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Trend of Malaria in Tain Sub centre, District Mewat, Haryana, India.

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ABSTRACT

Plasmodium vivax malaria is predominant in India. The hidden reservoir of *P. vivax* is achallenge to theelimination of vivax malaria. The anti-relapse drug primaquine 14 days regimen is potential for control and elimination of vivax malaria. The malaria patients were identified from Tain sub-centre, PHC Ujina, district Mewat, Haryana during the period of March 2015 to August 2016. The identified vivax malaria patients were treated as per National Drug Policy of India. A total 554 malaria patients were identified. Out of 554 patients, 514 were positive for *P. vivax* and 40 for *P. falciparum*.The incidence of *P. vivax*malaria was higher than *P. falciparum*. API was ranged from 0.267 – 7.090 in the year 2015 and 0.144- 5.134 in the year 2016. API of all the villages was decreased in these cond year. Prevalence of malaria was found high in the age group 1 to 10 years children (41 - 47%) followed by 11 to 20 years (29.1 – 37.3%) in the year 2015 and 2016 respectively. The study suggests that the vivax malaria might be controlled and eliminated by the compliance of anti relapse drug primaquine. Further study is needed to ensure the compliance of 14 days primaquine regimen by direct observed therapy (DOT) on the pattern of tuberculosis treatment.

Keywords: *Plasmodium vivax*, malaria, anti-relapse drug, primaquine, control

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INTRODUCTION

Malaria is a major global health problem, associated with 212 million new cases and 429 000 of deaths worldwide [1]. *Plasmodium vivax*, *P. falciparum*, *P. ovale*, *P. malariae* and *P. knowlesi* are known to cause human malaria [2]. It is estimated that 40% of the world's population is at risk of *P. vivax* infection [3]. The most prevalent species of *P. vivax* malaria in the Asia is associated with the relapse [4]. Nearby capital Delhi, district Mewat, Haryana is endemic for malaria [5]. The relapse rate in vivax malaria ranged from 23% to 44% [6 -7]). The relapsing phenomenon occurs due to inadequate dose and low patient compliance of anti-relapse drugs primaquine 14 days regimen[8-9]. The control and elimination of vivax malaria is difficult due to the relapsing phenomenon in *P. vivax* [10]. For the elimination of vivax malaria, compliance of anti-relapse drugs primaquine 14 days treatment is required [11-13]. On the basis of treatment with anti-relapse drug Roy et al [12] has modelled that *P. vivax* malaria can be eliminated in 5 years if treated with primaquine 14 days regimen. Hence, we have evaluated anti-relapse drug primaquine treatment as per National Drug Policy of India for control and elimination of vivax malaria [14].

MATERIALS AND METHODS

Nearby capital Delhi, district Mewat, Haryana is endemic for malaria [5].The district falls under the Sub-Tropical, Semi-arid climatic zone with extremely hot temperature in summer (up to 48 °C). The average rainfall varies from 336 mm to 440 mm in the district. The relative humidity varies from a minimum of 40% to a maximum of 80% (15). Intervention measures used in the study area are two rounds of IR Swith deltamethrin 2.5% wp for vector control and drugs used for parasite clearance are as per NVBDCP norms. These intervention measures were same/constant for both the years i.e. during 2015 and 2016.

Tainsub-centre of PHC Ujina (28.04°N 77.08°E), district Mewat, Haryanawas selected for the study based on endemicity malaria and accessibility. Eight villages of the sub centre Tain were undertaken and stratified into the low, moderate and high API villages based on previous three years (2011-2013) malaria prevalence. The village wise API was Dhadhuka (API 1.334 -Low), Machroli (API 1.775- Low), Tain (API 1.794 Low), Sudaka (API 3.399 -Moderate), Hushainpur (API 4.746 –Moderate), Raipuri (API 7.732 -High), Tarkpur (API 8.13 -High) and Satputiyaka (API 12.073 -High). Annual blood examination rate (ABER) was 24% (2015) and 29% (2016) in the selected study villages. The institutional ethical clearance was obtained from National Institute of Malaria Research (ICMR), New Delhi. The total population of 8 villages was 16798.A total of 3850 suspected malaria patients were included for diagnosis of malaria by bivalent Rapid Diagnostic Test (RDT) kits during the period of January 2015 to August 2016. All identified malaria patients were treated as per National Drug Policy of India [14].

RESULTS

Out of 3850 suspected malaria patients, 554 were found positive for malaria. Of 554 patients 514 were positive for *P. vivax* and 40 for *P. falciparum*. Incidence of vivaxmalaria was highest in village Raipuri 268 (52.1%) followed by Sudaka 125 (24.3%), Tarakpur 49 (9.5%), Satputikala 22 (4.2%), Tain 20 (3.8%), Dhadhuka16 (3.1%), Husainpur 7 (1.3%) and Marchroli 7 (1.3%) (Table1). API during the year 2015 ranged from 0.267 – 7.090 while in the year 2016, the API was 0.144-5.134 in all the study villages. API of all the villages was decreased during the year 2016 as compared to the year 2015 (Figure1).

Table 1: Village wise distribution of vivax malaria patients

Village	Year 2015 (N=302)	Year 2016 (N =212)	Total (N=514) (%)
Raipuri	150	118	268 (52.1%)
Sudaka	76	49	125 (24.3%)
Tarkpur	29	20	49 (9.5%)
Satputiyaka	16	6	22 (4.2%)
Tain	13	7	20 (3.8%)
Dhadhuka	9	7	16 (3.1%)
Husainpur	4	3	7 (1.3%)
Machroli	5	2	7(1.3%)

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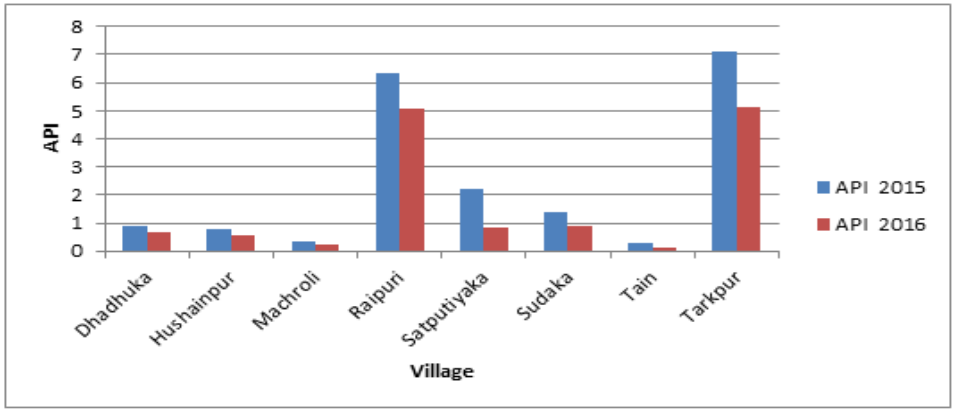
Figure 1: Village wise API of vivax malaria during 2015 and 2016



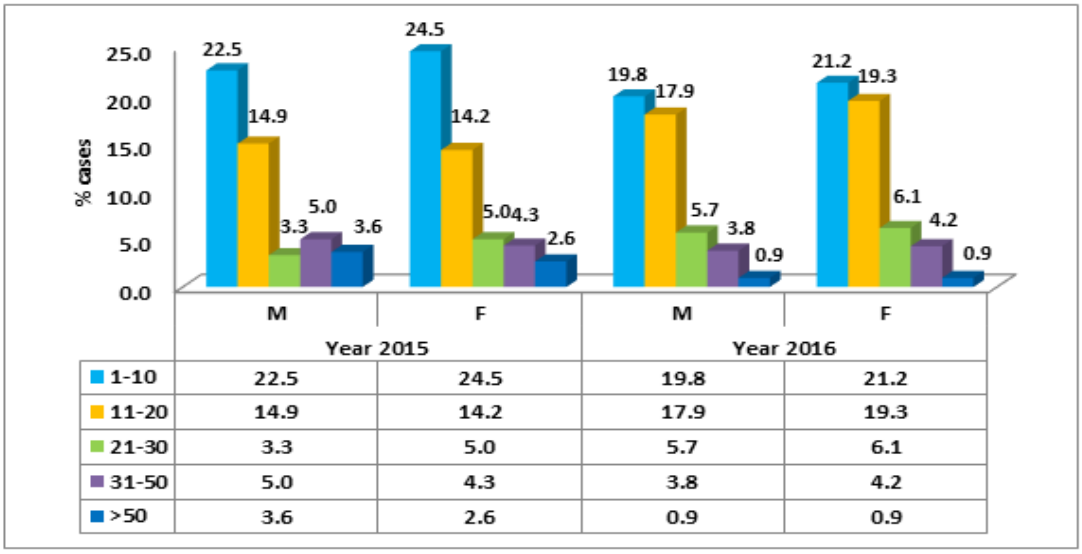
Prevalence of malaria was found high in the agegroup 1 to 10 years children (41-47%) followed by 11 to 20 years (29.1–37.3%), whereas the lowest number of affected age group was>50 years (1.9-6.3%) (Table2).

Table 2: Prevalence of vivax malaria cases in different age groups

Age group (Years)	Year 2015 (N=302)	Year 2016 (N=212)
	% (N)	% (N)
1-10	47(142)	41 (87)
11-20	29.1 (88)	37.3(79)
21-30	8.3 (25)	11.8(25)
31-50	9.3(28)	8.0(17)
>50	6.3 (19)	1.9 (4)

When analysed the distribution of malaria positivity among different age group and sex , there was no major difference of malaria cases between male and females in all the studied age groups. During the year 2015, out of 302 malaria cases 22.5% (68), 14.9% (45), 3.3% (10), 5% (15) and 3.6% (11) males in 1-10, 11-20, 21-30, 31-50 and > 50 year age groups respectively. For the same period, 24.5 % (74), 14.2% (43), 5% (15), 4.3% (13) and 2.6% (8) females were found positive in 1-10, 11-20, 21-30, 31-50 and > 50 year age groups respectively. Similarly in year 2016, out of 212 malaria cases found 19.8% (42), 17.9% (38), 5.7% (12), 3.8% (8) and 0.9% (2) males with 21.2% (45), 19.3% (41), 6.1% (13), 4.2% (9) and 0.9% (2) females in 1-10, 11-20, 21-30, 31-50 and >50 year age groups respectively (Figure 2).

Figure 2: Prevalence of malaria by age and sex



	Year 2015 M	Year 2015 F	Year 2016 M	Year 2016 F
1-10	22.5	24.5	19.8	21.2
11-20	14.9	14.2	17.9	19.3
21-30	3.3	5.0	5.7	6.1
31-50	5.0	4.3	3.8	4.2
>50	3.6	2.6	0.9	0.9

DISCUSSION

The diagnosis of malaria by the microscopic method is time-consuming and always not feasible in the field due to the improper power supply. RDT kit is rapid, more sensitive as compared to microscopic [16]. In this study, we have used the bivalent RDT kit for thediagnosis of malaria in the study villages and identified vivax malaria patients were treated with primaquine as per National Drug Policy guideline of India [14]. The prevention of relapses of *P.vivax* infection by anti-relapse drug primaquine is likely to be a key strategy for interrupting transmission and reducing the malaria disease burden [17]. Similarly in our study, after the treatment of vivax malaria with primaquine in thefirst year, API of all the villages was decreased in the second year. Thus, 14 days treatment with PQ might be a factor for reduction of vivax malaria in the year 2016 as compared to 2015. The study supports the hypothesis of Roy model [12]. *Plasmodium vivax* annual parasite index (Pv API) of ≥7 has been reported in parts of India [18]. The prevalence of *P. vivax* malaria is high as compared to *P. falciparum* malaria in the district Mewat, Haryana [19].

The incidence rate of vivax malaria has been reported 30% in the age group 1-14 years from India [20], 33.9% from Mumbai in 0-5 years age group [21] and 38.9% from Delhi in 6-10 years age group [22]. Similarly, in the presentstudy,vivax malaria was 47% in 1-10 years age group. The incidence of high malaria in children is possibly due to outdoor activities, more exposure of mosquito and low immunity [21, 23-24].

District Mewat in Haryana is endemic for malaria [5]. Therefore control and elimination of vivax malaria is aserious issue. Global Technical Strategy for Malaria 2016–2030 has been targeted to theeffort of malaria elimination [25]. For the control and elimination of vivax malaria required strong surveillance to ensure vivax malaria case diagnosis and anti-relapse treatment of primaquine for 14 days regimen [26-27]. There is also need to be treatment with a full dose of primaquine by directly observed treatment (DOT) on the pattern of tuberculosis treatment.

CONCLUSIONS

The study suggests that the vivax malaria might be controlled and eliminated by ensuring the compliance of the anti-relapse drug primaquine. Further study is needed to ensure the compliance of 14 days primaquine regimen by direct observed therapy (DOT) on the pattern of tuberculosis treatment.

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REFERENCES

[1] World Malaria Report. Geneva: World Health Organization; 2016 (http://www.who.int/malaria/ publications/atoz/ 9789241511711/en, accessed 13 December 2016.
[2] Lee KS, Cox-Singh J, Brooke G, Matusop A, Singh B. Int J Parasitol2009; 39:1125-28.
[3] Douglas NM, Anstey NM, Buff PA, et al. Malar J 2012; 11: 135.
[4] Hay SI, Guerra CA, Tatem AJ, Noor AM, Snow RW. Lancet Infect Dis 2004; 4:327-36.
[5] Srivastava A, Nagpal BN, Saxena R, Wadhwa TC, Mohan S, Siroha GP, Prasad J, SubbaraoSK. Curr Sci 2004, 86: 1297-1303.
[6] Adak T, Sharma VP, Orlov VS. Am J Trop Med Hyg 1998; 59:175-79.
[7] Imwong M, Snounou G, Pukrittayakamee S, et al. *J Infect Dis*. 2007b; 195:927–33.
[8] Gogtay NJ, Desai S, Kamtekar KD, Kadam VS, Dalvi SS, Kshirsagar NA. Ann Trop Med Parasitol 1999, 93: 809–812.
[9] Baird JK, Hoffman SL. Clinic Infect Dis 2004, 39: 1336–1345.
[10] Das R, Dhiman RC, Savargaonkar D, Anvikar AR, Valecha N. Malar J 2016; 15: 115.
[11] Wells TN, Burrows JN, Baird JK. Trends Parasitol 2010; 26: 145–51.
[12] Roy M, Bouma MJ, Ionides EL, Dhiman RC, Pascual M. PLoSNegl Trop Dis 2013; 7: e1979.
[13] White MT, Karl S, Battle K, Hay SI, Mueller I, Ghani AC. eLife 2014; 3:e04692.

[14] NVBDCP: National drug policy on malaria, Ministry of Health and Family Welfare/Directorate of National Vector Borne Disease Control Programme, Govt. of India. 2010. http://www.nvbdcp.gov.in.
[15] District disaster management plan Mewat 2016-17. Government of Haryana Department of Revenue & Disaster Management.
[16] NazR , khan S ,FarooquiMK ,Girotra R, Malik AK. Sch J App Med Sci 2016; 4:2539- 2543.
[17] Douglas NM, Simpson JA, Phyo AP, et al. J Infect Dis 2013; 208: 801–12.
[18] Gething PW, Elyazar IRF, Moyes CL, et al. PLoSNegl Trop Dis. 2012; 6:e1814.
[19] Amrita K, Kant R, Sharma PK, Chaudhary A.Indian Journal of Health Sciences and Care 2015; 2:36-40.
[20] NVBDCP: National Vector Borne Disease Control Programme, 2012. Strategic Plan for Malaria Control in India 2012–2017: A Five-Year Strategic Plan. Available at: http://nvbdcp.gov.in/Doc/Strategic-Action-Plan-Malaria-2012-17-Co.pdf.
[21] Kumari M, Ghildiyal R. Malaria Research and Treatment 2014; Article ID 765657, 6 pages http://dx.doi.org/10.1155/2014/765657.
[22] Sharma S, Aggarwal KC, Deswal S, Raut D, Roy N, Kapoor R. J ClinDiagn Res 2013; 7 : 1964 – 1967.
[23] Bull PC, Kortok M, Kai O et al . J Infect Dis 2000, 182:252-59.
[24] Wipasa L, Elliott S, Xu H, Good MF Immunol Cell Biol 2002, 80:401-414.
[25] World Health Organization. Global technical strategy for malaria 2016–2030. Geneva: WHO, 2015.
[26] Herrera S, Ochoa-Orozco SA, González IJ, Peinado L, Quiñones ML, Arévalo-Herrera M. PLoSNegl Trop Dis 2015; 9: e0003700.
[27] Sharma VP, Vas Dev, Phookan S. Indian J Med Res 2015; 141: 546-555.