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"TO STUDY THE PREVALENCE OF MALARIA WITH SPECIAL REFERENCE TO ITS SOCIO-ECONOMIC DETERMINANTS OF PATIENTS IN A TERTIARY CARE HOSPITAL, UTTAR PRADESH".

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ABSTRACT

BACKGROUND: Malaria imposes great socio-economic burden on humanity, and with six other diseases (diarrhea, HIV/AIDS, tuberculosis, measles, hepatitis B, and pneumonia), accounts for 85% of global infectious disease burden. In many parts of India and the Indian subcontinent, malaria is highly prevalent. *Plasmodium* parasites are the causative agent of malaria. It continues to be a global public health concern around the world.

AIM AND OBJECTIVE: To find out the prevalence of malaria related to its socio-economic determinants of patients in a tertiary care hospital of Uttar Pradesh.

METHEDOLOGY: This was a hospital based cross-sectional study carried out in the Department of Microbiology during the monsoon and post monsoon of the year from 1st July to 31st December at Department of Microbiology, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India. A total of 395 blood samples were collected from patients having febrile illness along with their Socio-economic profile. The suspected cases was tested for the seriological test. Diagnosis was confirmed by suitable laboratory tests after exhaustive clinical examination.

RESULTS: In the present study out of the 395 blood samples, 85 (21.5%) were positive for Malaria. Among them *Plasmodium falciparum* (78.8%) was more commonly associated. The infection rate was higher in males (67%) as compared to the females (32.9%) and in patients aged > 10 years (48.2%). It was also observed that he high rate of infection was seen among the patients belong to lower class (70.5%) of rural areas(36.4%).

CONCLUSION: This study reveals a better understanding of the association of various risk factors that influence the incidence of malaria is required to design and/or deploy effective policies and strategies for malaria elimination. When prioritising clinical and diagnostic workup and starting the appropriate empirical and supportive therapy, doctors are guided by their understanding of the local aetiology of AUFI.

Keywords: Socio-economic profile, *Plasmodium falciparum*, Febrile illness, Prevalence.

INTRODUCTION

Acute febrile illnesses brought on by infectious diseases can result in hospital admissions and outpatient visits, significant morbidity, and, in the event that treatment is not received, even death[1,2].If there is no specific source of infection and the fever lasts less than 14 days, it is referred to as acute undifferentiated febrile illness (AUFI) .There are many different infectious agents (viruses, bacteria, and protozoa) that can cause AUFI; therefore, in order to address the public health concern of AFUI, it is critical to understand the individual pathogens linked to each AUFI episode [2].In tropical nations, dengue fever, chikungunya, scrub typhus, malaria, enteric fever, leptospirosis, and other illnesses are common causes of AUFIs [3].

Malaria is a major cause of morbidity and mortality in the tropics. Disease is of global importance, results in 300-500 million cases yearly and 1.5-2.7 million deaths annually. Approximately 2.48 million malarial cases are reported annually from South Asia, of which 75% cases are from India alone [1,2]. The incidence of malaria has declined globally from 80 cases per 1000 population at risk in year 2000 to 57 cases in the year 2019. Twenty nine countries contributed to 95% of the global malaria burden with 94% of the cases being contributed by the WHO African Region [3].

In India, malaria is a major public health concern. It contributed 86% of all malarial deaths in the WHO South East Asia region. India has the highest number of malaria cases (2% of global cases) and deaths (2% of malarial deaths) outside of the African sub-continent [3]. In India, malaria is reported from almost all states and union territories (UTs), but its transmission is not homogenous. The Indian states of Jharkhand, Chhattisgarh, Odisha, Uttar Pradesh, Gujarat, Madhya Pradesh and West Bengal together contribute more than 80% of the total malaria cases [4].

Human malaria is caused primarily by 4 different species of *Plasmodium* namely; *P. falciparum*, *P. vivax*, *P. malariae* and *P. ovale*. Clinical pictures, outcome, prognostic factors, and changing clinical pattern of malaria due to individual species infection have been studied extensively [2]. The high mortality rate from *P. falciparum* is due to its ability to induce severe malaria, and in some cases, multiple organ failure [5]. A typical attack of malaria comprises three distinct stages: Cold stage, hot stage and sweating stage. The clinical features of malaria vary from mild to severe, and complicated, according to the species of parasite present, the patient's state of immunity, the intensity of infection and also the presence of concomitant conditions such as malnutrition and other diseases [6]. The Government of India has developed and launched a National Framework for Malaria Elimination (2016– 2030) [7] and a National Strategic Plan (NSP, 2017– 2022) [8], with a plan to eliminate malaria by 2027, three years ahead of global target [9]. Few studies have examined the association of socio-economic factors affecting malaria incidence particularly in India [10–12].

The present study was undertaken to find out the prevalence rate and to assess the role of different social-demographic, economic and behavioral factors in malaria incidence, Uttar Pradesh.

MATERIALS & METHODS

This was a six month (1st July to 31st December 2022) Cross-sectional study conducted in the Department of Microbiology at Department of Microbiology, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India. A total 395 blood samples were collected from suspected patients of febrile illness admitted in the hospital were studied.

Inclusion criteria: Sampling method was used and allin-patients fulfilling the AUFI definition were included. All in-patientswith <14 days of fever with no localising source of infection were included in the study

Exclusion criteria: Patient's who were already on antimalarial drugs, or confirmed cases of Dengue and Typhoid fever were excluded from this study.

Sampling Strategy: Socio-economic data with detail history of clinical findings, blood transfusion, antimalarial drug were recorded in the consent form. After obtaining consent ,3-5ml of blood sample were collected and proceeded for testing.

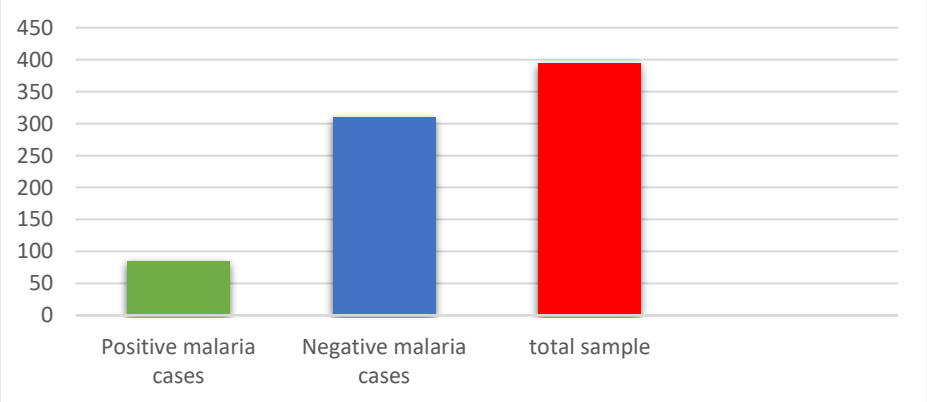
Microscopic Examination : Thin and thick blood smear were prepared from samples and stained with leishman's stain then observed under oil immersion lens(100x) of microscope. Minimum 100 field were examined before giving it as negative. If parasite detected in one or more than one field, give it as positive malaria test.
Thick smear was used for the detection of *Plasmodium* parasite and thin smear was used to species identification & to identify the infective stage of parasite.

Ethical consideration: Ethical committee clearance was duly obtained from Institutional ethics committee and informed written and verbal consent was taken from all the patients.

Statistical Analysis:
Descriptive statistics were used to summarize socio-economic characteristics and clinical data. The prevalence of malaria was calculated as the percentage of confirmed cases among the study participants. Bivariate and multivariate analyses were conducted to explore associations between socio-economic factors and malaria prevalence.

RESULTS

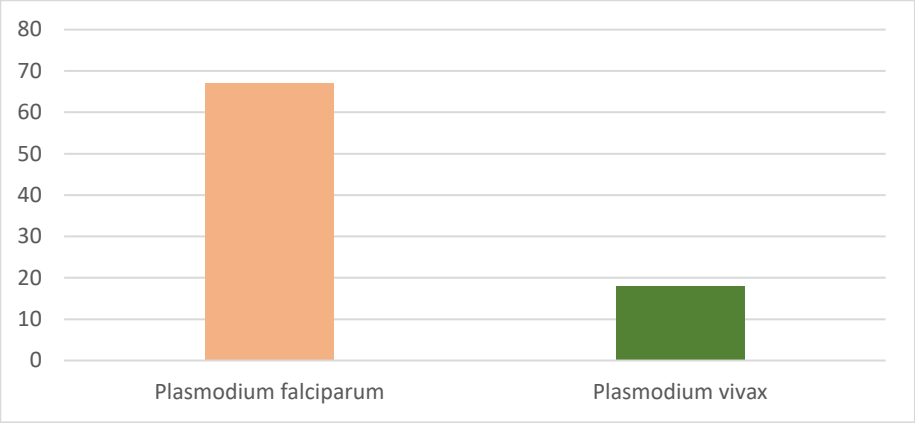
In the present study out of the 395 blood samples of suspected malaria patients, 85 were found positive for malaria with the Prevalence rate of 21.5% (Graph No.1).
Most of the cases were from the patients belong to rural areas (70.5%, 60 of 85) than those belongs to urban areas (29.4%, 25 of 85).(Table No. 3).



Graph No. 1: Prevalence of malaria cases.

As shown in this Graphical representation 85 (21.5%) were positive for malaria out of 395 total samples.

From the Graph No. 2 it was clear that among 85 malarial positive cases, *Plasmodium falciparum* was predominant (78.8%), followed by *Plasmodium vivax* (21.1%) (Graph No.2).



Graph No.2: Distribution of *Plasmodium* species

This graph was showing *Plasmodium falciparum*(78.8%) was more common than *Plasmodium vivax* (21.1%).

In the present study it was also observed that the Prevalence of malaria was more common in males (67%) as compared to female (32.9%) (Table No. 1).

GENDER	FREQUENCY	PERCENTAGE
Male	57	67%
Female	28	32.9%
TOTAL	85	100%

Table No. 1: Gender wise distribution.

In the current study malaria infection was more common in males (67%) than in females (32.9%).

AGE	FREQUENCY	PERCENTAGE
< 5 years	15	17.6%
5- < 10 years	29	34.1%
>10 years	41	48.2%
TOTAL	85	100%

Table No. 2: Age wise distribution.

Patients aged > 10 years were showed high rate of malaria infection (48.2%) than those belonged to < 5 years of age (17.6%).
With regard to difference in age group, 48.2% of the cases occurred in the age group > 10 years (41 0f 85) followed by aged 5-<10 years (29 of 85) (Table No. 2)

RESIDENCE	FREQUENCY	PERCENTAGE
Urban	25	29.4%
Rural	60	70.5%
TOTAL	85	100%

Table No. 3: Area wise distribution.

Among them infection was more common in patients belong to rural areas (70.5%) than those belongs to urban areas (29.4%).

SOCIO-ECONOMIC STATUS	FREQUENCY	PERCENTAGE
Lower	31	36.4%
Lower middle	16	18.8%
Lower upper	5	5.8%
Upper middle	7	8.2%
Upper lower	26	30.5%
TOTAL	85	100%

Table No. 4: Socio-economic distribution

Among them most of the cases were from the patients from Lower class (36.4%,31 of 85) followed by upper lower class (30.5%, 26 of 85) and least cases were from the Lower upper class (5.8%, 5 of 85) (Table No. 4). Least cases were also detected from patients who took preventive measures against malaria, 91.7% patients took preventive measures (Table No. 5).
Malaria infection was most common in lower (36.4%) and upper lower (30.5%) class respectively and least from Lower upper (5.8%) and upper middle (8.2%) class.

PREVENTIVE MEASURE	FREQUENCY	PERCENTAGE
Yes	78	91.7%
No	7	8.3%
TOTAL	85	100%

Table 5: Preventive measures taken by patients.

Those Patients took preventive measure had least chance of malaria infection. In this table, 91.7% patients were taken preventive measures against malaria infection.

FAMILY HISTORY	FREQUENCY	PERCENTAGE
Yes	18	21.1%
No	67	78.8%
TOTAL	85	100%

Table No. 6: Showing family history against malaria infection.

There was no corelation between family history and malaria infection.

PALLOR	FREQUENCY	PERCENTAGE
Present	66	77.6%
Absent	19	22.3%
TOTAL	85	100%

Table No. 7: Pallor symptoms in malaria patients.

Among 85 positive malaria cases 77.6% have pallor symptoms and 22.3% showing no symptoms.
There was no corelation among malaria positive patients with family history of malaria as showed in Table 6. Pallor symptoms present in 77.6% (66 0f 85) (Table NO. 7).
Comparison between different factors and their prevalence value was showed in Table 8.

COMPARISON b/w DIFFERENT FACTORS	X^2	P VALUE
Age Vs Family	86.34	0.082
Age Vs Pallor	0.238	0.007
Gender Vs Pallor	88.19	0.036
SES Vs Prevalentive measure	86.62	0.054
Residence Vs Pallor	86.5	0.058

Table No. 8: Comparison between different factors and their P value

From the Table No. 8 it was observed that Age with respect to Pallor is highly Significant whereas, Gender with respect to Pallor observes Significant correlation . SES with respect to the preventive measures and Residence with respect to Pallor is Significant with the Pvalue of (0.007, 0.036, 0.054 and 0.058) respectively,. It was found that the Age with respect to the Family does not show any Significant correlation and was observed as Not Significant with the Pvalue of 0.082.

DISCUSSION

Malaria is a major public health problem in India despite being a both preventable and treatable disease. India recorded the highest decline (49%) in malaria cases in 2018 compared to 2017 [13] and from 2018 to 2019 was 17.6% [3].

There is a wide variation of reports of prevalence of malarial infection in India and other countries. This can be due to differences in geographical and climatic condition which affect mosquito breeding, socio-economic conditions of patients, knowledge about healthcare and public health practices.

Prevalence of malarial infection in our study was observed to be 21.5% which was closer to the other research investigator Pandey et al. [14] with the prevalence rate of (24.74%). However , Hadiya et al. [15] from Gujarat and Karlekar et al. [16] reported much less prevalence of 2.10% and 4.28% respectively. This difference could be due to summer season in which the study was carried out.

Regarding prevalence of species, *Plasmodium vivax* was 21.1 %, *Plasmodium falciparum* 78.8% this study corelates with Karlekar et al. [16] who reported *Plasmodium vivax* 33.8% and *Plasmodium falciparum* 66.6%.

Nigeria reported much higher prevalence of *Plasmodium falciparum* 93.3%, Abdallah et al. [5] reported *Plasmodium falciparum* 81.3% which explains high mortality in these areas, as *Plasmodium falciparum* infection is associated with many complications.

The difference in prevalence of *Plasmodium vivax* and *Plasmodium falciparum* in different areas can be due to presence of endemicity of particular type and higher relapses in *vivax* type.

Although malaria distribution is predominantly determined by the climatic and environmental factors affecting mosquito and malaria parasite reproduction and proliferation, however, malaria is also influenced by various socio-economic factors [17–19].

Present study showed a strong association of malaria with age and gender , social group, family history and preventive measures.

In our study, infection of malaria parasite were more common in males (67%) than females which is similar to study by Karlekar SR et al. [16] it is because the males head of households are more likely to engage in outdoor activities and females are relatively more engaged in indoor domestic activities. The division of labour as a result of gender roles may play a significant part in determining exposure to mosquitoes [20]. Many studies reported a similar risk for both genders [11, 12, 21]. Some studies also reported males having greater occupation risk of contracting malaria [22, 23] In our study ,maximum number of cases of malaria occurred in the patients aged > 10 years (48.2%). Our finding correlates with S.R. Karlekar et al. [16] who reported mean age group of 24.8 years and Sahar S et al. [24] reported 16-30 years of age.

The reason of higher prevalence in this age group could be due to movement in wider areas possibly endemic, more chances of exposure to mosquito bites and most of carefree behaviour.

Malaria disease and poverty often described as a vicious cycle, whether malaria infection is a consequence of or a cause for low household socioeconomic status has been debated for decades [25]. Many studies showed a significant negative relationship of wealth index with malaria, i.e. the poorest households have significant more malaria cases compared to relatively better-of households

[26, 27, 28]. However, in our study, prevalence rate of malaria was high in lower class (36.4%) followed by upper lower class (30.5%).

For, mosquitoes and mites to breed and thrive, monsoon period is considered the best time. Drinking water is also contaminated during rainy season. All these factors lead to increase in above mentioned causes of fever in these particular months. Seasonal upsurge in fever is also a well known documentation in other studies [29,30].

The heavy burden of tropical infections such as dengue, enteric fever, scrub typhus and malaria. Beginning with the monsoon season, acute undifferentiated febrile illnesses (AUFI) are more common in tropical nations. The diagnosis and treatment of febrile disorders are made more difficult by several aetiologies, overlapping clinical manifestations, and mixed infections. Physicians would be more effective if they were aware of the regional aetiology and seasonal occurrence of certain disorders.

Thus, educating vulnerable people on malaria knowledge and on implementing preventative measures, and the necessity of seeking early diagnosis and prompt treatment may prove to be effective in controlling malaria. Complementary vector control and case management interventions are needed to further reduce malaria transmission.

CONCLUSION

This study revealed the association between malaria cases with age, gender, socio-economic status, preventive measures taken, which contributes to the understanding of the prevalence of malaria and its socio-demographic determinants in a tertiary care hospital setting. Understanding the regional and seasonal patterns of acute undifferentiated fever is helpful when developing logical clinical, diagnostic, and therapeutic algorithms that guide doctors in selecting the best empirical antibiotics.

The findings will inform targeted interventions, aiding healthcare professionals and policymakers in developing strategies to mitigate the impact of malaria on vulnerable populations.

Declarations:

Conflicts of interest: There is no any conflict of interest associated with this study

Consent to participate: We have consent to participate.

Consent for publication: We have consent for the publication of this paper.

Authors' contributions: All the authors equally contributed the work.

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