MALARIA PREVENTION AND CONTROL IN GADCHIROLI DISTRICT MAHARASTRA

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Abstract

Gadchiroli district is majorly covered with forest, and most of the population is tribal, living in the vicinity of the forest. The district is located on the eastern side of Maharashtra. As per the 2011 India census, Gadchiroli recorded a total population of 1071795 Males constituted 51% of the population and females 49%. Approximately 11% of the population of Gadchiroli was under six years of age, and almost 90% of the child population stays in the rural part of Gadchiroli. Annual rainfall for the Gadchiroli district is approximately 1,000 mm in the monsoon season from June to September. Gadchiroli is a hotspot for malaria disease in Maharashtra. More than 50% of malaria cases in Maharashtra are observed in Gadchiroli. A special malaria campaign of mass survey for identification of active transmission is carried out in 29 malaria-sensitive PHCs in Gadchiroli from january 2025 to 10 june 2025. About 76% population was tested by microscopic, and 11 % population
was screened by Rapid Diagnostic Kit. A total 984 positive and out of 164 asymptomatic malaria carriers were identified with
25% gametocytes.Identifying these asymptomatic transmissions followed by complete radical treatment towards malaria elimination is suggested.

Keywords: malaria, active surveillance, gametocytes, asymptomatic transmission

Introduction

Gadchiroli is an administrative district in the Maharashtra state of India. It is located on the eastern side of Maharashtra. Gadchiroli is surrounded by Gondia district in the north, Chandrapur district in the west, Chhattisgarh state in the east, and Telangana state in the south.

Gadchiroli district is majorly covered with forest, and most of the population is tribal living in the vicinity of the forest. Environmental and social condition like high vegetation, hilly geography of the land, poor housing conditions, lack of health awareness, low development, and the district being a red corridor contributes to overall deprived development, including difficulties in reaching health facilities, providing efficient treatment, support of local communities due to lack of awareness[1,2].

Vector-borne diseases like malaria, Japanese encephalitis, Filaria, are very common diseases contributing to the major health risk of the district [3]. Gadchiroli is highly endemic district for malaria in Maharashtra. More than 50% of malaria cases of Maharashtra are observed in Gadchiroli [2]. In this research paper, we are focusing on the situation of malaria in the Gadchiroli district. The objective of the study was to identify the asymptomatic transmission of malaria in Gadchiroli district.

Materials and Methods

The present study is a cross-sectional survey carried out in the Gadchiroli district across 29 sensitive Primary Health Centres (PHCs), conducted during of January 2025 to
the 10 jun 2025.

Study settings

The geographical location coordinates for Gadchiroli are at 20.10°N 80.0°E. The region is hilly and occupied with deep forests (76% of the geographical area of the district). The district is categorized as tribal and undeveloped district and most of the land is covered with forest

and hil[4]l's.

A large part of the population of Gadchiroli stays in a rural area and is dependent on forests and farming for a living. Almost 32% of the population has livable houses made up of mud and hay stacks. Forest areas, Bamboo trees, paddy fields, and these type of *kuccha* houses are major contributors to vector-borne communicable diseases[5,6].

The district is divided into six Sub-Divisions, i.e., Gadchiroli, Chamorshi, Aheri, Etapalli, Desaiganj, and Kurkheda, respectively, and each sub-division has two talukas. There are a total of 457 Gram Panchayats and 1688 Revenue Villages. Gadchiroli has a District Hospital (DH), a Women's Hospital (WH), three Sub District Hospitals (SDH), nine Rural Hospitals (RH), and 52 PHCs.

Conferring to the 2011 India census, Gadchiroli recorded a total population of 1071795 Males constituted 51% of the population and females 49%. Female population number as compared to male population number is slightly low Gadchiroli. Almost 88% of Gadchiroli resides in the rural area. The Tribal Community population that lives in the district is 38.17 %[5,7].

Children under six years of age are an important part of the population, as they are more prone to get infected with diseases due to weak immunity. Approximately 11% of the population of Gadchiroli was under six years of age, and almost 90% of the child population stays in a rural part of Gadchiroli. Change in population size and residence between census 2001 and Census 2011 is given in Figure 1.

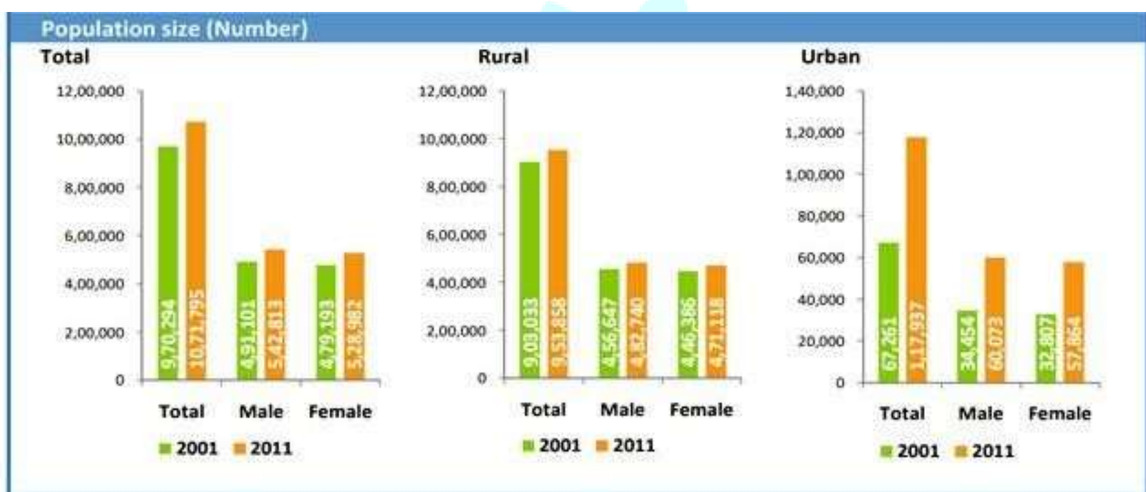

Figure 1 : Change in population size and residence as per Census 2001 and 2011, Gadchiroli, India. (Source: Census 2001 and Census 2011, India)

Data sources

a) *Malaria Register*

An SF1 register is regularly used to capture details of each individual of the house in the village.

b) *Special Malaria Campaign*

In the year 2020, a total of 6485 cases with five deaths were reported from Gadchiroli. Therefore, a special malaria campaign for the Gadchiroli district was planned, and a village-wise micro-action plan was prepare[d8].

In addition to information from SF1 register, information of the details of fever and other symptoms of malaria if observed were also noted through the special campaign.

Study area

Gadchiroli district comprises 52 PHCs, out of which 29 sensitive PHCs for malaria were identified, and a special malaria campaign was planned for these 29 PHC[9]s.

Micro planning

A micro action plan was developed for 29 sensitive PHCs with a population of 4835149. Apart from the regular staff, additional manpower was provided to these 29 PHCs to carry out this special malaria campaign. The state has formed a team of state supervisors comprising almost 60 people; in a span of 45 days targeted to cover 70% of the population under malaria testing and treatment. A total of 15 senior-level officers from the state had been appointed for these 29 PHCs for improved monitoring and management. The state malaria office has planned a micro action plan and provided additional human resources, laboratory

consumables, drug stock management, transportation, Long-Lasting Insecticidal Nets (LLIN) stock management, and overall supervision and monitoring for this special campaign.

Distribution of manpower and allocation of role and responsibilities at each PHC were as follows –

- 1 Radical Treatment (RT) worker/per 1000 population - for Blood Smear (BS) collection
- 1 RT worker- to implement biological control measures under which RT worker should identify breeding sites and eliminate them by introducing Guppy fishes as a biological control
- 1RT worker – to transport collected blood smear slides to a nearby testing laboratory.
- 1 RT worker - staining of blood smear slide collected.
- Every staff member's role in this campaign was pre- assigned effectively, especially the involvement of Accredited Social Health Activist (ASHA) in the malaria campaign was observed to be very operative. Health workers (HW) were assigned for BS collection along with RT workers. Health assistants (HA) were assigned to provide radical treatment to malaria-positive patients and supervisors are allotted to monitor RTW, HW, HA, SFW, and LSO work. Medical Officers were enrolled to manage and supervise the entire activities of their PHC. Taluka Health Officers (THO) were assigned to visit all the PHCs under Follow-up patients on the 7th, 14, th 21, st and 28 of infection identification.

Data Collection

This days their block and supervise the campaign in their area. However, the district malaria officer (DMO) considered micro-planning, fulfilling physical and financial this campaign was a mass survey for identification of active transmission, thorough testing in a mass population, and immediate radical treatment for malaria-positive patients.

Malaria blood sample slides were collected. ASHAs were allotted to immediately provide medicines/radical treatment. If any house was left in the active survey, ASHAs were assigned to mop up the survey. The target for blood smear examination was 70 BS/day to cover 1750 BS examination/ Lab Scientific Officer (LSO) in 25 days.

Monitoring

A state senior officer, a supervisor and a health worker were assigned to for each of 29 PHCs. Malaria technical Requirements, and monitoring and analyzing campaign activities for proper implementation.

Reporting

All the 29 PHCs were provided with a reporting format to report their daily activities to the state. This reporting format compiling data for 29 PHCs is shared below, focusing on PHC-wise population, RTW allotment, and BS. Collection, BS examined, RDK, Total positive identified, Gametocyte%, RT Given, breeding sites identified and eliminated, and LLIN distribution to cover maximum aspects for malaria prevention and control (Table 1).

Table 1: Reporting format developed to collect information during ACTIVE campaign across selected 29 PHCs.

29 HIGH RISK PHC DAILY MALARIA TESTING REPORT 1/1/25 to 10/6/25 .

Sr. No	Name of Taluka	Name of PHC	Population	Daily			Progressive				Daily		Progressive			Daily Positive cases			Monthly Positiv			Progressive case		
											Passive Collection													
				Active BS	Active RDK	Total	Active BS Colle	Active RDT	Total	%	OPD	BS	OPD	BS	%	P V	PF	Total	P V	PF	Total	PV	PF	Total
1	Korchi	Kotgul	10394	26	51	77	243	658	901	8.7	31	12	269	146	54.3	1	0	1	13	4	17	48	67	115
2	Korchi	Botekasa	36009	81	120	201	398	935	1333	3.7	33	21	190	117	61.6	0	0	0	2	0	2	4	2	6
3	Kurkheda	Malewada	17863	47	59	106	1558	3429	4987	27.9	62	13	397	87	21.9	0	1	1	0	2	2	3	15	18
4	Armori	Bhakrondi	11706	39	60	99	746	904	1650	14.1	51	17	1557	328	21.1	0	0	0	0	0	0	0	0	0
5	Dhanora	Godalwahi	22302	42	45	87	268	468	736	3.3	10	5	124	67	54.0	0	0	0	3	8	11	13	16	29
6	Dhanora	Rangi	11588	42	93	135	340	772	1112	9.6	50	8	353	57	16.1	0	0	0	0	2	2	0	2	2
7	Dhanora	Karwafa	13039	41	110	151	275	704	979	7.5	50	17	405	150	37.0	0	3	3	1	3	4	3	4	7
8	Dhanora	Pendhari	15198	13	51	64	125	298	423	2.8	33	4	227	50	22.0	0	0	0	0	4	4	3	8	11
9	Dhanora	Murumgaon	22752	95	297	392	401	797	1198	5.3	33	9	106	21	19.8	0	2	2	1	3	4	9	24	33
10	Gadchiroli	Potegaon	18638	0	0	0	782	1220	2002	10.7	0	0	201	122	60.7	0	0	0	1	2	3	2	12	14
11	Chamorshi	Kunghada	25007	38	104	142	457	1061	1518	6.1	90	14	784	148	18.9	0	1	1	2	5	7	2	5	7

12	Chamorshi	Regadi	11588	26	34	60	201	458	659	5.7	37	4	228	36	15.8	0	0	0	0	0	0	0	2	2
13	Mulchera	SundharNagar	27969	48	36	84	334	430	764	2.7	39	7	208	37	17.8	0	0	0	0	0	0	0	1	1
14	Ettapalli	Todsa	24522	232	279	511	671	581	1252	5.1	7	6	111	56	50.5	0	0	0	0	1	1	1	3	4
15	Ettapalli	Burgi	14372	122	141	263	362	879	1241	8.6	12	4	88	25	28.4	0	1	1	0	1	1	2	4	6
16	Ettapalli	Kasansur	32119	16	45	61	155	363	518	1.6	27	4	328	57	17.4	0	0	0	0	3	3	5	17	22
17	Ettapalli	Pipli Burgi	6452	11	60	71	104	233	337	5.2	6	1	66	26	39.4	0	1	1	0	1	1	4	7	11
18	Ettapalli	Gatta	16080	87	87	174	393	619	1012	6.3	9	9	176	83	47.2	0	8	8	0	12	12	7	33	40
19	Bhamragad	Aarewada	19664	15	994	1009	616	2969	3585	18.2	15	15	92	88	95.7	0	4	4	3	21	24	17	102	119
20	Bhamragad	Mannerajram	9790	25	45	70	129	408	537	5.5	24	4	150	34	22.7	0	0	0	1	0	1	4	9	13
21	Bhamragad	Laheri	10421	41	41	82	173	446	619	5.9	60	41	136	100	73.5	0	19	19	5	93	98	44	396	440
22	Aheri	Permili	10883	35	9	44	159	113	272	2.5	49	11	196	40	20.4	0	0	0	0	0	0	2	0	2
23	Aheri	Kamlapur	19621	16	45	61	155	363	518	2.6	27	4	328	57	17.4	0	0	0	0	0	0	14	15	29
24	Aheri	Jimalgatta	12956	37	45	82	171	196	367	2.8	18	4	142	31	21.8	0	0	0	0	0	0	2	5	7
25	Aheri	Dechlipetha	8583	7	64	71	71	587	658	7.7	21	4	142	19	13.4	0	0	0	0	0	0	1	2	3
26	Sironcha	Moyabinpetha	7839	0	0	0	18	32	50	0.6	0	0	39	18	46.2	0	0	0	0	0	0	0	1	1
27	Sironcha	Tekadatala	11356	17	21	38	76	98	174	1.5	29	8	172	53	30.8	0	0	0	1	1	2	2	2	4
28	Sironcha	Rangayapali	27296	70	164	234	177	323	500	1.8	13	12	94	43	45.7	0	0	0	0	0	0	0	0	0
29	Sironcha	Zinganur	7512	29	19	48	192	118	310	4.1	24	5	145	36	24.8	0	1	1	0	1	1	0	1	38
Total			483519	1298	3119	4417	9750	20462	30212	188	860	263	7454	2132	28.6	1	41	42	33	167	200	192	755	984

At all the 29 PHCs, Malaria diagnosis was carried out using microscopy and Rapid Diagnosis Kit (RDK) methods. The RDK method was used in core forest areas and at difficult geographical locations. Mass blood smear collection was carried out in the villages under each PHC not to miss a single house and covered the maximum population. Blood smear samples were collected from individuals with and without malaria symptoms to identify if there was any asymptomatic transmission in the community (Figure 2).

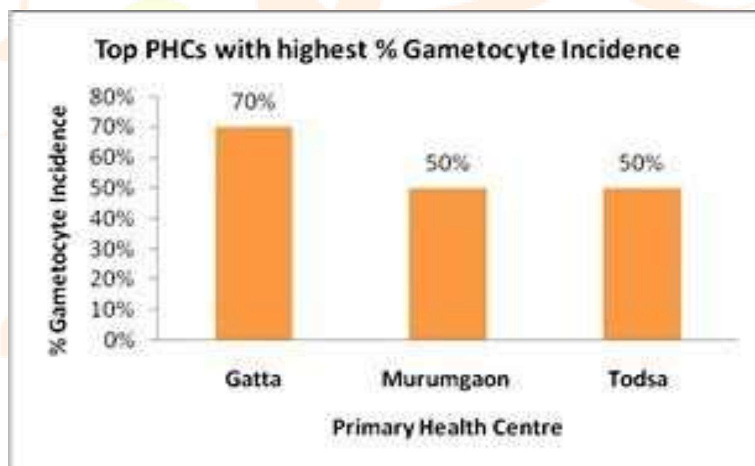

Figure 2: PHC wise malarial parasite transmission to vector

Briefly, 76% of the population was tested by collecting blood smears and microscopic methods. Blood smear collection range across all the 29 malaria-sensitive PHCs was reported to be 57% to 87 %. Maximum blood smear collection was observed at Gatta PHC with 87%, followed by Laheri and Mannerajaram with 85% and 84%, respectively. Deulgaon PHC had the least blood smear collection of 69%. 11% population was tested using the RDK kit. So total malaria testing using both microscopy and RDK was approximately 87%.

Furthermore, to understand if any asymptomatic transmission exists in the Gadchiroli district, especially in these selected sensitive PHCs, individuals with no malaria symptoms were also screened by collecting blood smears and diagnosing by microscopy. Individuals with no malaria symptoms but were diagnosed malaria positive by gold standard diagnosis method microscopy were considered asymptomatic malaria patients. It is less likely for these asymptomatic patients to visit and seek medical help and also to get noticed in regular fever surveys carried out by the public health department. However, asymptomatic patients have equal potential to transmit disease compared to symptomatic patients. In our present study, 164 asymptomatic positive malaria cases were identified, and all were given radical treatment for 14 days.

Gametocytes are the only form of both *Plasmodium vivax* and *falciparum* parasite development transmissible to mosquito vectors[10]. Along with classical malaria control methods in routine practice, cessation of malarial parasite transmission is an equally important criterion in malaria elimination[11]. Thus for the transmission control, gametocyte count was taken from asymptomatic malaria-positive patients using their blood smear slide stained with Jaswant Singh–Bhattacharji stain (JSB stain), which is a rapid staining method for malaria detection and in regular use by the public health department, the government of Maharashtra, India[12]. A blood smear was examined using a binocular microscope with oil immersion under 100X magnification. The percentage of gametocytes in the tested asymptomatic population was counted.

Gametocyte transmission was 25% in the blood smear examined population (Figure 3).

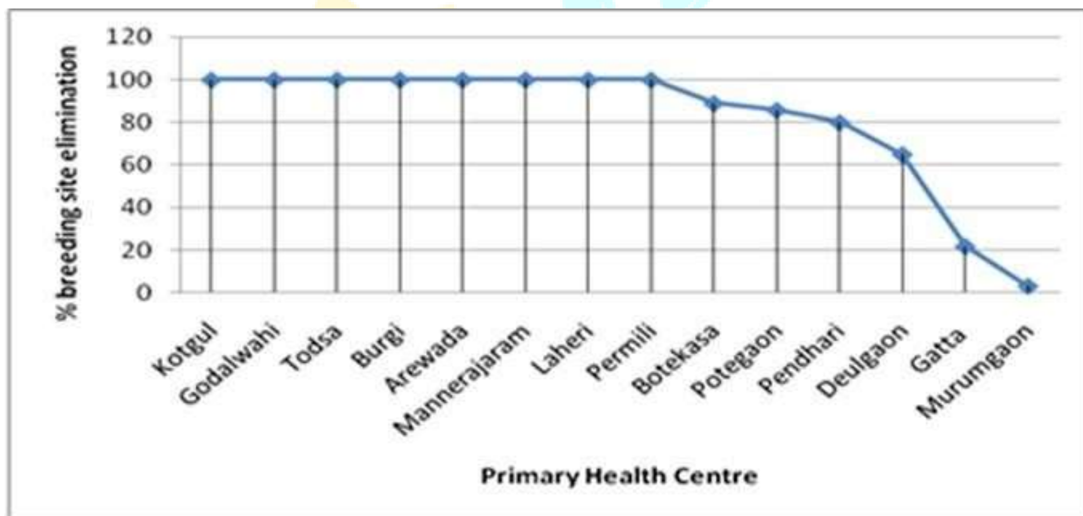

Figure 3: Breeding site enumeration and their elimination across sensitive PHCs in Gadchiroli

The highest gametocyte transmission was observed at Gatta PHC with 70% gametocytes, followed by Murumgaon and Todsa PHCs with 50% gametocytes, respectively. These PHCs with a higher rate of asymptomatic patients provided complete radical treatment to break the further malarial parasite transmission in the community. Along with treatment, entomological surveillance was strengthened simultaneously.

Prevention and Control measures applied

As one of the preliminary yet important steps in control and prevention is the identification of temporary and permanent breeding sites in the selected 29 PHCs. An RT Worker was allotted to each PHC, especially for breeding site enumeration and elimination. More than 1000 breeding sites were enumerated in this sensitive region, and 79% of breeding sites were eliminated. Some breeding sites were destroyed, and at some breeding sites, especially permanent breeding sites, biological control measures such as Guppy fishes (*Poecilia reticulate)* [13-15] and (*Gambusia affinis*) were introduced[16-18]. Out of 29 sensitive PHCs, in the 11 PHCs, more than 80% of enumerated breeding sites were eliminated. However, Gatta and Murumgaon PHC's performance concerning breeding site elimination was unsatisfactory. Data for Kasansur PHC was not available, so it was not considered further.

Using LLINs is one of the effective prevention measures against malaria and other vector-borne diseases [18-22]. The distribution of LLINs as a protective and preventive measure for malaria transmission was included in a micro action

plan for the special malaria campaign in Gadchiroli across 29 sensitive PHCs. For each PHC, according to population, a target LLIN distribution was set up. All together average of 90% of LLINs were distributed of the given target across 29 selected PHCs. Multi-Purpose Workers and RT workers were allotted for LLIN distribution in their respective PHCs. Out of 29, ten PHCs achieved 100% of the target LLIN distribution, and 14 PHCs were observed to achieve more than 70% LLIN distribution. Only Todsa PHC achieved less than 60 % LLIN distribution.

Conclusion

The present study was a special malaria active surveillane to identify asymptomatic malarial transmission existing across highly sensitive 29 PHCs in Gadchiroli. Around 87% population was screened, and 984 malaria-positive patients were identified with 25% of gametocytes. Identifying asymptomatic malaria patients and their complete radical treatment along with implementing preventive control measures is a major step towards malaria elimination.

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