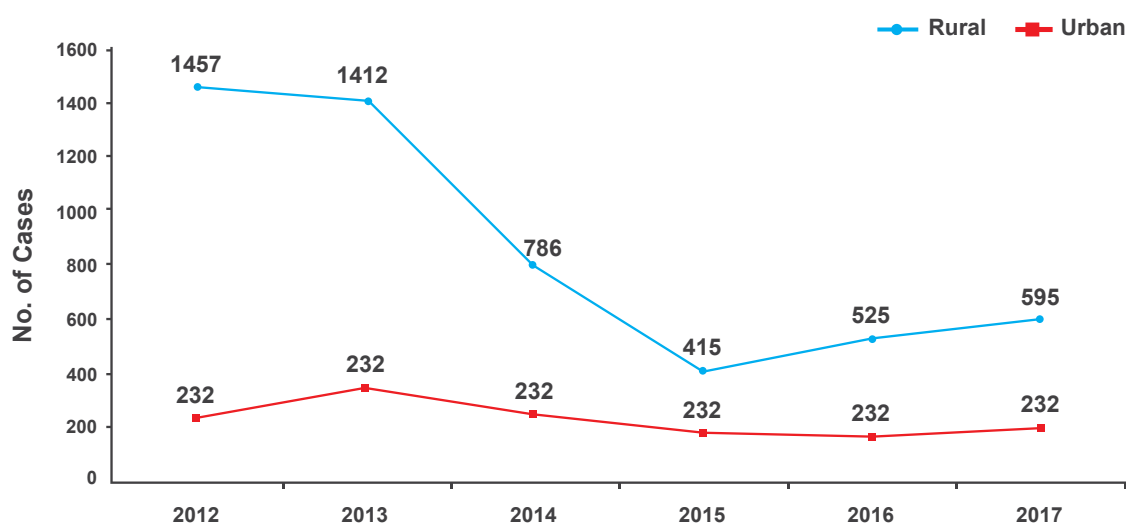


There is need for mapping of places where there is such aggregation of migrant populations to ensure that they are screened for Malaria on their arrival and covered routinely under surveillance. Vector control measures should be undertaken at such places.

2.6 Urban and Rural Distribution of Malaria cases

State has identified 127 urban areas which contributed 181 Malaria cases (30.4%) of total Malaria cases reported in the state in year 2015, which declined to 167 cases (24.1%) in year 2016 and rose to 201 in 2017 (25.2%). Of the 127 urban areas, 31 (24.4%) reported Malaria cases in year 2015, 37 (29.1%) in 2016 and 38 (29.9%) in 2017. However, none of the urban areas had reported API - I -or more during last three years.

Rural/Urban - Malaria



Segregation of Malaria cases by city/ urban area wise, need to be further stratified up to ward or sub-ward level for focused interventions.

2.7 Vector mosquitos

NIMR carried out cross-sectional entomological survey in various rural districts of Punjab, viz. Mansa, Roopnagar, Muktsar, SAS Nagar, Bhatinda, Ludhiana, Patiala and Tarn Taran. Three vector species, two primary - *An. culicifacies*, *An. stephensi* and one secondary – *An. annularis*, were detected. In district Mansa, another vector species *An. fluviatilis* was also detected along with the other three vector species. However, density of vector mosquitos was reported low as the survey was carried out in Malaria non-transmission months. Vector species were found highly resistance to DDT, which was used for focal spray in the state of Punjab in past, however, Vectors were found susceptible to Malathion and synthetic pyrethroid. The use of DDT for IRS has now been stopped due to resistance. The most profound breeding places reported were rice fields, ponds, canals and water seepage from canal, tube well ditches, dam sites and cement tanks. No study on biting rhythm, human blood index, vector incrimination was carried out.

Susceptibility status-NIMR

Susceptibility status for the Year 2017					
Sr.No	Distt	Vector Species	% Mortality		
			DDT	Malathion	Deltamethrin
1	S.A.S Nagar (Mohali)	<i>An. culicifacies</i>	60	100	68
		<i>An. annularis</i>	57	100	90
2	Mansa	<i>An stephensi</i>	62.5	95	100
3	Bathinda	<i>An stephensi</i>	55	92.5	100
4	Ludhiana	<i>An stephensi</i>	60	90	96.7



Systematic longitudinal studies on vector biology need to be carried out in order to determine the optimum mosquito densities and other important indices of epidemiological significance. Study site may be selected in areas where there is evidence of active transmission of the disease. In district Mansa, (district reporting high number of Malaria cases), *An. fluviatilis* has been detected which requires further validation using molecular method. Further, use of DDT has been stopped by the state as the vector species is no more susceptible. Selection of an alternate insecticide used for vector control should be based on susceptibility testing.



Health Infrastructure and required activities for elimination of malaria

The districts of Punjab have adequate health infrastructure; however, deficiency in human resource is present. There are 22 district hospitals, 8 medical colleges, 151 block PHCs (CHCs) 425 PHCs, 2950 subcenters to serve around 3 crore population distributed in 127 urban areas and 13,208 villages. Position of the staff at State level under NVBDCP is indicated below:

Human Resource involved in Programme implementation at State level

Designation	Required	Sanctioned	In position	Vacant
SPO	1	1	1	0
State entomology (NVBDCP)	1	1	0	1
State entomology (IDSP)	1	1	1	0
Zonal Entomologist	0	0	0	0
Assistants Entomologist	1	0	0	0
Insert collector	2	2	1	1
AMO	1	0	0	0
MLTs	2	2	2	0
Pump Mechanics	23	12	5	7

There are eight districts in the state where the posts of District Malaria Officers (DMOs) are vacant and are likely to be filled during the current year. Though four posts of entomologists are required by the state, no post is sanctioned so far. Out of 15 posts of Assistant Malaria Officers sanctioned for the districts, only 5 posts were in position. About 50% positions of MPWs (Male) were lying vacant which are likely to be filled during the current year. Status of human resource available for implementation at district level is given in the table below.

Table 5 : Health resource manpower available at district level

Human Resource available at district level and below

Designation	Required	Sanctioned	In position	Vacant	Hired on contact against vacancies	shortfall	Target in 2018-19/ Status of filling vacant position
DMO (NVBDCP)	22	22	14	8	-	-	8
District Epidemiologist (IDSP)	22	22	16	6	-	-	6
Assistants Entomologist	4	0	0	0	-	-	-
Biologists	22	13	0	13	-	-	-
Insert collector	47	29	6	29	19 on outsource	-	-
AMO	22	15	5	10	-	-	-
MPHS (M)	640	640	611	29	-	-	-
MPHW (M)	2958	2958	1550	1408	-	-	1263 Posts will be filled shortly
MLTs	1018	1018	775	245	-	-	-
Pump Machines	22	9	4	5	-	-	-
ASHA	17745	17745	14972	2771	-	-	-

***1163 POSTS OF MPHW-M HAVE BEEN FILLED BY STATE AND THE DATA IN THE TABLE NEEDS TO BE AMENDED.**



State programme should expedite filling of vacant posts of MLTs to ensure that blood smears are examined and confirmed Malaria cases are treated within stipulated time frame. How best the existing strength of MPHS and MPW (M) can be used in characterization and investigation of each Malaria case detected during the year. Training of MLTs needs acceleration to ensure their proficiency in examination of blood smears collected from suspected Malaria cases. Similarly, MPHS and MPW (M) should be trained in case characterization/investigation and tracking of cases/foci in the community.

3.1 Moving from low to no local transmission

A core set of interventions are already in place in the state of Punjab, including optimum coverage of vector control (IRS), high- quality, timely case management, and an ever – improving information and surveillance system capable of confirming and characterizing cases, intervention coverage and transmission dynamics. **Appropriate insecticide should be used for vector control in malaria foci.**

3.2 Stratification of district by Malaria transmission intensity

The Punjab has already done Stratification at the lowest geographical levels in all the 22 districts for which operational decisions can be made such as subcenter or village catchment area. Village wise stratification of Malaria epidemiological data for all 22 districts is placed at annexure – 1. Analysis of district wise epidemiological data for the last three years (2015 – 2017) revealed mostly areas (villages) with transmission only in discrete foci; and very few villages with low persistent transmission.

In most of the villages in Punjab Malaria cases have not been reported; but as being historically Malaria endemic, continued measures are required to prevent re-establishment of transmission. The risk from reintroduction of Malaria or “vulnerability” is high in villages of Punjab due to high incidence of imported Malaria cases from other Malaria endemic areas, as there is continuous flow of seasonal labor population from an endemic areas such as Jharkhand, Bihar, UP, Chhattisgarh, Odisha etc.

3.3 Progression from low transmission to elimination

Progression from low transmission to elimination passes through a phase in which fewer or more discrete Malaria foci are identified, investigated, and cleared. In settings like Punjab with ‘very low’ transmission, cases will be increasingly more clustered, and surveillance system must be sufficiently sensitive to identify the case clusters in health facility catchment areas or individual villages, to characterize/ classify it and to clear the infections and residual transmission. Surveillance programme must be strengthened so that the staff and systems are fully prepared to undertake this work, which is required for achievement and documentation of elimination.

3.4 Enhancing and optimizing case detection and case management

In the state of Punjab, transmission of Malaria is ‘low’ or ‘very low’ in most of the areas (villages);therefore, it becomes essential to enhance case detection and case management to find out all suspected Malaria cases, test for confirmation of Malaria infections, characterize and classify infections by their most likely place of origin, and report cases and actions taken to the Malaria surveillance system.

3.4.1 Case detection

Interruption of malaria transmission in Punjab requires a surveillance system strong enough to detect all cases in the community by ensuring recording and reporting of all cases that come in contact with any provider (public/ private); identifying hidden/ unreported cases through tracking and active case detection; eliminating risk of residual transmission through reactive case detection.

The Punjab has to gear up both passive case detection (PCD), when patients seek care for their illness from health workers including ASHAs, active case detection (ACD), which requires extension of testing with or without screening to high – risk, vulnerable groups, hard to reach populations or low transmission settings and reactive case detection (RCD), which involves an active response to a case detected either by PCD or ACD. Testing should be conducted with a high-quality diagnostic test and the case reported after confirmation. When people are screened for symptoms before testing, cases are suspected when they occur in people with fever or a recent history of fever, a history of Malaria, anemic of unknown cause or splenomegaly. In areas with low or very low or no transmission, a history of travel to an endemic area is a strong criterion for testing. Information required on cases are given in Annexure – 2.

3.4.1.1 Passive case detection

PCD that is testing of patients passively reporting to the health facility or provider, is conducted in Punjab at the community level by ASHAs as well as in the health facilities ranging from SCs to tertiary care facilities. The state should identify and list all the health facilities, both public and private health facilities where clinical Malaria cases are initially identified in the district including ASHA in villages as PCD, as part of the routine diagnostic and treatment services provided to the population. If the population has good access to health facilities/ health workers, PCD can result in early identification and treatment of cases and reduce the risk of ongoing transmission of Malaria. PCD in the state of Punjab should cover the entire population, including people

living in remote areas; to increase the probability that any case or illness that might be Malaria will be rapidly tested and reported. Each Malaria endemic district in the state of Punjab should identify, by mapping or another means, any communities in receptive areas that are far from public health facilities; add additional alternative health volunteers other than ASHA to those locations to extend the reach of PCD network. Imported cases may occur both in receptive and no-receptive areas and should be correctly managed.

The state currently has 72 passive surveillance centres and other public health hospitals that conducts malariamicroscopy . To ensure access universal access to passive case detection, all public health facilities (irrespective of the microscopy availability) and providers will be provided with malaria RDT for point-of-care testing. RDTs will be used for malaria diagnosis if–

- Functioning microscope and/ or trained laboratory technician for malaria diagnosis is not available
- Result of malaria microscopy cannot be made available within 24 hours due to patient reporting in odd hours or transport delay.

ASHAs in villages situated at a distance of 10 km or more from the nearest SC and/or villages and ASHAs in forested villages will conduct RDTs for malaria diagnosis. The basic principle is to ensure early detection and treatment of a suspected malaria fever case, i.e. within 24 hrs.of appearance of symptoms.

Population in Punjab has a strong preference for private health sector. NSSO 71st round report documented that only 19% of spells of ailment in the population sought treatment during last fortnight from public sector health providers and/ or facilities and in the rural population this is only 17%.¹³ Even for in-patient care private facilities are preferred in the state. (NSSO 71) All private facilities and/or provider should ensure point-of-care malaria diagnosis prior to treatment of malaria and presumptive treatment without testing for malaria is not allowed in Punjab.

Confirmed malaria cases should receive the full recommended treatment (including radical treatment for *P. vivax* to clear persistent liver stage parasites and single dose primaquine for *P. falciparum* to clear gametocytes) and be followed up at recommended intervals to ensure complete cure, as per national guidelines. All confirmed cases should be reported to health information system. It is advisable that both negative and positive results be reported to demonstrate whether testing is sufficient in all at risk populations.

3.4.1.2 Active case detection

ACD requires extra effort to find Malaria cases among people who do not access health facilities in the area, for various reasons, including living in a remote area, population such as migrants, and refugees who may not use or have access to routine health care and asymptomatic infections. ACD may play an important role in elimination programme by detecting infected people who may risk transmitting Malaria but are not detected by PCD. As in PCD patient with confirmed Malaria should receive the full recommended treatment, be followed up to ensure that the infection is cleared and be reported to health information system.

In low transmission settings like state of Punjab or as a part of a focus investigation, ACD may consist of testing of a defined population group without prior symptoms screening (population – wide or mass testing) to identify asymptomatic infections.

In view of the shortage of required strength of male multipurpose workers (MPW) in the state of Punjab, programme may identify areas which require ACD and priorities may be given to such areas for active case detection by relocating MPWs.

¹³ NSSO Report No. 574: Health in India. 71st Round. 2014. Page- 33.

In state of Punjab there is large influx of seasonal migrant workers from Malaria endemic states to work in brick kilns, agriculture and industries which make the local population at risk of acquiring malaria infection. ACD for malaria will be intensified with focus on these areas through the following mechanism–

- Mapping of migrant malaria cases and tracking their route of travel in last one month.
- Identification and mapping of labour populations, seasonal workers, urban slums, construction sites and brick kilns in all districts.
- Fever survey in all urban slums reporting indigenous malaria cases in last 3 years every fortnight for malaria throughout the year.
- Fever survey in brick kilns and construction sites every fortnight between July-September and every month in the rest of the year.

Malaria diagnosis posts should be established in Railway stations and Bus stands in districts with large number of migrant workers to improve access to malaria diagnosis. State of Punjab in collaboration with respective stakeholders /sectors, attracting migrant populations should ensure universalHealth coverage of migrant workers with preventive,promotive and management of confirmed malaria cases.

3.4.1.3 Reactive case detection

Reactive case detection (RCD) is a type of ACD which is conducted in a targeted, reactive fashion after identification (by either PCD or ACD) of a local or imported case. The rationale is that at low transmission intensity, Malaria cases are highly aggregated, thus, where there is one, there will be more. RCD is an important element of an elimination strategy at low transmission intensity and is related to the concept of focus investigations. This type of RCD is determined by how the case is identified, how wide the net is cast around the index case and who is tested. The strategy chosen for a given area depends on local epidemiology and the health system.

3.4.2 Parasitological Diagnosis

Malaria infection is detected in symptomatic suspected Malaria cases primarily in blood by RDTS or by microscopy. RDTs and microscopy can be used to detect almost all symptomatic infections but not all asymptomatic infections. More sensitive diagnostic methods, such as Polymerase chain reaction and other molecular techniques, are used to detect subclinical asymptomatic infections with very low parasite densities. Currently, most molecular methods can be performed in laboratory settings with sophisticated equipment and skilled personnel, they are not recommended for routine case management or surveillance.

State may review the functional status of laboratories with quality microscopy and must strengthen in a time bound manner. Availability of RDTs should be priorities for detection of Malaria cases at community level, special emphasis should be given to vulnerable populations identified by the programme.

3.4.3 Treatment

Malaria treatment should follow the national policies and guidelines. Treatment that fully clears Malaria infection is required in the context of Malaria elimination. Thus, for cases of *P.vivax*, in addition to clearance of blood infection, anti-relapse therapy (primaquine) is required to clear liver stage parasites, and , for all infections caused by *P. falciparum* parasite, a gametocytocidal drug (primaquine) should be administered in addition to treatment for of blood stage to reduce and eventually halt the transmission.

Treatment should be placed through all channels of service delivery such as Public health facilities, private health providers and community outreach through health workers and ASHA. As Malaria transmission and Malaria incidence is reduced, increased coverage and better access to high quality care is ensured through all three channels.

3.4.3.1 Public health facilities

The state should ensure that all health institutions in the public sector should serve as diagnosis and treatment centres for Malaria free of charges to cover all population groups with Malaria who contribute to ongoing transmission including migrant workers. All such health facilities should be registered and notified for monitoring their performance.

3.4.3.2 The private health providers

This sector comprises wide range of health care providers – medical practitioners, licensed pharmacies, unlicensed drug vendors, authorized services for the employees of private companies and not for profit services, such as non-government organizations and faith based organizations. All such practitioners should be listed and should be involved in Malaria diagnosis, treatment and surveillance. Their engagement may require in communication, training, monitoring and, in many cases, provision of quality assured diagnosis and medicines. The state programme should develop a strategy for determining the most appropriate role of various types of private health providers.

3.4.3.3 Community health service providers

Many states in India have well established community case management services through well trained cadre of accredited health activists (ASHA) or alternative health providers like anganwari workers (AWW) that provide diagnosis, treatment and reporting of clinical cases of Malaria free of charge. Technically community health service providers are part of public health services but the providers themselves are often volunteers, who depend on support from health workers in peripheral health facilities, their community or non-governmental organizations. Because community service providers are often the best solution for people living in remote areas. Punjab has a good network of ASHA in rural areas including in vulnerable and hard to reach areas, programme should consider how to ensure high quality community outreach services that include testing, treatment and reporting for confirmed Malaria cases.

3.4.4 Detecting and treating asymptomatic Malaria infection

In areas of low or very low transmission like the state of Punjab where the risk of infection throughout the life is low, few people develop any significant level of immunity. Those infected, even of very low parasite densities, will exhibit clinical symptoms and signs. Therefore, the proportion of the population infected in the absence of clinical manifestations would tend to be very low.

While the elimination programme must provide timely diagnosis and treatment to all Malaria cases, it should consider the local transmission dynamics and determine whether, when and where to seek and treat asymptomatic individuals who do not go to health facilities for care. Such an approach should be considered in the context of persistence of transmission in spite of intensified vector control and sufficient surveillance system.

If the local Malaria transmission persists despite intensive vector control and universally good case management, the programme may consider undertaking special studies to evaluate the distribution and frequency of infections in the asymptomatic population.

If the programme decides that all symptomatic and asymptomatic infections in an active focus must be cleared, the work must be well planned and all efforts made to reach the entire targeted population, including ill and apparently healthy people, young and old. Special consideration should be given to populations, e.g. pregnant women, newborns, mobile populations.



Quality diagnosis and quality treatment of Malaria

As malaria programme progresses towards elimination, consistent quality of work is essential. Quality encompasses overall quality assurance of the health system as well as ensuring quality for malaria services, particularly for detecting, confirming, treating, tracking and reporting of Malaria cases.

One of the essential requirements for Malaria elimination certification is to demonstrate that laboratory services are in place that provide prompt, quality assured parasitological diagnosis of Malaria throughout the state, including the most remote and inaccessible areas. If microscopy is used, WHO standard for Malaria microscopy training, certification and quality assurance should be in place. State should put in place quality diagnosis of Malaria cases in all the districts.

4.1 Quality assurance

Quality assurance for malaria programming requires meeting the gaps in effectiveness and efficiency of existing interventions, ensuring universal access and acceptability of services, as well as equity and safety in patient care— thereby covering the six dimensions of quality.

The quality goals for malaria elimination from the state include the following—

1. Ensuring universal access to 24*7 point-of-care malaria diagnosis within 24 hours of onset of fever.
2. Providing early and complete treatment to all malaria positive cases in alignment with national guideline, ensuring continuity of care and appropriate referral.
3. Providing quality indoor residual spraying in eligible foci and ensuring improved acceptance to minimize the risk of outbreak.

Quality assurance in malaria diagnosis requires—

Access to point-of-care diagnosis through microscopy or RDT for all fever cases suspected of malaria at the site of reporting. This requires availability of WHO-prequalified bivalent Ag based RDT and slides for malaria microscopy with all ASHAs, SCs, PHCs, and higher facilities.

Microscopy allows direct visualization of parasites, determination of species and stages, and quantification of density of parasites. However, it requires well trained laboratory technician and laboratory support.

RDTs are easy to use in communities by both health workers and trained health activists/volunteers; allow detection of parasite antigens and differentiate species. It is either supplied through programme or available in the market and can consistently, detect over 95% of parasite infections with 95% specificity.

RDTs should be available at all levels of community services and designated laboratories. It should be available even at health facilities with good laboratories, because they allow rapid diagnosis when laboratory personnel are absent.

Both RDTs and microscopy must be supported by a quality assurance programme. Data on cases of Malaria are either confirmed by microscopy or RDT in the state without functioning of laboratory quality assurance systems may not be reliable. Variations over the time in implementation of laboratory quality management systems may also influence trends in the numbers of confirmed Malaria cases or Malaria test positivity rates, and with coverage of laboratory services must be considered in data interpretation.

Quality assured malaria diagnosis and microscopy ensures correct diagnosis of all new and relapse cases.. Malaria microscopy requires trained LTs and availability of malaria microscopy in all facilities up to PHC level. Training and retraining of LTs in malaria microscopy and certification on successful training completion are essential. Training is also required for the ASHAs and frontline health workers on slide preparation and RDTs. The core of this activity is availability of standard operating procedures with the health workers, training of new entrants within the cadre and refresher training and monitoring of the already trained workers.

Quality assurance in malaria diagnosis requires a chain of reference laboratories linked to all diagnostic facilities to ensure quality continuum. The National Reference Laboratory for malaria is the apex laboratory for quality assurance in malaria diagnosis in India. At the state level, quality assurance in malaria microscopy will require upgrading one existing laboratory to State Reference Laboratory (SRL). The SRL may be located in a secondary or tertiary care hospital or ICMR body with necessary laboratory space, equipment, reagents, and consumables and sufficiently trained laboratory technicians (microscopists) and should be accredited by the NVBDCP as the reference center for malaria diagnosis. The role of the SRL will be:

- Disseminating standard operating procedures for testing, laboratory techniques, and equipment specifications based on national guidelines to all laboratories engaged in Malaria microscopy in the state and training them to ensure quality implementation of diagnosis services.
- Overseeing internal and external quality assurance, including comparing the sensitivity, specificity and predictive value of tests used in all public and private facilities the state.
- Coordinating the servicing and maintenance of equipment in the laboratory network in the state.
- Ensure that diagnostic equipment and reagents procured meet the recommended minimum criteria and supplied in time.
- Coordinating the referral of samples from district laboratories and providing confirmatory testing.
- Establishing and standardizing management protocols and practices for collecting laboratory data.
- Liaison with National Reference Laboratory.
- Liaison with private facilities having diagnostic services for malaria to ensure quality diagnosis.

All private facilities should use either quality assured malaria microscopy or bivalent antigen-based malaria RDT for malaria diagnosis. The SoPs for malaria diagnosis should be displayed in all private facilities/ laboratories engaged in malaria testing.

Quality assurance in malaria treatment requires eliminating prescription errors and ensuring treatment adherence. Presumptive treatment for malaria is not allowed at any level of provider/ facility, all cases must be provided with complete treatment and followed up for treatment compliance. Random checking and empty strip collection can be used to monitor and ensure treatment completion. Drug quality of antimalarials should be ensured through coordination with state or central drug control authority.



Surveillance

Surveillance of Malaria infection in the human population is the back bone for Malaria elimination. Identifying where the Malaria transmission is occurring with increasing accuracy permits targeted, effective responses where they matter most. Steady improvement in quality, timeliness and use of surveillance information must be in place to ensure elimination work is well directed and monitored. Ultimately, surveillance should become part of intervention, focused on case characterization, treatment and investigation and on identification, management and clearance of transmission foci.

5.1 Increasing sensitivity of surveillance system for elimination:

In Punjab, where the case load is low and all the districts have API < 1, surveillance should include data on individual cases, characterized and classified according to most likely place of origin. Attempt should be made to geo-locate cases to understand where transmission is occurring. Staff at all levels should be trained to examine and evaluate surveillance data, on both disease and operations to monitor programme progress, target interventions and detect problems that require action.

The surveillance system should be robust and sufficiently sophisticated to capture all infections, which can only be achieved through strengthening community outreach services. State has sufficient number of ASHAs whose services can be utilized for community outreach services with back up support of MPHS (M) and MPHW (M), and female health workers to fully characterize each infection and locally investigate the case, and institute interventions for clearance of transmission.

State programme officer should clearly articulate action to accelerate community outreach services and persons responsible for characterization and investigation of each infection and remedial measures to be taken to clear the transmission.

5.2 Surveillance as an intervention to eliminate Malaria:

In Malaria elimination settings like state of Punjab, Malaria surveillance comprises of a set of responses that should allow: i) detection of all Malaria infections (symptomatic and asymptomatic) as early as possible, probably, within 48 hours of detection of index case, ii) prevention of onward transmission from each case through rapid radical treatment and vector control, and iii) Identification, investigation, classification and management of all transmission foci with appropriate measures to terminate transmission as soon as possible.

5.3 Declare Malaria as notifiable disease as a legal requirement by State:

The purpose of such notification is to ensure participation of all health care providers treating Malaria cases in the surveillance system. Identification, investigation, classification of a case (s) reported by health providers should be the responsibility of the local health workers. Malaria is already notified diseases under Epidemic Disease Act in Punjab. Strict implementation of Act has to be ensured so that cases are reported from private sector.

5.4 Case characterization, classification, follow up and response:

Each parasitologically confirmed Malaria case should be evaluated. A case investigation form, as prescribed is completed; for each confirmed Malaria case, which includes characterization of the case – patient's age, sex occupation, residence, history of current illness, including diagnostic test results and treatment, as well as travel history to assess how and where the infection might have been acquired and possibility of onward transmission.

After the case has been characterized, it should be classified as imported, introduced, indigenous, relapsing, and recrudescent or induced according to the definition given in the box below.

Imported case:

Malaria case or infection in which the infection was acquired outside the area in which it is diagnosed. Here outside the area means outside the district boundary as the district is an operational unit.

Index case:

a case of which epidemiological characteristics trigger additional active case of infection. The term “index case” is also used to designate the case identified as the origin of infection of one or several introduced cases.

Indigenous case:

A case contracted locally with no evidence of importation and no direct link to transmission from an imported case.

Induced case:

A case the origin of which can be traced to blood transfusion or other forms of parenteral inoculation of the parasite but not to transmission by natural mosquito born inoculation.

Introduced case:

A case contracted locally, with strong epidemiological evidence making it directly related to known imported case (the first generation of local transmission).

Locally acquired case:

a case locally acquired by mosquito – borne transmission. A locally acquired case can be indigenous, introduced, relapsing, and recrudescent.

Relapsing case:

Malaria case attributed to activation of hypnozoite of *P.vivax* acquired previously.

Recrudescent case:

Recurrence of asexual parasitemia of the same genotype (s) that caused original illness, due to incomplete clearance of asexual parasites after anti-Malaria treatment.

Staff responsible for case classification should be trained in classification and investigation during field exercises and by reviewing case histories. After a case has been characterized the responses should be based on the classification, although all cases should be managed according to national guidelines. Additional responses to address transmission for the different classification should be dealt accordingly.

5.4.1 Imported cases:

The imported case is one which is acquired outside the area (district) in which it was diagnosed in the elimination phase, the area should usually correspond to a focus or district. Such cases should be reported as “indigenous” in the area in which they were acquired (outside the district) and as “imported” in the area in which it was detected.

Subsequently, an adequate response should be made to a case detected in a receptive area where it could generate secondary cases. In reporting to WHO, only cases reported from other countries should be considered “imported”.

The main concern with the imported cases is spread of the infection in the local area. Following measures are recommended to stop the spread of infection: i) the household and neighboring households of such a case should be alerted and asked to report any suspected Malaria illness, ii) an investigation with screening and or testing of people in the case household and possibly neighboring households, could be undertaken to identify additional infections. The finding of other cases, perhaps characterized as “introduced”, suggest local transmission, and activities to stop transmission should be instituted. However, receptivity and vulnerability of the area should be considered.

5.4.2 Local cases:

Local cases can be indigenous or introduced. It may be difficult to distinguish between these categories, however, this is not important in early stage of Malaria elimination, because all such cases indicate the presence of recent local transmission. This distinction becomes more important during the interval just before certification of Malaria free status, when the occurrence of some introduced cases, rigorously validated, is not an impediment to certification.

5.4.3 Relapsing or recrudescent cases:

In elimination settings, a person infected locally before the transmission was interrupted could have a relapse or a late primary attack of *P. vivax* Malaria. A relapsing case requires radical cure as per national guidelines, which includes an anti-Malaria drug for asexual stage and primaquine at a dose of 0.25mg per Kg body weight daily for 14 days. Further, investigation should be carried out in case household and neighboring households, as for imported cases described above.

A locally acquired Malaria case may be detected after transmission has been interrupted because of long latency in the blood, such cases have been described for *P. falciparum*. If careful investigation of such a case provides strong evidence that it was indeed acquired locally by mosquito infection before presumed interruption of transmission, it may be classified as “recrudescent”, and its occurrence should not preclude certification. Such cases should be treated as per national treatment guidelines.

5.4.4 Induced cases:

A case the origin of which can be traced to a blood transfusion or other parenteral inoculation of parasite is not due to mosquito borne transmission. It should be managed, promptly. If there is a risk of ongoing transmission in the area, surveillance staff, the case household and neighbors should be alerted and asked to report any suspected Malaria illness.

5.4.5 Unclassified cases:

Cases which cannot be classified should be reported separately.

5.5 Focus identification, characterization, classification and follow-up:

Focus is a defined and circumscribed area situated in a currently or formerly malarious areas that contains epidemiological and ecological factors necessary for Malaria transmission. Foci can be classified as active, residual non-active and cleared.

It should be noted that a focus may not necessarily have active transmission, foci can only be identified in Malaria receptive areas. Foci are described and delimited to identify areas in which appropriate interventions should be deployed or maintained. Focus investigation is conducted to determine the response measures that are necessary to eliminate or prevent reestablishment of transmission.

5.5.1 Identification of a focus:

A focus can be identified in several ways. For example, the investigation of an individual case may lead to the recognition of additional locally transmitted cases around the case household and further investigation shows that transmission is limited to a geographically defined area. Active investigation of areas previously defined as “at risk” and may identify a transmission focus.

5.5.2 Investigation of a focus:

Once a focus is identified, an investigation is launched to delimit and characterize the area and the population at risk, and a focus investigation form as given in Annexure-3 is completed. The investigation is more extensive for a new focus, whereas detection of a new case in known active foci will trigger a new focus investigation only if it features (e.g. parasite species or location) differ from those previously detected cases.

The area to be covered is determined by an initial rapid assessment based on the results of ACD and entomological and community social and behavioral investigations.

The focus investigation will then identify the main features of the location, including populations at risk, location of actual or potential breeding sites, likely vectors, and if possible insecticide susceptibility and behavior.

A map should be prepared of the location of case households, geographical features relevant to Malaria transmission (e.g. water bodies, forest, altitude etc.), other habitations, health facilities and roads, as well as coverage of all interventions.

5.5.2.1 Practical aspects of focus investigation:

1. An initial ACD survey should be carried out and completed within 7 days of identification of detection of the focus.
2. State programme should prepare a standard operating procedure and should be used to determine the timing of initiation and completion of focus investigation, including reporting and response.
3. Once the field investigation is completed, the team should be able to determine the extent and factors driving the local transmission, and to characterize the focus. Response plan will be prepared by local health workers in consultation with the supervisor and other experts.
4. Copies of the completed case and focus investigation forms, and line list of records of all cases identified in the focus should sent to the state, national level and the reporting health facility. The situation and response plan are communicated to local health staff, community leaders and relevant local actors.
5. The district Malaria officer is responsible for ensuring that a register of foci is established, all foci are investigated and reports on all foci should be available and kept up to date.

5.5.2.2 Classification of foci:

Once investigated, the focus may be classified into one of the three types, i.e. active, residual non-active and cleared. Definitions and operational criteria are explained in the following table:

Type of focus	Definition	Operational criteria
1. Active	A focus with on-going transmission	Locally acquired case(s) have been detected within the current calendar year.
2. Residual non-active	Transmission interrupted recently (1-3 years)	The last locally acquired case (s) Was detected in the previous calendar year or up to 3 years.
3. Cleared	A focus with no more transmission for more than three years.	There has been no locally acquired case for more than 3 years, and only imported or/and relapsing or/and recrudescence or/and induced cases may occur during the current calendar year.

Foci should be recognized and their classification upgraded immediately after detection of cases. Reclassification should be based on regular review, usually at the end of the transmission season.

A register of foci should be maintained at district, state and national levels, which is updated with new data on interventions and findings as they accrued. Focus classification should be updated at the end of the transmission season. Residual non-active foci should remain non-active (no-indigenous cases) for three years before programme applies for Malaria elimination certification.

5.5.2.3 Response measures:

Response measures are required to be undertaken in all the three types of Malaria foci; however, the nature and extent of intervention measure may vary. Following principles should be observed while considering response to foci:

- Assessment of vector control measures: vector control measures should be assessed for their appropriateness, coverage and use and increased according to the characteristics of Malaria in the area with attention to its receptivity.
- PCD services are available to all members of the population throughout the year with supervision at defined intervals.
- For active foci, various options exist: a) high coverage of appropriate vector control should be maintained; ACD with screening and testing or with testing alone can be considered at appropriate intervals, especially just before or during transmission season. If testing is chosen and no cases have been found after several rounds of ACD, the frequency of testing may be reduced or strategy may be changed for active surveillance for suspected cases of clinical Malaria that can be tested and managed accordingly. In some circumstances mass drug administration may be appropriate.
- For non-residual active foci: ACD may be considered at key times e.g. the mid and late transmission season), and people most likely to have Malaria, e.g. those with fever, migrant laborer are screened to identify local cases, indicative of ongoing transmission. If several rounds of ACD reveal no cases, the frequency may be reduced. If new introduced or indigenous cases are identified, further evaluation of focus is required to determine whether there is local transmission, which would require additional action.
- For cleared foci, the programme should rely on the surveillance system to rapidly identify any cases of suspected Malaria and determine whether local transmission has resumed.

5.5.3 Special surveys:

The most important surveys or special assessments in the elimination settings may be those on operational factors, such as coverage of key prevention interventions, the quality and availability of diagnosis, understanding of how to identify and manage a suspected case, and have to investigate a confirmed case. Where appropriate, population level information on intervention coverage and use can be collected during the case and/or foci Investigation. Health facility survey may be used to investigate the quality diagnosis and treatment of Malaria.

5.5.4 Data Management, analysis, feedback and decision making:

All major components of a malaria surveillance system should be integrated into broader health management information systems (HMIS). However, to progress towards elimination, a computerized geo-referenced database collected through a vertical surveillance system, should be in place that covers all cases, including those seen outside the public health system. The data base will support programme management and can be used for in-depth analysis and response. Decision-making with regard to active surveillance and screening for malaria should be decentralized to district level to ensure early and rapid response to all outbreaks with progress towards transmission interruption. For this purpose, all front-line staffs involved in case detection, recording and reporting of cases should be the first user of data. To achieve this, the front-line health workers should be trained in examining and evaluating data from surveillance. However, a major challenge in this capacity building is the learning curve of community level health workers, i.e. ASHAs. Therefore, examination and evaluation of data can be carried out in district and block headquarters and decision-making can be decentralized through dissemination of findings and collective action setting engaging the front-line health workers at monthly interval in each block and in district level.

In elimination settings in Punjab, surveillance is linked to specific responses that should allow the early detection of all cases of malaria infection (including symptomatic and asymptomatic infections) as early as possible; the prevention of onward transmission from each case through prompt, radical treatment and vector control; and the identification, investigation and management of all transmission foci, with appropriate measures for interrupting transmission as soon as possible. Therefore, records and reports of mass screening, and special services should be reported in the same levels as that of the routine reporting system, with special mention of source of data and surveillance/ survey type.

During elimination, cases must be notified immediately to the field team, and data may be transmitted as a patient line list almost daily.

Repositories of all Malaria reports, records of case detection, entomological surveys and intervention quality and focus investigations, special surveys, case registers, should be maintained at district and state levels.

5.5.5 Monitoring drug efficacy:

As the state of Punjab has progressed to very low numbers of indigenous malaria cases, monitoring of drug efficacy should be integrated into malaria case surveillance by the state. Once efficacy monitoring has been integrated into overall Malaria case surveillance, treatment should be given to all confirmed malaria cases under direct supervision. At a minimum, the patient should be assessed clinically and parasitologically daily for at least for first three days and weekly thereafter until day 28 or day 42 for ACT containing a partner drug with a long half- life.

5.5.6 Quality and performance indicators of surveillance:

Indicator	Target	Achievement	Data Source
1. Annual blood (ABER) examination rate by district and focus by RDT or microscopy	To be set by district and state		Malaria case and case detection database
2. Percentage of microscopy results cross-checked by national reference laboratory	100% positive results and 10% negative results		Reference laboratory database
3. Percentage of testing laboratories participating in WHO recommended microscopy quality assurance assessments	100%		Reference laboratory database
4. Percentage of expected monthly reports received from health facilities and other health service providers (with number of patients tested for Malaria and number positive)	100%		Malaria case and Malaria detection data base
5. Percentage of cases notified within 24 hrs of detection	100%		Malaria case and Malaria detection data base
6. Percentage of cases with completed case investigation form submitted within stipulated delay	100%		Malaria case and Malaria detection data base
7. Percentage of foci for which completed investigation form submitted within stipulated delay.	100%		Malaria focus database
Case management			
1. Percentage of patients who received parasitological test	100%		Malaria case and Malaria detection data base
2. Percentage of confirmed Malaria cases who received treatment according to national policy	100%		Malaria case and Malaria detection data base



Vector Control Intervention

Vector control strategies, such as use of insecticide treated mosquito nets (ITNs)/ Long lasting insecticide mosquito nets (LLINs) and indoor residual spray (IRS) , together with prompt access to diagnosis and effective treatment (case management) are critical for reducing Malaria morbidity and mortality and reducing Malaria transmission in all areas. Continued access to core Malaria prevention will be required even as transmission is markedly reduced because a large proportion in reduction in malaria receptivity is due to vector control. Thus, in the State of Punjab, where the disease has been reduced and mostly focalized, vector control will accordingly be targeted for defined at risk population to interrupt transmission.

6.1 Core vector control interventions:

ITNs/ LLINs and IRS are core intervention for reducing human biting rate and vector survival, which significantly reduce vector efficiency and Malaria transmission. ITNs/LLINs provide protection for the occupants of house against biting Malaria mosquitoes by killing them before they can take blood meal, whereas IRS kills mosquitoes that rest indoors after they have taken a blood meal.

While the effectiveness of both these interventions is maximal with high coverage, their impact is temporary and depends on their maintenance, premature withdrawal of ITNs/LLINs and IRS can result in a rebound of malaria transmission to pre-existing level.

Optimal coverage of ITNs/LLINs or IRS should be maintained in strata that are both receptive and vulnerable to Malaria transmission.

A significant advantage of IRS for the containment of malaria foci is that it does not require human behavioral change except when people refuse access to their houses or re-plaster their walls soon after spraying. Unlike ITNs/LLINs, which remain effective during several transmission seasons, IRS may be effective for only two to six months, depending upon the insecticide formulations and spray surface.

Failure to achieve high coverage and high - quality implementation of either ITNs/LLINs or IRS should not be compensated by adding the other intervention.

6.2 Supplementary vector control intervention:

Evidence from various areas indicates that residual Malaria parasite transmission occur even with good access to and use of ITNs/LLINs or well implemented IRS, as well as in situations where ITNs/ LLINs use or IRS are not practical. The behavior of human and vector is responsible for residual transmission.

Additional vector control measures should be practiced to supplement ITNs/LLINs or IRS on the principal global vector control response. Such supplementary intervention, such as larval source management can accelerate reduction in transmission intensity.

6.3 Vector control intervention in active transmission foci:

Decreasing transmission in the state of Punjab has resulted heterogeneity in Malaria transmission, leading to ongoing transmission in foci, in which vector control should be enhanced. Such foci may be due to intense vectoral capacity, inefficient prevention and treatment, changes in vector or parasites that make the current strategies less effective, or reintroduction of malaria parasites by the movement of infected people or more rarely, infected mosquitoes.

State should identify such active foci in different parts of the state and cover them with appropriate vector control measures. Before selection of Insecticide for IRS, susceptibility to currently used insecticide should be evaluated. Similarly, before procurement of ITNs/LLINs, behaviour of the people should be assessed in respect of their acceptability and usage of such nets. Supplementary vector control may be justified for some settings.

6.4 Vector control in residual non-active foci:

Soon after liquidation of foci has been achieved, vector control coverage should be maintained in receptive areas where there is substantial risk of reintroduction (vulnerable areas). WHO recommends that :

1. In areas with recent local Malaria transmission (residual non-active foci), continuation of vector control is recommended. Optimal coverage with effective malaria vector control of all people in such areas should be pursued and maintained.
2. In areas where transmission has been interrupted for more than three years (cleared foci, discontinuation of any vector control should be based on a detailed analysis, including assessment of receptivity and vulnerability of the area and the capacity for active disease surveillance and response.

6.5 Monitoring and evaluating vector control intervention:

The programme should identify and use relevant indicators according to their priorities, especially process indicators, in accordance to strategic and operational plan. Any indicator measured should generate data that can be used for response.

The Effectiveness of ITNs/LLINs or well implemented IRS depends on the timing and location of blood meals. Strategies for sampling adult mosquitoes are not effective for all vector species and do not work equally well indoors and outdoors, except of human landing catches. Paired (indoor and out indoor) all-night landing catches at the time of the peak vector population enable simultaneous determination of the relative frequency of outdoor and indoor-biting and time of biting.

Good understanding of the behavior of the local vector species (feeding, resting and breeding preferences and of the human population (socio – cultural factors such as mobility, extent of uptake of preventive measures by vulnerable populations such as forest workers, and difficulty in achieving optimal adherence to anti-Malaria treatment) should be the basis of a plan to control Malaria in such areas of residual transmission.

6.5.1 Monitoring Indicators for vector control interventions:

Indicator	Target	Performance	Data source
1. Percentage of active and residual non-active foci covered with ITNs/LLINs by year	100%		Operational records
2. Population of population living in receptive and vulnerable areas covered by ITNs/LLINs by year	100%		Operational record
3. Percentage of active and residual non-active foci protected by IRS by year	100%		Independent foci survey
4. Percentage of population living in receptive & vulnerable areas protected by IRS by year	100%		Independent foci survey
5. Percentage of potential larval habitats in active and residual non-active foci treated with larvicides.	As per state targets		Independent habitats survey
6. Percentage of potential larval habitats in active and residual non-active foci in which environmental modifications is implemented.	As per State targets		Independent habitats survey



Strengthening the Enabling Environment

Malaria elimination, needs to be embedded in, and supported through, a strong enabling environment that can ensure that efforts are expanded in an effective and sustainable manner. The main activities to contribute to the enabling environment are as follows:

7.1 Political commitment:

High level political commitment in the state is necessary to secure domestic funding, to ensure flexibility in the programme of decision making, asubstantial investment is needed to demonstrate that the government is willing to do what it takes to ensure elimination and maintain it once it has been achieved. Involvement of local political leaders is important at every level to secure community support and engagement in the programme.

7.2 Robust health sector Response:

Malaria elimination depends on a high level- performing health system, especially, primary health care system that can deliver malaria interventions of good quality and coverage. Effective coverage depends not only on access to the interventions but also on provider compliance, patient adherence and individual benefit. For elimination programme to succeed, health system should be evaluated for basic health care infrastructures, commodity delivery system, pharmaceutical regulation, human resources, and vital registration system to improve the environment in which the national Malaria programme operates. Strong collaboration between Malaria programme and other health programmes – such as reproductive health, maternal and child health programmes, laboratory services and regulatory authorities (for diagnostic, medicines and insecticides) is essential for the successful implementation of Malaria interventions.

7.3 Enact the necessary legislation and regulations:

Punjab has already enacted and notified legislation for compulsory notification of all confirmed cases of Malaria detected in public and private health care facilities and laboratories. Programme should monitor how effective is this legislation in strengthening malaria surveillance system. Additionally, strengthened regulations may be required for careful approval of products and tools and their use in the state.

7.4 Partnerships across sectors:

Malaria elimination is unlikely to be achieved only by the conventional health system, many government departments and society should forge a strategic partnership for effective implementation of malaria elimination.

7.5 Community engagement:

Engaging the communities targeted for interventions is important for Malaria elimination. The required level of coverage, particularly as malaria prevalence is reduced to very low levels, can be achieved and sustained only if communities are fully supportive. If local communities feel that they own programme and are actively involved in its implementation, activities will be easier to implement, and coverage targets will be more likely to be achieved. Building community and local political support for elimination of malaria may be achieved by involvement of institutions like *Village Health Committees* (VLC), *Rogi Kalyan Samitis* (RKS) at block and district level, constituted under National Health Mission can be leveraged for building community engagement.



Strategic and operational plan for moving from low Malaria to Malaria-free status

Planning for elimination should be linked with national and local planning. It should begin with an assessment of the epidemiological, operational and financial situation of the programme, including what is currently working well and any gaps and challenges.

8.1 Vision:

Malaria-free Punjab

8.2 Goal:

To achieve zero indigenous malaria transmission by year 2020 and ensure readiness for prevention of reintroduction beyond 2020.

8.3 Objectives:

- Reduce malaria incidence to zero indigenous cases to achieve malaria free status
- Reduce numbers of active malaria foci to zero level
- Maintain zero malaria deaths

8.4 Operational Unit:

District will be the operation unit for achieving elimination of malaria, i.e. district will be eligible for entering elimination phase when all the lowest geographical units i.e. village attains zero indigenous transmission of malaria infection. Thus, each district should carry out block, subcenter and village wise stratification of confirmed malaria cases during last three years and those villages reporting continuously such cases should be identified as malaria foci for further characterization, investigations, classification and appropriate responses. In addition, new cases detected during the current year will be identified, characterized, classified and treated appropriately as per national guidelines. Any additional village(s) that have reported new confirmed indigenous malaria case(s) other than the villages already identified for malaria foci, will be treated as new active foci and followed up till declared as cleared. The state will be eligible for malaria elimination certification when no indigenous case of malaria is identified consistently for three years from the date of last reported malaria confirmed indigenous case.

8.5 Categorization of districts:

As Punjab is a Category 1 state eligible for malaria elimination by 2020, the districts within the state were put into a new categorization, different from the NSPME. The purpose of this new categorization is to ensure adequate programmatic focus and resourcing across districts in a phased manner.

Under the new categorization, districts (Kapurthala, Fatehgarh, SBS Nagar and Pathankot) that have reported no malaria foci during last three year (2015 -2017) i.e. not a single village reported malaria case continuously for last three years, have been categorized as New Category – 1 districts. Sporadic case(s) reported needs investigation, characterization and classification. It is envisaged that all these districts will enter elimination phase by the end of December 2018. Malaria requires prevention of reintroduction in these districts beyond December 2018 and occurrence of even a single indigenous malaria case will be considered as an outbreak in these districts.

New Category- 2, i.e. the second category of 6 districts, namely, Fazilka, Barnala, Sangrur, Gurdaspur, Rupnagar and Moga, which have reported very low number of malaria cases but reported consistently 1- 3 foci (villages) during last three years (2015 – 2017). These districts are targeted to enter elimination phase by end of July 2019.

Five New Category– 3 districts, namely, Tarn Taran, Hoshiarpur, Jalandhar, Firozpur and Amritsar have reported low number of cases but there were 4 – 6 foci (villages) that consistently reported Malaria cases during last three years. These districts have been targeted to enter elimination phase of the programme by the end of 2019.

New Category– 4 districts are Mansa, Patiala, Ludhiana, Sas Nagar, Bhatinda and Faridkot which have reported consistently high incidence and more cases as compared to other districts during last three years. The number of foci (villages) reported by this group of districts were > 6 during last three years (2015 – 2017). These districts are targeted to enter elimination phase by the end of 2020.

8.6 Milestones and targets:

Following milestones and targets are indicated to achieve the Goal of malaria elimination in the state of Punjab. Considering heterogeneity of Malaria incidence in the state, districts have been categorized into four categories.

Table 6 : Milestones and Targets

1.Reduce incidence of Malaria cases and achieve zero indigenous cases	December - 2018	July - 2019	December -2019	December - 2020
	Category -1 districts: Kapurthala, Fatehgarh, SBS Nagar and Pathankot	Category -2 districts: Tarn Taran, Hoshiarpur, Jalandhar, Ferozpur, Amritsar, and Muktsar Sahib	Category -3 districts: Fazilka, Barnala, Sangrur, Gurudaspur, Rupnagar and Monga	Category -4 districts: Mansa, Patiala, Ludhiana, Sas Nagar, Bhatinda and Faridkot
2.Reduce numbers of active foci (34)		Ten (10) active foci transit to residual non-active foci	Twenty-four (24) active foci transit to residual non- active foci	Thirty-four (34) active foci transit to residual non- active foci
3. Maintain zero Malaria transmission	Zero	Zero	Zero	Zero

8.7 Accelerate efforts towards elimination of Malaria:

8.7.1 Refocus programme:

The state of Punjab has low number of malaria cases and will further go down with efforts to eliminate malaria, the programme priorities and activities need to be readjusted to complete the final phase of elimination. Thus, in addition to interventions mentioned, programme should enhance surveillance to ensure that every infection is detected, implement targeted measures for attacking both parasites and vectors to interrupt local transmission, eliminate all parasite from humans and manage the risk of re-establishment through imported malaria. There should be reorientation of health staff to understand the new categorization and the required sensitivity of surveillance and case management as the number of cases are reduced.

8.7.2 Review political commitment and local level collaboration:

Final phase of elimination needs strong political commitment, predictable financing and increased collaboration between neighboring border states and other endemic states from which migrant workers come into the state. Efforts are needed to protect migrant workers in the state of origin by informing them of the risk of spreading the disease in the state of destination. Solutions should be found for migrant workers within the state by providing them access to prevention tools and treatment through accessible health clinics. Programme should identify such places of aggregation of migrant workers for appropriate interventions.

8.7.3 Reduce the number of undetected infections:

Ensuring that Malaria parasites are fully cleared from infected people will require new approaches. Strategies, such as mass administration of medicines have been successfully used in the past, in special situation such intervention can also be explored.

8.7.4 Leverage enacted legislation:

Malaria has already been included under notifiable disease by the state government of Punjab with the objective to include compulsory notification of all confirmed cases of malaria infection detected in both public and private health care facilities. Programme should facilitate in creating enabling environment for reporting cases as well as making arrangement for adequate stock of anti-Malaria drugs and facilitating diagnosis and complete treatment of cases. Enabling environment can be ensured through regular stakeholder consultations, wide dissemination of state action plan for malaria elimination, orientation of regular health staffs, and a scalable and sustainable social and behavior change communication that highlights the shift from control to elimination paradigm in malaria response. Efforts should also be made to regulate dispensing of anti-malaria drugs through pharmacies and chemists.

8.7.5 Implement targeted vector control:

Programme should realize that as transmission decreases to low level, universal coverage of population at risk of malaria with control intervention should be maintained in most settings to prevent resurgence. A shift from universal coverage to targeting of vector control to specific populations is required.

8.7.6 Prevent re-establishment of local Malaria transmission:

Even when the disease has been eliminated from an area, continuous importation of malaria cases into Punjab means that the quality of case detection must remain high. Vigilance for possible renewed local transmission is a responsibility of Local ASHA and front-line health workers, MPHW (M&F). There should be good collaboration with other sectors like agriculture, panchayat raj, environment and forest, industry, and their ground level workers in reporting suspected malaria cases from the field.

8.7.7 Strengthen routine information system:

As progress is made towards elimination, it becomes necessary to investigate individual case of infection or cluster of cases to understand risk factors and eliminate foci of transmission. Sufficient investments must be made in the management and use of data from improved routine information system to generate information needed for programme planning, implementation and evaluation. Data reporting requires management with quality controls in place and good follow up. Building the technical capacity of staff for data analysis and interpretation is the overriding need to enable programme to use surveillance information most effectively.

8.7.8 Devise *P. vivax* specific strategies for compliance

Punjab faces a greater challenge to eliminate malaria because of preponderance of *P.vivax* infection. For elimination to succeed greater attention must be given to *P. vivax* as dormant hypnozoites are more difficult to detect because the parasitemia is low and the dormant hypnozoites residing in the liver cannot be detected with existing diagnostic tools. Hypnozoites can give rise to multiple relapses and contribute to significant morbidity and onward transmission.

P. vivax can only be eliminated through a 14-days course of primaquine, which can produce severe side effects (Hemolytic anemia) in patients who have glucose-6-phosphate dehydrogenase deficiency and such treatment is contraindicated in vulnerable population groups such as infants and pregnant women. Testing of glucose – 6-phosphate dihydrogen deficiency is challenging and are not available in many settings.

Frontline health workers should be trained about the side effects of primaquine and referral of such cases to higher health facilities. State programme may devise follow – up treatment cards to *P. vivax* cases in the state to ensure supervised administration of primaquine for 14 days. Follow up slides on 15th day should be prepared and examined by a proficient laboratory technician to ensure completion of treatment. G6PD testing should be a focus activity of the proposed State Reference Laboratory and in the interim period of upgradation of a state laboratory to SRL, the NRL will function to support G6PD testing as the predicted burden of G6PD is low considering low prevalence of G6PD in India and very low case load of malaria in Punjab.



Operational Action Plan for Elimination of Malaria in State of Punjab by 2020

9.1. State-level operations and performance indicators

Activities/ Sub-activities	Responsibility	Performance indicator(s)	Timelines	Remark
A. Strengthen programme management and coordination				
Develop human resource development plan including filling up of vacant positions to meet capacity gap at state level	State NVBDCP	1. HRD Plan developed for all districts 2. List of district-wise HR in position updated 3. Mapping of state and district level HR vacancies prepared and submitted to Government of Punjab for filling up	September 2018	
Train all malaria dedicated staff on programme management, planning and technical guidance on malaria elimination	NVBDCP, Delhi State NVBDCP District VBD Office WCO	1. Orientation Training of all officials and staff at State NVBDCP completed	October-November 2018	State- and WCO-TA
		2. Training of all DVBDs completed– Two days orientation training of district level officials on concept of malaria elimination programme.	August-December 2018	
		3. Training of all BMHO and BPM completed– Two days orientation training of block level staffs on concept of malaria elimination programme	October 2018	
Review and update relevant key policy and standard operating procedures (SoPs) to align with elimination goals	NVBDCP, Delhi State NVBDCP	Guidelines and/or SoPs for– a. Diagnosis b. Laboratory methods c. Treatment d. Vector management Updated	September 2018	

Conduct annual planning and review meeting for development of state annual action plan for malaria elimination	State NVBDCP	a. Meeting conducted before developing District Action Plan and State PIP b. All DVBDs participate in the meeting c. Malaria transmission status and logistic requirement for all districts reviewed d. District-wise annual action plan developed	January 2019	
Constitute State Task Force/ Advisory Body for Malaria Elimination; develop terms of reference (ToR) and conduct Task Force/ Advisory Committee meetings on malaria elimination	State NHM State NVBDCP	ToR for State Task Force/ Advisory Body for Malaria Elimination Developed Member and Responsibility mapping completed	September 2018	
		Task Force is approved by State Health Department	October 2018	
		Task Force members hold first meeting on malaria elimination	November 2018	
Form state-level independent Malaria Elimination Committee for validation of progress towards elimination	State NVBDCP, NVBDCP, WCO	ToR Developed Member and Responsibility mapping completed	September 2018	
		MEC Endorsed by WHO and NVBDCP Delhi	November 2018	
		MEC members conduct first monitoring visit to review elimination readiness and feasibility	December 2018	
Designate focal person for partnership and coordination at state programme division	State NVBDCP		August 2018	
Conduct bi-annual coordination meetings with military, paramilitary, civil police, railways, and other sectors to align malaria policies for prevention, case management and surveillance with state programme	State NVBDCP WCO support	Two inter-sectoral meetings conducted (First in May, Second in October) each year	October 2018 May 2019 October 2019	

Identify and map partners (public and private sector) supporting malaria elimination agenda on six-monthly basis	State NVBDCP-WCO	Partner map developed and submitted to State NVBDCP Partner map reviewed and updated twice in a year	December 2018	
Monthly coordination and review meeting with all stakeholders under the chairmanship of District Collector	State NVBDCP	12 meetings held under the chairmanship of DC in the presence of at least three other sectors	Through plan period	
B. Strengthen procurement and supply chain management system				
Designate focal point for procurement, supply and stock management at state and district level	State NVBDCP	Focal point is introduced to NVBDCP, Delhi and WCO for coordination	October 2018	
Develop a stock management and supply chain dashboard for timely indenting and supply	State NVBDCP	PSCM Dashboard and management module developed	December 2018	
Develop annual forecast plan of all malaria commodities and submit the procurement plan to NVBDCP and state NHM	State NVBDCP/ District NVBDCP	Annual forecast plan submitted to NVBDCP and State NHM	November 2018	
Establish and maintain logistic management and information system at all districts and state	State NVBDCP District NVBDCP	LMIS developed	December 2018	
Train the focal points on malaria logistic management and maintenance of logistic management and information system	State NVBDCP WCO Technical support	Training at state and all districts completed	March 2019	

Quantify, procure and distribute microscopes and maintain all microscope on annual basis	NVBDCP Delhi State NVBDCP	Quantify microscope requirement and map availability of LTs	October 2018	
		Procure and distribute microscopes	March 2019	
Quantify, procure, and distribute in time adequate (required + buffer) antimalaria drugs, malaria diagnostics and other commodities at all facilities and providers	NVBDCP Delhi State NVBDCP District VBD office	Quantification of commodities completed	Every month by DVBD office Every quarter by State NVBDCP	
		Indent placed and commodities at appropriate level	Every year for procurement Every quarter for distribution	
Review and monitoring of stocks to prevent stock-out and expiry at district and peripheral health facilities and maintain adequate buffer stock at each level at monthly basis	State NVBDCP District VBD Office	Quarterly visit to districts-blocks-PHCs-SCs reporting no case in last 1 year Monthly visit to districts-blocks-PHCs-SCs reporting cases in last 1 year	Throughout the period	
C. Advocacy for political commitment to malaria elimination				
Organize annual advocacy meeting for malaria elimination under the chairmanship of Chief Minister, and featuring all stakeholders	Government of Punjab State NVBDCP	Annual meeting conducted at last week of March of every year	Throughout the plan period	WCO & NVBDCP Participation
Six-monthly annual progress report presented to Health minister and outcome of the meeting posted on NHM website	State NHM State NVBDCP	Progress update at May and October every year		
Quarterly progress review meeting under the chairmanship of Secretary, Department of Health and Family Welfare	State NHM State NVBDCP	Quarterly review meeting at the third week of last month of every quarter		

Community level advocacy and monitoring meeting held at GKS level	District VBD Office	In one fixed week of every month (overlapping with monthly GKS/VHSNC meeting)		
D. Cross-border collaboration with other bordering states (J&K, Himachal Pradesh, Haryana, Rajasthan)				
Conduct annual meeting with the state programme officers of neighboring states under the chairmanship of Secretary, Health & Family Welfare to synchronize implementation of malaria programme	NVBDCP Delhi State NVBDCP WCO	Annual meeting conducted at first week of May every year	Throughout the plan period	
Regularly share information of mutual interest related to malaria programme	State NVBDCP	Monthly report of introduced/ imported cases shared to respective states with details of case identification, travel, source district, diagnosis and current treatment		
E. Introduce and scale up appropriate intervention for mobile, migrant and other underserved population at risk of malaria infection				
Carry out mobility mapping to identify where and when population move and how movement relates to malaria elimination	State NVBDCP WCO-NPSP	Mobility map submitted to Central and State NVBDCP	December 2018	
Conduct GPS mapping of firms/ industries/ construction sites/ and other large-scale development project sites at risk of malaria bi-annually (once before and once after the transmission season)	State NVBDCP WCO	GPS mapping of firms/ industries/ construction sites/ and other large-scale development project sites completed	March 2019	

Utilize multi-sectoral meetings at state level to devise and implement strategies necessary to reduce risk among MMPs	WHO support Punjab State NVBDCP	One meeting with mapped sector/ industry every quarter	Start in March 2019	
Review and finalize the interventions to address MMPs for malaria elimination in the state bi-annually	WCO State NVBDCP	First MMP malaria elimination action plan submitted MMP malaria elimination action plan updated every 6 months	March 2019 September 2019 onwards	
District-wise mapping of MMPs for screening of malaria and treatment of positive cases	State NVBDCP	Monthly report of malaria in MMPs submitted	10 th of every month	

F. Data analysis and risk stratification

Analysis of secondary data provided by State for 2015 -2017	WCO - technical support State NVBDCP	Dissemination of document to state for implementation. Achieve 0 indigenous transmission in New Category -1 districts by end of December 2018; by July 2019 in category – 2 districts; by December 2019 in Category 3 districts and by the end of December 2020 in all category districts.	2018	
Utilize malaria risk stratification to identify villages for capacity building of ASHA for malaria case management	State NVBDCP District VBD Office	Village mapping for ASHA training completed 25% training completed 50% training completed 100% training completed	Oct-Nov 2018 January 2019 March 2019 May 2019	

G. Enhancing case detection and case management and ensuring universal coverage

Screen all suspected malaria cases and high-risk groups (pregnant and U6 children) living in malaria endemic areas	District VBD Office BMHO MO-in charge PHC LHV/ Supervisor ANM, MPW ASHA	100% of suspected malaria cases tested in all districts within 24 hours of reporting 100% of pregnant women are screened for malaria during ANC 100% of U6 children are screened for malaria in AWC every month during transmission season	Throughout the plan period	
Train all peripheral laboratory staff (PHC) providing malaria diagnosis by malaria microscopy	NVBDCP Delhi & State NVBDCP	100% of LTs in position at PHC are trained in malaria microscopy LT list, vacancy, recruitment and training status updated every 6 months	August – December 2018; Throughout the plan period	
100% prescriptions are found to have correct and radical treatment prescribed during prescription audit	District VBD Office BMHO MO-in charge PHC LHV/ Supervisor ANM, MPW ASHA	100% of confirmed malaria cases treated at point-of-testing immediately under direct supervision of provider (1st dose DOTS) - Compliance of treatment is checked for 100% of confirmed malaria cases at 0-3 days for uncomplicated Pf malaria, 0-3 days post discharge for complicated Pf malaria and 0-3-7-14 days for Pv malaria. 100% prescriptions are found to have correct and radical treatment prescribed during prescription audit	Throughout the plan period	
Follow up of all treated cases with patient treatment card and monitor the re-emergence of symptoms to suspect poor compliance, relapse, re-infection, or drug-resistance.	District VBD Office BMHO MO-in charge PHC LHV/ Supervisor ANM, MPW ASHA	100% of confirmed malaria cases received patient treatment card for follow up 100% patients who receive treatment card are followed up as per follow up guideline mentioned above by ASHA	Throughout the plan period	

Monitor the prescription and safety of anti-malarial drugs at all facilities (public and private providers, dispensaries, pharmacies or any drug dispensing body)	State NVBDCP District VBD Office WCO technical support	Monthly prescription audit conducted at all provider level and with random checking of positive cases	Throughout the plan period	
Identify and map private providers in every district	District VBD Office WHO-NPSP	- Private provider map developed at every district and submitted to district VBDCP and state NVBDCP - Provider map updated every 6 months	December 2018	
Enforce all regulations including malaria notification on private sector providers	State NVBDCP DCGI and State Drug Controller	Quarterly visit to mapped facilities or districts	Throughout the plan period	
Provide training to private providers on case management (early diagnosis, treatment, referral and reporting) every alternate year	WCO State NVBDCP District VBD Office	First training in the first week of January Refresher training on annual basis	January 2019	
Develop ASHA operational manual	NVBDCP Delhi State NVBDCP	ASHA operational manual developed and disseminated to all districts, blocks and SCs	October- – December 2018	
All ASHA receive training on malaria case management services to resident villages and migrant population in the village	State NVBDCP District VBD Office	25% training completed	January 2019	
		50% training completed	March 2019	
		100% training completed	May 2019	

H. Strengthen case detection and recording and reporting by all health care providers

Mandate malaria as a notifiable disease	State NVBDCP Government of Punjab (Department of Law)		Already completed	
Align military, paramilitary, police, railways, and other establishments in the state data forms and reporting requirements	NVBDCP Delhi State NVBDCP WHO	Coordination and orientation meeting completed with all sectors (overlaps with coordination meetings) Biannual review meetings post alignment as mentioned above.	October 2018	
Upgrade real time system to include immediate case alert and stock management features and link it with MIS	State NVBDCP WCO support Different sectors (military, paramilitary, police, railways, and other establishments)	Real time case alert and stock management system launched and staffs designated and trained.	October 2018- March 2019	
Scale up electronic reporting of case by private providers	District VBD Office WCO support	Coordination meeting with all providers at quarterly basis post mapping	Throughout the plan period	
Generate geo-referenced household maps (with characterization of households on the basis of remoteness/ ecology/ other factors) in every village in all districts	WCO State NVBDCP	Geo-referenced House Hold map developed and submitted to State NVBDCP	September 2018- March 2019	Assisted by T A –WCO
Investigate, classify and report all cases from health facilities as well as from community providers	State NVBDCP District VBD Office	100% malaria cases are investigated, classified, tracked and reported	Throughout the plan period	

Carry out Re-active case detection (RACD) around index cases in all districts	District VBD Office All frontline health workers including ASHAs	For all villages reporting new case, one round of RACD survey to be initiated	Throughout the plan period	T A –WCO should track the activities
Conduct core vector control intervention (IRS/ LLIN) in households around index case as response to malaria case detection in all districts	District VBD Office BPM	100% coverage with at least one vector control method (IRS or LLIN) in all villages in each month when index case is reported.	Throughout the plan period.	

I. Strengthening the quality assurance and control systems for malaria diagnosis

Update, print and disseminate guidelines on quality control and assurance and the standard operating procedure for the laboratory diagnosis of malaria	NVBDCP Delhi State NVBDCP		August 2018 – October 2018 for initial dissemination.	
Establish State Reference Laboratory and conduct training and Accredited External Competency Assessment (ECA) of malaria microscopists at state level	NVBDCP Delhi State NVBDCP WCO	SRL established; Training of all microscopists completed at SRL; ECA done	October- 2018- March 2019	
Train concerned district staff on monitoring and supervision of microscopy services, including cross checking of slides and share feedback on quality of microscopy services on monthly basis	NVBDCP Delhi State NVBDCP WCO	District staffs trained in 100% districts	January 2019	

Conduct quarterly supervision of microscopy services at PHC by operational district	State NVBDCP State Reference Laboratory District VBDCP		Throughout the plan period	
Establish & maintain a quality-assured national malaria slide bank at state level	State NVBDCP State Reference Laboratory			With the support of NVBDCP
Ensure post-dispatch quality assurance of malaria RDTs (both public and private sector)	State NVBDCP State Reference Laboratory	Random Checking of RDTs for quality assurance conducted at least once in every six months in all private sector and for all batches procured and distributed in government sectors		
Quality control for antimalarials at both public and private sector	State NVBDCP DCGI State Drug Control Authority	Checking of all private sectors for counterfeit antimalarials at least once in every six months; Antimalarial quality report submitted for all batches of antimalarial procured under state programme		

J. Develop and implement integrated vector management (IVM)/Mosquito & Vector Control Mission (MVCR) strategy for malaria elimination

Review data on entomology, vector control and insecticide resistance	WHO- Technical Support State NVBDCP	Quarterly review report on entomological surveillance, and IR submitted to central and state NVBDCP	Throughout the plan period	
Develop manual for vector management strategy and insecticide resistance monitoring plan	NVBDCP Delhi WHO- Technical Support State NVBDCP		January 2019- March 2019	Align with Country guidelines
Conduct annual village risk stratification and household survey in villages with active foci to inform quantification and distribution strategy of LLINs	State NVBDCP District VBD Office ASHA (for HH survey)	100% villages stratified following data validation and HH conducted in all active foci (village levels)	January 2019	

Procure LLINs for universal coverage in all active foci and distribute them to all risk population through mass distribution campaign	NVBDCP Delhi State NVBDCP	100% villages eligible for LLIN are covered with LLINs.	March 2019- May 2019	
Monitor LLIN mass distribution campaign by rapid assessment	District VBD Office State NVBDCP	At least one rapid assessment is conducted during each GP distribution campaign	March 2019- May 2019	
Conduct household survey on acceptability and use of LLINs by population	State NVBDCP	At least one HHS conducted every year starting three months post-distribution	2019 & 2020	
Train District and PHC staff on IRS in targeted operational district/ high risk areas	Zonal entomological Unit State entomological unit	100% trainings completed in target areas.	March 2019- June 2019 and March 2020- June 2020.	
Procure insecticides and equipment according to identified foci	NVBDCP Delhi State NVBDCP	Insecticide requirement estimated for all eligible villages. Status of all equipment submitted to state NVBDCP for maintenance and repair 100% instrument are either maintained or repaired as per report.	September 2018 – March 2019.	
Spray all households around index case household (50 households) in targeted operational districts with evidence of ongoing local transmission	District VBD Office	100% eligible HHs are sprayed. At least 90% room coverage for all spray operations No outdoor spraying on random monitoring	Throughout the plan period	
Monitor quality and coverage of indoor residual spraying	State NVBDCP District VBD Office	100% areas with spray operation are monitored and spray quality reported.	Throughout the plan period	
Conduct household survey on acceptability and use of IRS by population	State NVBDCP		Overlap with LLIN survey	

VC-sub-1. Utilize environmental strategies to reduce vector breeding sites (Sub-strategy)				
Train district and Health centre staff on basic entomology	NVBDCP Delhi	Basic entomology included in training modules of all staffs	October – December 2018	
Assess impact of potential environmental management intervention in targeted foci	Zonal entomological unit District VBD office	Impact assessment conducted for each foci intervened	Throughout the plan period	
Develop policy brief for village leaders/ government officials on specific environmental management intervention for interrupting transmission in targeted areas	State NVBDCP WHO State entomology department	100% PRIs of villages that are targeted for environmental management receive knowledge brief	January – March 2019	
Hold local stakeholders' meeting with all relevant sectors in preparation for implementation of environmental management	District VBD Office BMHO/ MO IC PHC WHO	Stakeholder meeting at least once before transmission season (for preparedness); once during peak transmission (for response); and once after the end of transmission season (for review).	Throughout the plan period	
VC-sub-2. Strengthen entomological surveillance for malaria elimination				
Build capacity of state and zonal entomology units	NVBDCP Delhi State NVBDCP WHO	100% staffs at state and zonal entomological unit are trained.	August-December 2018	Support of NIMR/IDSP entomologists
Collect entomological data at sentinel sites	District VBD office Zonal entomological units	Monthly collection and reporting of entomological data to state NVBDCP	Throughout the plan period	
Monitor receptivity and vector density in areas where transmission has been interrupted (no local case)	Zonal entomological units			
Map vector distribution, transmission foci and vector control intervention	Zonal entomological units District VBD office State NVBDCP			

Routine (quarterly) monitoring of insecticide resistance	Zonal entomological units	Quarterly submission of IR monitoring report from all zonal units in the last week of each quarter		
VC-sub-3. Strengthen investigation, classification and appropriate response to all malaria transmission foci				
Investigate, classify and map all foci in all districts to identify drivers of transmission	District VBD Office (for district level) WCO support	100% of foci are classified within and reported to State NVBDCP with 15 days of detection	Throughout the plan period	
Respond to active foci based on results of investigation	District VBD Office	Action taken report by district office submitted for each month for all active foci		
Establish and maintain geo-referenced database for all foci	State NVBDCP WCO support	Geo-referencing of foci is completed within 7 days of foci reporting to the state.		
Strengthen surveillance system to immediately investigate, classify, report and respond to all cases and foci				
Constitute a surveillance working group to strengthen malaria surveillance at public sector and notification from private sector	State NVBDCP WHO District VBD Office (for district level)	State SWG developed and trained. District focal point to review and report surveillance status to SWG designated	October-October 2018	
Install hardware for MIS upgrade for operationalization of Integrated Health Portal	State NVBDCP NVBDCP Delhi	Align with local MIS hardwares installed in all offices with users	December 2018-March 2019	
Assessment and training of human resources engaged in malaria surveillance on the revamped surveillance strategy and MIS	WHO State NVBDCP	All focal points trained in MIS District and sub-district level training completed	January – March 2019	
Establish feedback mechanisms on surveillance data for all health levels	State Surveillance Working Group State NVBDCP	Monthly feedback to all district focal points by state SWG	Throughout the plan period	

Outbreak preparedness and response				
Develop guidelines for outbreak preparedness and response	State NVBDP WHO	Outbreak preparedness and response guidelines developed and disseminated to all districts	August – December 2018	
Train all relevant staffs on outbreak preparedness and response	State NVBDP WHO District VBD Office	Training of staffs	Same as for other trainings	
Investigate and take response in outbreak situation	State NVBDP WHO District VBD Office	Outbreak investigation initiated within 24 hours of reporting, FIR submitted within 7 days of reporting, Response completed through and ATR submitted within 14 days of reporting for all outbreaks.	Throughout the plan period	
Develop outbreak early warning system in high risk areas	State NVBDP WHO District VBD Office	Outbreak warning system developed State and district level monitoring focal points trained on managing the OWS. OWS reporting (including no outbreak report) to be submitted on weekly basis in 2019 and bi-weekly basis in 2020.	OWS launched December 2018 Continued throughout the plan period.	
Strengthen programme monitoring and evaluation				
Update monitoring and evaluation plan as per NVBDP policy	NVBDP Delhi WCO	Elimination focused monitoring and evaluation plan and module developed and disseminated to states targeting malaria elimination by 2020	October–November 2018	
Train all relevant staff on malaria monitoring and evaluation	NVBDP Delhi WHO	Cascade monitoring training completed at– State–District–Block level	October–December 2018	
Conduct mid-term review of the status and progress towards malaria elimination	WCO NVBDP Delhi	Mid-term independent review completed and report published	December 2019	
Reprogramming and re-strategizing as per transition to elimination based on the strategic action plan	State NVBDP	Reprogramming report submitted on the basis of mid-term review report	January 2020	

Monitoring and mentoring all health care providers at all levels to strengthen compliance to national guidelines	State NVBDCP District VBD Office WHO	Quarterly monitoring report submitted for all districts. 100% monitoring reports are complied with action taken report from district VBD office within one month of monitoring report submission.	Throughout the plan period	
Monitoring of ASHA performance at district level	District VBD Office LHV/ Supervisor/ Male HW	ASHA performance report is submitted from all blocks at every quarter on malaria case detection, treatment and referral	Throughout the plan period	
Improve quality and delivery of IEC BCC messages for malaria elimination				
Review and update current state IEC BCC strategy to align with the national malaria elimination strategy	WCO, State NVBDCP	State SBCC Strategic Plan for Malaria Elimination developed	October 2018- January 2019	WCO may support to develop IEC materials
Framing of focused IEC strategy for increased engagement of private practitioners through IMA, IAP and other professional bodies.	WHOIMA, IAP, and other professional bodies	IEC sub-strategy for engagement of private practitioners developed	October 2018- January 2019	
Print/ disseminate malaria IEC BCC messages for programmes, partners and all relevant stakeholders	State NVBDCP District VBD office	All ASHAs are provided with key messages for IPC Provider wise key messages are developed Job-aids with key messages are provided to all providers Key messages are developed for mass media and partners Review and update of messages every year	February – March 2019	

Train health staffs on all IEC BCC guidelines	State NVBDCP District VBD office	District and sub-district level managerial training (All DVBDOs, BPMs) for IEC campaign completed Sub-district and community level (100% ASHAs, ANMs, MPWs) implementation training for IEC campaign completed	February – March 2019 March 2019 – May 2019	
Deliver health education messages utilizing ASHA and paramedical staffs and other methods of mass media as per national IEC BCC strategy	District VBD office Sub-district and community level health workers and volunteers including ASHA		Throughout the plan period for community delivery and message update	
Coordinate with partners on IEC BCC strategy	State NVBDCP WHO	All partner meetings have IEC BCC as one agenda point for discussion	Throughout the plan period	
Monitoring and supervision of IEC BCC activities in districts to identify barriers, challenges and discuss potential solutions with stakeholders	State NVBDCP WHO	Monitoring checklist for IEC activities prepared and integrated in monitoring proforma	September 2018	
		Monitoring checklist for IEC activities are filled up during each monitoring and/ or supervisory visit.	Throughout the plan period	
Strengthen community mobilization for increase uptake of malaria interventions				
Build capacity of different community platforms and self-help groups and organize sensitization workshops with different community-based organizations in selected villages in priority areas	WHO-TA support District VBD Officials and Staff Block level staff	• One sensitization workshop at each subcenter in May • Sensitization meeting with community platforms and SHGs once every month	Throughout the plan period	

9.2. Intervention-specific indicators for district and sub-district level monitoring

Indicator	Target	Achievement	Data Source
Surveillance, Case Detection, Case Investigation			
1. Annual examination rate by district and focus by RDT or microscopy	To be set by district and state		Malaria case and case detection database
2. Percentage of microscopy results cross-checked by national reference laboratory	100% positive results and 10% negative results		Reference laboratory database
3. Percentage of testing laboratories participating in WHO recommended microscopy quality assurance assessments	100%		Reference laboratory database
4. Percentage of expected monthly reports received from health facilities and other health service providers (with number of patients tested for Malaria and number positive)	100%		Malaria case and Malaria detection data base
5. Percentage of cases notified within 24 hrs of detection	100%		Malaria case and Malaria detection data base
6. Percentage of cases with completed case investigation form submitted within stipulated delay	100%		Malaria case and Malaria detection data base
7. Percentage of foci for which completed investigation form submitted within stipulated delay.	100%		Malaria focus database
Case management			
1. Percentage of patients who received parasitological test	100%		Malaria case and Malaria detection data base
2. Percentage of confirmed Malaria cases who received treatment according to national policy	100%		Malaria case and Malaria detection data base
Integrated Vector Management			
1. Percentage of active and residual non-active foci covered with ITNs/LLINs by year	100%		Operational records
2. Population of population living in receptive and vulnerable areas covered by ITNs/LLINs by year	100%		Operational record
3. Percentage of active and residual non-active foci protected by IRS by year	100%		Independent foci survey
4. Percentage of population living in receptive & vulnerable areas protected by IRS by year	100%		Independent foci survey
5. Percentage of potential larval habitats in active and residual non-active foci treated with larvicides.	As per state targets		Independent habitats survey
6. Percentage of potential larval habitats in active and residual non-active foci in which environmental modifications is implemented.	As per State targets		Independent habitats survey



Village wise stratification of Malaria epidemiological data for all 22 districts

Name of District	Total PHCS	No. PHCs Reported cases in last three years (2015 -2017)	Total No. SCs	No. SCs Reported cases in last three years (2015 -2017)	No. SCs reported cases persistently in the last three years (2015 -2017)	Total no. villages	No. villages reported cases in the last three years (2015 -2017)	No. villages reported cases persistently in the last three years (2015 -2017)
Amritsar	7	8	179	45	3	854	58	0
Barnala	3	2	71	11	0	142	10	0
Bathinda	6	6	136	60	4	290	75	4
Faridkot	3	3	62	27	2	185	36	1
Fatehgarh Sahib	2	2	73	5	0	445	5	0
Fazilka	4	4	109	25	0	309	25	0
Ferozepur	4	4	122	18	0	766	22	0
Gurdaspur	10	10	222	27	0	1325	26	0
Hoshiarpur	9	9	244	75	1	1446	105	0
Jalandhar	9	7	198	17	0	953	16	0
Kapurthala	6	5	88	6	0	582	7	0
Ludhiana	10	8	265	45	3	926	56	3
Mansa	3	3	107	75	18	246	105	12
Moga	5	5	122	18	0	333	18	0
Mukatsar Sahib	4	4	102	33	0	241	38	0
Pathankot	3	1	68	3	0	496	1	0
Patiala	6	6	185	64	3	950	86	1
Rupnagar	4	4	85	10	0	647	12	0
Sangrur	7	6	190	19	0	581	21	0
Sas Nagar	3	3	76	44	4	467	78	4
Sbs Nagar	5	3	95	6	0	467	6	0
Tarn Taran	10	7	152	29	1	531	39	1
Total	123	110	2951	662	39	13182	845	26



Individual Cases Investigation Form for National Malaria Case Register

The form is to be completed for all laboratory - confirmed (microscopic and RDT) Malaria cases.

Section 1. Char terization of the case

- 1.1 Malaria case ID
- 1.2 Date
- 1.3 Facility
- 1.4 Is the case linked to a larger focus?
 - Yes ☒
 - No ☐
- 1.5 Information about the case (patient)
 - 1.5.1 Name
 - 1.5.2 Age
 - 1.5.3 Gender M ☐ F ☐ Trans ☐
 - 1.5.4 Present home address, including contact details
 - 1.5.5 Occupation or other aspect related to Malaria risk exposure
 - 1.5.6 Date of confirmation of Malaria diagnosis
 - 1.5.7 Species of Malaria parasite Pv. ☐ Pf. ☐ Mixed ☐
 - 1.5.8 Date of notification of Malaria case
 - 1.5.9 Recent travel history outside the State to an endemic area within the country (past two weeks, six months, and for one year)
 - 1.5.10 Recent travel history outside the country i.e. to a Malaria Endemic Setting (past two weeks, six months, and for one year).
 - 1.5.11 Blood transfusion within three months
 - 1.5.12 Possible origin of Malaria infection (place where Malaria infection is likely to have been acquired)
 - 1.5.13 Previous history of Malaria, if any (when, where, parasite species, treatment received etc.
 - 1.5.14 Recent contact with known imported case(s); provide details

1.6 Case detection and treatment

- 1.6.1 Method of diagnosis PCD ☐ ACD ☐ RCD ☐ Mobile Malaria Clinic ☐ Others (specify) ☐
- 1.6.2 Main symptoms
- 1.6.3 Date of onset of first symptom(s)
- 1.6.4 Test used Microscopy ☐ RDT ☐ Both ☐
- 1.6.5 Parasite species Pv ☐ Pf ☐ Mixed ☐
- 1.6.6 Parasite density (if microscopy done)
- 1.6.7 Presence of gametocyte (if microscopy done) Yes ☐ No ☐
- 1.6.8 Radical Treatment Date ☐ Dose ☐ drugs ☐ days ☐
- 1.6.9 Treatment outcome No. of follow up visits (dates) ☐ Confirmation of clearance (date) ☐

Section 2. Classification of the case:

2.1 Case is classified as

- 2.1.1 Parasite species Pv. ☐ Pf. ☐ Mixed ☐ Others (specify) ☐
- 2.1.2 Classification
- Imported (outside the district/ Province, other country (specify) ☐
 - Relapsing ☐ - Introduced ☐ - Recrudescence ☐ - Indigenous ☐
 - Induced ☐ - Failure to follow up ☐

Section 3. Follow of the case, household and neighborhood

3.1 Date of investigation

3.2 Case household visit done Dates

3.3 Household members listed and screened, tested and results

- | | Age | Gender | Tested | Results |
|----------|-----|--------|--------|---------|
| 1. _____ | | | | |
| 2. _____ | | | | |
| 3. _____ | | | | |
| 4. _____ | | | | |
| 5. _____ | | | | |

3.4 Neighborhood visit done Dates

3.4.1 Household locations (GPS)

3.4.2 household members listed, screened, tested results

Note – If additional infections are detected/identified in the case or neighboring households, continue to focus investigation form.

3.4.3 Vector control and preventive measures taken, if any

3.4.4 Follow up measures taken, if any

3.4.5 Name and designation of the officer who investigated the case

3.4.6 Reference to relevant case or focus investigation records and record numbers



Individual Focus Investigation Form

This form should be completed for all confirmed Malaria foci.

Section 1 Characterization of the focus

1. Malaria focus ID:
2. List of case ID numbers that are part of the focus ID:
3. Date of the report:
 - 3.1 Date of focus identification
4. District and health facility catchment area:
5. Information about the focus:
 - 5.1 Geographical map of focus and its limits:
 - 5.2 Size of population and number of houses:
 - 5.3 Administrative map of houses, health facilities and other important structures, as well as access routes within focus:
 - 5.4 Distribution of parasites (species, number and location of infection identified)
 - 5.5 Distribution of vector species within the focus, their behavior and breeding sites
 - 5.6 Types of environment in relation to receptivity (urban or rural population, altitude, main geographical features, environmental changes as a result of development, original and current endemicity, etc.) and vulnerability (proximity to endemic areas within the country) or across international border within the focus):
 - 5.7 Population characteristics in relation to vulnerability (migration patterns, presence and numbers of temporary workers, typical travel histories etc. within the focus:
6. Focus history
 - 6.1 Total number of Malaria cases by species reported within the focus during the past five years:
 - 6.2 Results of Malaria survey, including active case detection within the focus during the past five years:
 - 6.3 Dynamics of focus status during the past five years (active foci versus residual non-active foci versus cleared foci):
 - 6.4 Types and date of vector control and other preventive measures applied within the focus during the past five years:

Section 2. Classification of the focus

7. Focus classification

Focus classified as

7.1 Parasite species

P. falciparum ☐

P. vivax ☐

Mixed ☐

7.2 Classification at time of detection

Active ☐ Residual non-active ☐ Cleared ☐

Others ☐

7.3 Classification at the time of specified follow – up

Active ☐ Residual non - active ☐ Cleared ☐

Other ☐

7.4 Relation of focus to the Malaria case that prompted focus investigation (in time, space and circumstances, e.g. the person in residence, work, etc.)

7.5 Location and total number of households with inhabitants where Malaria cases were registered within focus:

Section 3. Follow – up of the focus households and neighborhoods and response

Measures taken to clear infections and stop transmission within the focus and prevent possible onward spread of the current Malaria infection from the focus, if any (provide details)

8. Follow up action taken (provide details). For example

8.1	Neighbourhood visits done	Dates	map	Household location
	Household members listed	No. screened	No. tested	Results
	Household members listed	No. screened	No. tested	Results

8.2 Vector control and preventive measures taken, if any

8.3 Other follow – up measures taken, if any

Name, designation and signature of investigating officer



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