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Malaria incidence in two tribal district of India: A comparative analysis

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Abstract

Malaria is one of the top most public health problem in tribal dominated district of India. Epidemiology and transmission of Malaria vary from region to region of tribal areas with ecotypes, types of forest cover and variation in topography. This study was carried out in two tribal dominated district of India viz Sundargarh (Odisha) and Papum Parre (Itanagar) in Arunachal Pradesh North East India to understand the epidemiology and case load of Malaria and an ecological study including breeding sites was carried out to identify the vector mosquitoes. In both the district the case load are in decreasing trend. In Sundargarh (Odisha) *Plasmodium falciparum* is the dominate species where as *Plasmodium vivax* is in Papum pare (Arunachal Pradesh).

Keywords: Malaria, *P. falciparum*, *P vivax*

1. Introduction

The World has made major progress to fight against malaria by upgrading vector control interventions with increased access to diagnostic testing and follow up of patient with quality treatment. In south East Asia, India is the highest malaria burden country (with an estimated 24 million cases per year) which is directly linked with poverty [1]. About 82% of country's population lives in malaria transmission risk areas and approximately 60% of malaria cases in India confined to tribal areas [2]. Despite numerous control measures, malaria is still remaining a challenges in public health. In India, the forest malaria ecotype interacts with a vulnerable population which leads to the health obligation. Forest areas are dominated by socio economically weaker section of tribal origin who represent only 8% of the national population but 30% of reported malaria cases [3]. The present study was initiated to determine the trends of Malaria and case load in two tribal district of India i.e-Sundargarh (Odisha) and Papum pare, Itanagar (Arunachal Pradesh).

2. Materials and Methods

Sundargarh district is situated in the Latitude 21°36' N to 22°32' N and Longitude 83°32'E to 85°22'E where as Papumparre (Itanagar) district is situated in the latitude 27.0844 °N and Longitude 93.6053° E. Both Sundargarh (Odisha) and Papumparre (Arunachal Pradesh) district represents ideal ecological conditions for perennial transmission of Malaria. The selection of the area was justified by several factors.

First the mean annual temperature in Sundargarh district ranges between 22-27 °C and the average rainfall is between 210-300cm. Most of the rainfall occurs between June and September in Sundargarh with lower in January-February. The mean annual temperature in Itanagar district ranges between 15.3 °C - 24.7 °C with as low as 9 °C during the month of December and January and the average rainfall in Itanagar is between 160-200cm. Itanagar receives rainfall from April to September with peak during June to August. Population of urban Sundargarh is 45,036 where as Itanagar is 34,970 as per the 2011 census. Itanagar has literacy rate of 65.95% which is lower than the national average of 74.4% but Sundargarh has an average literacy rate of 73.34% which is nearer to national average.

The data of the slide collection was done from the district hospital sundargarh and R.K Mission hospital Itanagar. The day wise data of malaria incidence was presented and analyzed. Further, more data's of both hospital were compared for a possible analysis.

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3. Results

Both the hospitals are with efficient laboratory technician trained from reputed institute. Their slides were cross checked at different level and discrepancy rate was nil. The results obtained from the above two hospital are presented in table 1 & 2. A comparative analysis of *Plasmodium vivax* and *Plasmodium falciparum* of both the hospital is presented in table-3. Both the district showed that the case load are in order of decreasing trends. The slide positivity rate (SPR) is presented in table -4. The slide positivity rate is 4.37% in Sundargarh in comparison to 3.43% of Itanagar. The rate of *Plasmodium falciparum* in Sundargarh hospital was 99.05% in 2010 which was declined to 96.55% in 2015. The *Plasmodium falciparum* incidence is significantly higher than *Plasmodium vivax*. The rate of *Plasmodium falciparum* in Itanagar hospital was 51.06% in 2010 which was declined to 20% in 2015. However, the *Plasmodium falciparum* rate is less than *Plasmodium vivax*. Both the hospitals are showing two different trends. In both the hospitals the *Plasmodium falciparum* rate was declined during the period. The breeding sites of *Anopheles fluviatilis* in Sundargarh were identified mainly from slow flowing streams, ponds, pools where as *Anopheles Culicifacies* were identified in rice fields, rain water collection, earth well, waste water, rock pool, temporary ponds

etc. In Itanagar, breeding sites of the major vector *Anopheles minimus* (perinial) were ponds, well, ditches, pits, paddy fields, *Anopheles dirus* (monsoon) in pools, unused wells, borrow pits, drains, *Anopheles fluviatilis* (winter) in slow streams, ponds.

4. Discussion

Two types of vector *Anopheles culicifacies* and *Anopheles fluviatilis* are two efficient vectors in Sundargarh region whereas in Itanagar *Anopheles minimus* (perinial), *Anopheles dirus* (monsoon), *Anopheles fluviatilis* (winter) are mainly responsible for malaria transmission [4]. The transmission dynamic varies in both the district. So, the data shown in the figures were validated. The decline of case load was due to the intervention of uninterrupted supply chain up to house hold level i.e-Asha level in Sundargarh where as decline in R K Mission hospital speaks volume about the successful use of conventional use insecticides on a wide scale effected the bionomics of vector species[5]. Beside two rounds of insecticide spraying in both the district long lasting insecticidal nets (LLIN) were introduced by govt. of India and accepted by the communities. The intervention done at field level was satisfactory for which there is reduction in malaria cases.

Table 1: Malaria Patient of District Head Quarter Hospital Sundargarh.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2010	59	62	40	19	26	18	33	62	51	36	63	61
2011	34	26	30	22	20	11	21	23	20	15	21	16
2012	20	5	9	4	3	4	6	5	7	7	9	9
2013	5	6	7	10	7	10	10	14	7	16	19	7
2014	7	5	10	8	3	7	7	11	11	7	7	6
2015	3	4	4	5	4	3	7	6	6	5	5	6

Table 2: Malaria Patient of R.K. Mission Hospital, Itanagar.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	13	14	12	31	24	37	45	41	22	40	33	17
2011	9	3	5	6	8	19	24	22	23	15	20	9
2012	6	5	4	5	9	35	46	11	10	7	9	12
2013	1	7	11	4	1	4	8	18	9	43	9	6
2014	0	5	3	9	10	13	11	4	2	3	6	1
2015	1	0	1	0	1	5	7	4	2	1	2	1

Table 3: Comparison of Malaria (*P. vivax* vrs. *P. falciparum*) Incidence

Year	Total Patient		<i>P. vivax</i>		<i>P. falciparum</i>		Mixed		Total	
	SNGH	PPRE	SNGH	PPRE	SNGH	PPRE	SNGH	PPRE	SNGH	PPRE
2010	12416	9582	5	151	525	168	0	10	530	329
2011	10409	7434	4	122	255	35	0	6	259	163
2012	10384	9185	0	128	88	10	0	15	88	159
2013	8952	6763	1	92	117	11	0	8	118	121
2014	7863	7882	0	44	89	2	0	3	89	67
2015	7951	6643	1	18	56	6	1	2	58	25

SNGH-Sundargarh District (Odisha), PPRE-Papumparre District (Arunachal Pradesh)

Table 4: Comparison of slide positivity rate (SPR) between both the hospital

Year	Total Patient	
	Sundargarh	Papumparre
2010	4.27	3.43
2011	2.49	2.19
2012	0.84	1.67
2013	1.31	1.64
2014	1.13	0.84
2015	0.70	0.45

5. Conclusion

Comparison of Malaria incidence in two tribal district of India, one with densely populated while other is less and one is a hilly state other is a plain land. In Itanagar there is no summer season with a longer rainy season. In sundargarh *P. falciparum* is the dominant species where as *P. vivax* is in Itanagar. However there is sequential decline in the malaria incidence in both the district relates to the preventive measures irrespective of their above geographical and ecological difference.

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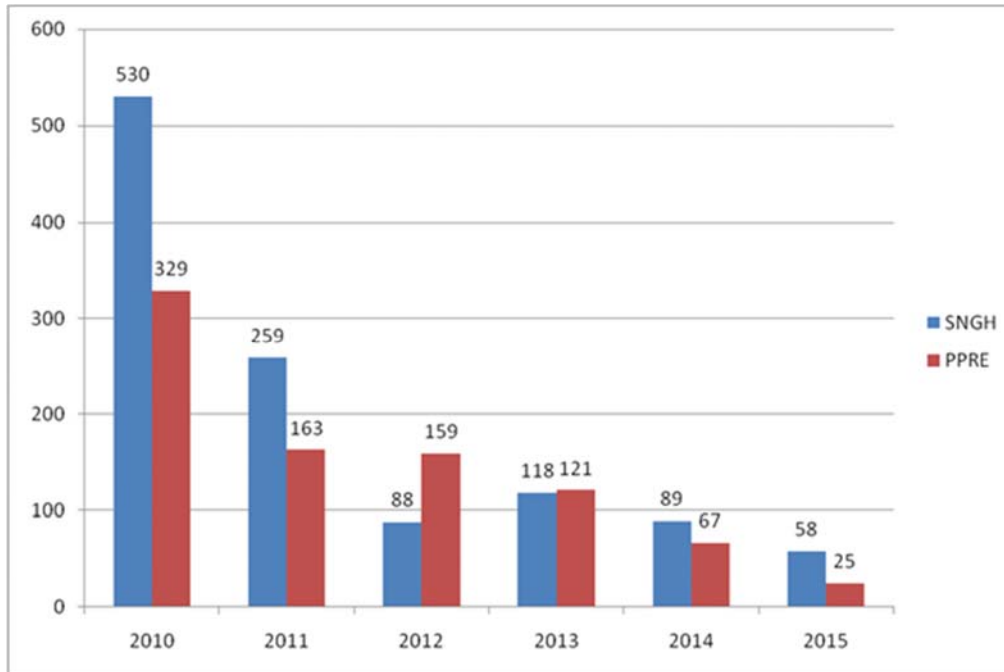


Fig 1: Malaria incidence in two tribal hospital of India

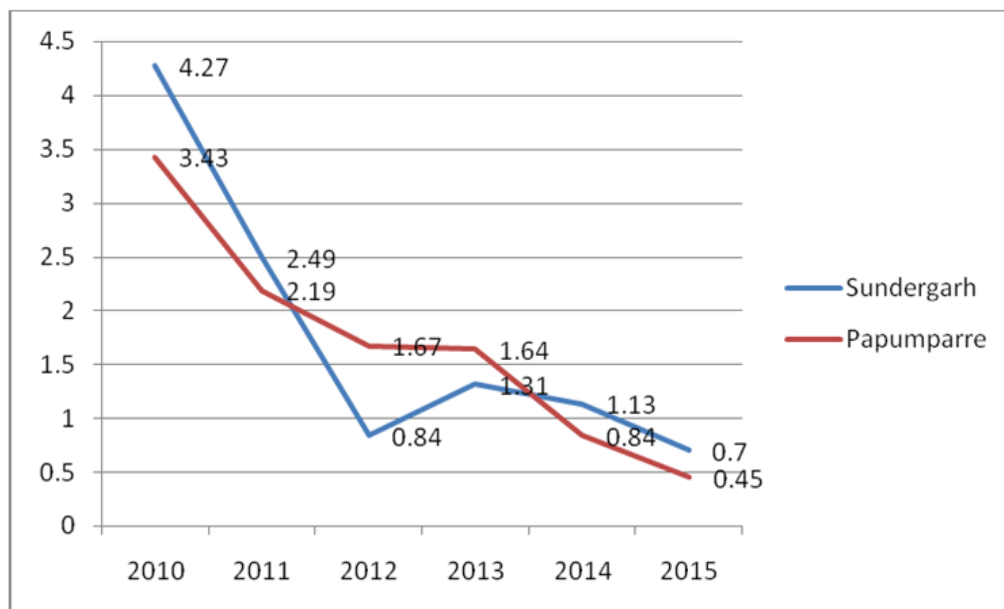


Fig 2: Camparison of slide positivity rate between both the Hospitals.

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