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Pattern of Malaria Infection at Tertiary Care Hospital of Haryana-A Hospital Based Study

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A B S T R A C T

Malaria is a well-known mosquito-borne illness and it continues to be a major public health problem at the start of new millennium. The problem is persistent in both rural and urban area. The problem in rural India is that the settlements are difficult to approach; road and transport facilities are minimal, limited health care facilities and inappropriate preventive measures. we studied the pattern and seasonal trend of malaria infection from Mewat region. Study was carried out at SHKM Government Medical College Mewat, Haryana. All suspected cases of malaria were tested by peripheral blood film and examine under light microscope.In one year study 575 (12.7%) patients were slide positive out of 4500. According to types of plasmodium species *Plasmodium vivax* and *Plasmodium falciparum* accounted for 73.9% and 24.6% of malaria morbidity respectively. Malaria was reported in all age groups and both sexes, but the 21–30 year age group were affected more (24.1%) and 55.65% patients were 11to 40 years. Males were more affected than females. Majority of cases reported in September and October months. The present study reported the prevalence of *Plasmodium vivax* more than *Plasmodium falciparum* in our region. Adult males were more prone to infect with malaria.

Introduction

Malaria is common mosquito-borne illnesses in our country. It is a protozoan disease caused by the parasites of the genus *plasmodium.* Common species in India are *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium falciparum*, and *Plasmodium ovale.* Sporozoite of *Plasmodium* is transmitted by the bite of female *Anopheles* mosquitoes commonly from dusk to dawn. (Swetha *et al.*, 2015).

A typical attack comprises of three stages such as cold stage, hot stage and sweating stage and showing symptoms such as head ache, fever, shivering, vomiting, haemolytic anaemia, jaundice, haemoglobin in urine, retinal damage and convulsions.(Chatterjee KD *et al.*, 2009)

Plasmodium vivax and *Plasmodium falciparum* are commonly seen the tropical countries like Africa, India Pakistan, Afghanistan, Shri Lanka, Middle East and South East Asia, *Plasmodium Malariae* and

Plasmodium Ovale are less common cause of disease and generally do not cause severe illness. (Park K *et al.,* 2002)

It is estimated that a cumulative 1.2 billion fewer malaria cases and 6.2 million fewer malaria deaths occurred globally between 2001 and 2015 than would have been the case had incidence and mortality rates remained unchanged since 2000. Of the estimated 6.2 million fewer malaria deaths between 2001 and 2015, about 5.9 million (95%) were in children aged under 5 years. These deaths represent 13% of the 46 million fewer deaths from all causes in children aged less than 5 years since 2000 (assuming under-5 mortality rates in 2000 remained unchanged during 2000–2015). More than 90% of malaria is caused by *P. vivax* and *P. falciparum*. It is one of the leading causes of illness and death in the world (World Malaria Report 2015). Severe malaria caused by *Plasmodium falciparum* is associated with fatal complications such as cerebral malaria, algid malaria, septicemic malaria, severe anemia, kidney failure, respiratory distress, metabolic acidosis. (Verma P *et al.,* 2014)

In tropical countries such as India, malaria may be throughout the whole year but higher in autumn and spring. (Alemu *et al.,* 2012) Owing to existence of an ideal environment for the breeding of mosquitoes such as warm climate, heavy rain, and stagnant water, industrialization, and expanding urbanization are the factors attributed toward the mosquito breeding.[7] The incidence of malaria peaks in monsoon (June to October), as stagnant water provides the optimal conditions for the breeding of mosquitoes. In India, National Vector-Borne Disease Control Program (NVBDCP) auspices the control measures for malaria that should be vertically implemented all over the nation. The most endemic Malarious regions in India are Central and Eastern Indian regions of the country covering Madhya Pradesh, Jharkhand, Chhattisgarh, Orissa, West Bengal and Assam.(Aruna *et al.,* 2004)

The present study was planned to observe the occurence and pattern of malarial infection and socioeconomic factor at a tertiary care hospital in Mewat region. A constant watch on the changing pattern of the diseases provides us an opportunity for timely intervention as well as monitor the progress of the ongoing disease control programs.

Materials and Methods

The present was carried out as seasonal variations and pattern of malaria infection at Mewat region (Atif *et al.,* 2000).

Study Area

Research laboratory of Microbiology department of SHKM GMC Mewat, Haryana

Duration: one year study was done on 4500 blood samples from January 2015 to December 2015

Inclusion Criteria

Outdoor and indoor patients from various departments of SHKM GMC Mewat presented with sign and symptoms suggestive of malaria. Clinical diagnosis based on fever (temperature > 37.5˚C) and/or history of fever (3-17 days), and other symptoms including; headache, joint pains, body weakness, cough, diarrhoea, loss of appetite/refusal of feeds, abdominal pain, and generalized body weakness was carried out by physicians at the outpatient and inpatient department of the hospital.

Exclusion criteria

1. Patients took any anti-malarial within a week
2. HIV positive or any other immunological disorder
3. Febrile patients with other possible alternative cause
4. Patients of acute febrile illness with negative MP on peripheral blood film on three consecutive samples.

Methodology

All of the samples obtained in Parasitology laboratory were tested by peripheral blood film and examine under light microscope using 100X oil immersion. The smears were processed by fixing the thin film in absolute methanol (methyl alcohol), heat fixed and stained with 10% Giemsa solution in buffered water, pH 7.2 for 10-12 min. After staining, the smears were rinsed with normal water, drained and air dried. They were then examined by light microscopy under 1000x magnification for malaria parasites, *Plasmodium species*. A malaria blood film was considered negative after 100 high power fields had been examined.(Chatterjee *et al.,* 2009)

Results and Discussion

4500 patients with symptom suggestive of malaria were screened,out of which 575(12.7%) were found slide positive for malaria parasite. *Plasmodium vivax* found in 73.9% cases and *Plasmodium falciparum* found in 24.6% cases. Mixed infection acquired by 1.91% cases.

In present study males were 54.43% and females were 45.5%. The malaria was predominently obsereved among adults (11 to 40 years) contituting 55.6% cases. Majority of patients came from rural area of mewat most of victims were uneducated and they belonged to lowere class families. 74.9% patients were from OPD and 25% were from IPD (Table No.1).

There was a fluctuating seasonal trend of malaria during a year, as there was a complete absence of microscopically confirmed malaria cases being reported from February to June, and the maximum cases were reported from August to November, with a peak in October (Table No. 2).

In our study maximum number of cases was from August to November. Parasite rises soon after the start of the first rain season in July reaching peak in September and October because the rains provide good breeding sites for mosquito vectors. As vector population increases, transmission of infection subsequently rises. As rainfall decreases and breeding grounds of mosquito vector dries up at the end of the rain season around October, then falls reaching a minimum after November, probably due to a reduction in mosquito vector population. Many investigators reported seasonal trends of malaria in tropical countries like India. Mewat belt is associated with unusual monsoon rains and other socio-economic factors, changing the malaria scenario at an interval of 7–9 years.(Aruna *et al.*, 2004)

The present study findings were similar to other investigators. Tropical countries are humid and warm in rainy season. . For most *Anopheles* vector species of malaria, the optimal temperature range for their development lies within 20°C to 30°C. However, transmission of *Plasmodium vivax* requires a minimum average temperature of 15°C and transmission by *Plasmodium falciparum*, requires a minimum temperature of 19°C. That may be a reason for more cases of malaria during October or November month.(Amit *et al.,* 2012)(Suman *et al.,* 2006; Joel JJ *et al.,* 2013)

Since most of the patients in Mewat were poor they live in mud plastered houses (Katcha ghar) and sleep in open spaces in fields, prone to bite by mosquitoes. In addition improper disposal of excreta and stagnant water around house working in fields bare footed, bare body major factor to spread of malaria. Majority of people are uneducated, lack of health facility and poor they were not aware about malaria they didn't take appropriate preventive measures. It worsens the condition of patients and increases the severity of malaria. Other investigators also reported that malaria more common in poor living standards (Amit *et al.,* 2012).

Males (54.4%) were more than female (45.5%). The present study results were similar to other investigators. A study from Kerala also support that malaria infection in males is higher compared to females (Chandrashekar *et al.,* 2011). A hospital based study conducted at KMC hospital, in India also supports high preponderance of males in malaria case infection (Chowta *et al.,* 2007). Study by Praveen *et al.,* from Rajasthan reported a much difference males were more affected than female similar to our study behind it may be in this region male were more engaged in outdoor activities and fields work so, it makes them more prone to mosquito bites (Kumar P *et al.,* 2010). Other studies also reported similar findings (Balpande *et al.,* 2014; Preetam *et al.,* 2012; Amit *et al.,* 2012).

Maximum patients were from age group 21-30yr (24.17%) followed by 1-10yr (21.04%). 55.6% patients were adult from 11-40 yr, these findings might be associated with their daily outdoor activities for job, farming, etc., which expose them to the bite of mosquitoes. Similar results were found in other studies also.(Kumar P *et al.,* 2010) Study by Amit *et al.,* from Gujarat reported maximum cases from age group less than 15 years and Balpande *et al.,* reported most common affected group 11-2-0 years. Difference may be due to difference in area and they club age groups.

In the present study *Plasmodium vivax* were 73.9% and *Plasmodium falciparum* were 24.6% Frequency of P. Vivax (73.9%) cases was remarkably high with, while the study conducted by I Jamaiah *et al.,* (2006) they found *Plasmodium falciparum* was the most common species (57%) reported in their study followed by *Plasmodium vivax* (38%) and 5% mixed infection.

There are various studies from various geographical area reported different pattern of malaria. In some studies found more cases of *Plasmodium vivax* while other reported more cases of *Plasmodium falciparum*. Table no.3 showed comparison of various studies. Madhu Muddaiah *et al.,* in their study on malaria in South Canara, Karnataka states also reveals that *Plasmodium vivax* constitutes as highest; 52.54%, *Plasmodium falciparum* 33.75% and mixed malarial infection is13.69% (Muddaiah M *et al.,* 2006). Similar findings also reported in the study of Swetha *et al.,* 95.83% cases were *Plasmodium vivax* 4.13% were *Plasmodium falciparum* (Swetha *et al.,* 2015). The other studies conducted in different states of India on this regard also second the preponderance of *Plasmodium falciparum*. Gauravi Mishra in their study of malaria in Ratnagiri district, reports the 59.09% of infection was due to *Plasmodium falciparum*.(Gauravi *et al.,* 2003). Nadjm *et al.,* in their study on 'Malaria an update for physicians' also support that more infections happens due to *Plasmodium falciparum* because *Plasmodium falciparum* constitutes 75% of infection while *Plasmodium vivax* occupies only 20% of infection (Nadjm *et al.,* 2012).

Table.1 Distibution of Patients among Malaria Infections

Factor	No. of patients n=575	Percantage
1. Gender		
a. Male	313	54.43%
b. Female	262	45.5%
2. Age		
1-10 yr	121	21.04%
11-20 yr	97	16.86%
21-30 yr	139	24.17%
31-40 yr	84	14.6%
41-50 yr	88	15.3%
51-60 yr	37	6.4%
More than 60 yr	9	1.56%
3.Locality		
Rural	401	69.73%
Urban`	174	30.26%
4.Educational status		
Educated	231	40.17%
Uneducated	344	59.82%
5.Socio-economic status		
Katcha ghar	392	68.17%
Pacca ghar	183	31.82%
6.Income		
Below poverty line	117	20.34%
Above poverty line	458	79.65%
7.Outdoor/Indoor		
OPD	431	74.9%
IPD	144	25.04%

Table No. 2 Month-wise distribution of Malaria infection

Month	*Pl. Vivax*	*Pl. Falciparum*	Mixed infection	Total
January	4	1	-	5(0.86%)
February	-	-	-	-
March	-	-	-	-
April	-	-	-	-
May	-	-	-	-
June	-	-	-	-
July	15	3	-	18(3.13%)
August	40	11		51(8.86%)
September	154	41	7	202(35.1%)
October	183	73	3	259(45%)
November	21	9	1	31(5.39%)
December	8	1	-	9(1.56%)
Total	425 (73.9%)	139(24.6%)	11(1.91%)	575

Table.3 Comparison of Various Studies from Various Places

Study	Place	*Pl falciparum*	*Pl. vivax*
Sidhu *et al.*, 1991	Kerala	50%	40.6%
Anand *et al.*, 1999	North India	85.36%	-
Atif *et al.*, 2000	Pakistan	26.6%	66.6%
Mishra *et al.*, 2003	Maharashtra	59.09%	-
Muddaiah *et al.*, 2006	Karnataka	-	52.4%
Jamaiah *et al.*, 2006	Malayshia	57%	38%
Guera *et al.*, 2010	Africa	22.6%	42%
Nadjm *et al.*, 2012	North America	75%	20%
Alemu *et al.*, 2012	Ethopia	75%	25%
Amit *et al.*, 2012	Gujrat	66%	34%
Balpande *et al.*, 2014	Madhya Pradesh	4.8%	95.1%
Swetha *et al.*, 2015	Gujrat	4.13%	95.83%
Present study 2016	Haryana	24.6%	73.9%

The limitation of this study was that we could not trace the malaria cases from remote area that did not attend the clinic; so, the actual prevalence of malaria and its epidemiological trend in Mewat region could not be calculated. Since most of patients were poor uneducated they live in mud plastered house and sleep in open places. In addition improper disposal of excreta stagnant water near houses working in field bare footed and with out clothing were major factors leading to transmission of malaria parasite.

The human behavioural pattern is a major epidemiological factor that impacts on disease transmission and progression.

Important component for reducing the burden of malarias morbidity and mortality include more sensitive diagnostic tools effective use of anti-malarial drugs and improved personnel and community protection and mosquito controls. In order to monitor the transmission of malaria and for eradication strategies, epidemiological studies of malaria are essential. There should be some policy and practice guide-lines toward the factors that help in reducing the transmission.

Plasmodium vivax was reported as the most common parasite to cause malaria in Mewat region. Slide positivity rate were 12.7%. Malaria was most common in male subjects than female subjects. The commonly affected age group was between 21 and 30 years. Water stagnation & accumulation in rainy season plays a major role in mosquito breeding and subsequent spread of malaria. Poor sanitation in lower socioeconomic class has maximum number of malaria cases. With help of our study on malaria pattern we wish to create awareness at health sector level, municipal corporation level, Panchayat level and each individual level to take disciplinary action in monsoon season to prevent stagnation of water in our houses and colony. Government authority should find out the probable breeding sites of mosquitoes, slum areas, open drainage system etc which have to be cleaned regularly and water accumulation and stagnation should be avoided to prevent mosquito breeding. Individual awareness can create a miracle to stop transmission of malaria. Active vector control implementation of regular training programs, workshops and proper treatment should be encouraged to decrease transmission of malaria.

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