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INCIDENCE OF MALARIA AMONG FEBRILE PATIENTS ATTENDING TERTIARY CARE HOSPITAL, LUCKNOW-CROSS SECTIONAL STUDY

Medical Microbiology

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ABSTRACT

Background: Malaria remains a significant public health concern, particularly in regions with tropical and subtropical climates. In India, the burden of malaria is substantial, with most cases concentrated in certain states. **Objective:** This study aimed to determine the incidence of malaria among febrile patients attending a tertiary care hospital in Lucknow. **Materials and Methods:** This is a hospital based cross sectional study. Over a period of six months, 264 febrile patients were screened for malaria using rapid card tests and blood smears. **Result:** The study found an overall seropositivity rate of 16.29%, with Plasmodium vivax being the predominant species. Females were found to be more affected than males, and young adults aged 20-29 years showed the highest prevalence of malaria. Seasonal variations were observed, with peak transmission occurring in October. **Conclusion:** These findings underscore the importance of robust surveillance and early detection strategies to effectively manage and control malaria in endemic regions.

KEYWORDS

Malaria, Plasmodium, Febrile Illness.

INTRODUCTION:

Malaria remains a significant public health challenge globally, particularly in tropical and subtropical regions. In the South East Asian region, India bears a substantial burden, with approximately 77% of all malaria cases reported in the region originating from India.[1] Despite efforts to control the disease, malaria continues to be a concern, with 80.5% of Indians residing in areas where malaria transmission occurs. Certain states, including Orissa, Chhattisgarh, Jharkhand, Gujrat, and Rajasthan, account for a significant proportion of malaria cases and deaths in India.[2] In 2022, malaria was expected to have caused 608,000 deaths worldwide, or 14.3 deaths per 100,000 people who were at risk. Just four nations accounted for more than half of all deaths: Tanzania (4%), Niger (6%), the Democratic Republic of the Congo (12%), and Nigeria (31%).[3]

The history of malaria in India reflects fluctuations in disease burden, with notable peaks in the 1950s and resurgence in the 1970s despite initial success with control programs.[4] Plasmodium vivax and Plasmodium falciparum are the predominant species causing malaria, with children under five being the most vulnerable group. Despite progress in reducing malaria mortality in this age group, malaria remains a leading cause of death, claiming a child's life every two minutes globally.[5]

In developing nations, severe malaria continues to cause a high rate of child mortality even with advancements in malaria management and a deeper comprehension of its pathogenesis.[6] These include respiratory distress, hypoglycaemia, severe anaemia, neurological consequences (such as cerebral malaria in humans), and metabolic abnormalities. Cerebral malaria is characterized by unarousable coma not attributable to other neuro-pathologies combined with *Pf* parasitaemia. Of all severe malaria complications, CM is the most prevalent and deadly, with a mortality rate of 100% if untreated and a patient fatality of 15-25% if treated with current first-line anti-malaria therapy.[7] Plasmodium falciparum (Pf) is the parasite that causes most complex malaria cases. On the other hand, P. vivax infections can also result in CM, [8]while P. knowlesi can occasionally induce severe symptoms and indications of malaria.[9]

AIM AND OBJECTIVE:

The aim of this study is to determine the incidence of malaria among febrile patients attending a tertiary care hospital in Lucknow.

The objectives include determining the socio-demographic profile of the study population and estimating the incidence of malaria cases among febrile patients.

MATERIALS AND METHODS

Study Design and Period:

This cross-sectional study received ethical clearance from the Institutional Research Committee and Institutional Ethical Committee on 17th October 2023 (IEC/IIMSR/2023/20). It was conducted at the Department of Microbiology, IIMSR, Lucknow, over a period of six months (October 2023 to March 2024).

Data Collection:

A total of 264 febrile patients attending the Tertiary care hospital were included in the study, and blood samples were collected for malaria screening.

Laboratory examination:

Blood samples are collected and transferred to the microbiology laboratory for diagnosis. Various methods are used, from direct microscopic observation to concentration and staining techniques. Thick and thin blood smears are examined with Romanovsky stain for screening and species identification. Peripheral blood smear study is a confirmatory test. Common faults in preparing blood films should be avoided. Thick smear is more sensitive, while thin smear allows speciation. Non microscopic tests like Antigen detection tests (RDTs) detect parasitic LDH, HRP-II, aldolase. Rapid diagnostic tests come in various formats like plastic cassette, card, dipstick, or hybrid cassette-dipsticks. Results of rapid diagnostic tests are read after 15 minutes.

Data analysis and interpretation:

Data analysis was performed using MS Excel, SPSS software and presented in number and percentages using graphs as well as tables. The sample size estimation was based on a confidence level of 95% and a margin of error of 6%.

RESULTS:

Out of 264 patients screened, 43 tested positive for malaria, resulting in a seropositivity rate of 16.29%. Plasmodium vivax was the predominant species identified in all positive cases. Gender-wise distribution showed a higher prevalence among females (53.41%) compared to males (46.59%). The age group of 20-29 years had the highest malaria prevalence (28.40%), followed by 10-19 years. Seasonal analysis revealed peak transmission in October. Hospital

admission data indicated a higher proportion of positive cases among inpatients compared to outpatients.

These are the images of positive findings from this study of rapid card test and blood smear.

Figure 1

Figure 2

Figure 1 showing plasmodium vivax positive in rapid diagnostic card test and figure 2 showing gametocyte stage of plasmodium vivax in blood smear.

Out of 264 patients, 43 patients were found positive for Malaria, hence seropositivity was 16.29% (43/264) as shown in figure.3

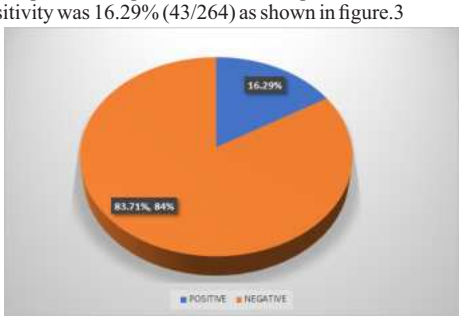

Fig.3, Graph showing percentage of positive cases among patients enrolled in this study

Out of 264 patients enrolled in the study majority were males (53.41%) as compared to females (46.59%) but number of positive cases in females (23) were more than male (20). Among these 2 females were pregnant. Pregnancy-related malaria can have harmful effects on both the mother and the fetus. Expectant mothers are more vulnerable to placental malaria, maternal anemia, and even mortality. On the other hand, poor fetal/newborn pregnancy outcomes include low birth weight , stillbirth, early birth, and intrauterine growth restriction.

Table No. 1 Distribution Of Patients According To Their Age Group

AGE GROUP (IN YEARS)	NUMBER OF OPD PATIENTS	NUMBER OF IPD PATIENTS	NUMBER OF TOTAL CASES	PERCENTAGE (%)
0-9	3	13	16	6.06%
10-19	24	33	57	21.59%
20-29	39	36	75	28.40%
30-39	20	18	38	14.39%
40-49	8	25	33	12.5%
50-59	8	15	23	8.71%
60-69	6	7	13	4.92%
70-79	3	4	7	2.65%
80-89	2	0	2	0.75%
TOTAL	113	151	264	100%

The association between prevalence and sociodemographic factors are presented in table. Age group 20-29 years has the highest malaria prevalence of 28.40% while the lowest malaria prevalence of 0.75% is noted among the 80-89 years old participants. Generally, malaria infection in this study significantly decreases with increasing age.

DISCUSSION:

Malaria is a major public health problem widespread throughout tropical and subtropical regions of the world including Ethiopia. In the present study, the overall prevalence of malaria infection (16.29%) was lower than previous study findings of 33.8% in Ethiopia.[10] The present results were also lower than prevalence of 64.5%, 32.4%, and 41.6% from Tanzania [11] and Nigeria, [12] respectively.

The present study showed that malaria is a public health concern among young adults 20-29 years old in the study population. The overall prevalence of malaria among young adults (20-29 years of age) visiting Tertiary care hospital, Lucknow was (28.40%). This result was comparable to a study conducted in Arsi Negele, Ethiopia (22.8%), [13] Arba Minch Zuria District, South Ethiopia (22.1%) [14] and Nigeria (22.6%).[15]

In this study similar to a study done in Wogera district, Ethiopia, [16] as a child becomes older, fewer youngsters experience febrile illnesses and Plasmodium infections. The reason for this could be that the children reside in stable regions where malaria transmission is prevalent, and they can acquire age-related protective immunity from repeated exposure to infectious mosquito bites.[17]

Compared to those who did not, young people who spent more time outside or at night were more likely to be exposed to malarial infections. Malaria was statistically significantly associated with night time outdoor stays. This result was consistent with earlier research conducted in Armachiho, in Dembia district and Sherkole refugee camp in Benishangul-Gumuz, Ethiopia.[18]

In the present study, more females (53.48%) were affected by malaria than males (51.16%). this was similar with a study conducted in Amhara region where the prevalence of malaria was relatively higher among females (60%) than males (40%).[19]

All malaria infections in the present study were observed to be caused by *P. vivax and similar findings were reported by D. Legesse that* the overall percentage of malaria cases detected was 81(19%), with *P.vivax* being the most prevalent species.[20]

The percentage of Plasmodium species in the current study was comparable to that of other North Indian writers. The findings are consistent with previous research that indicated P. vivax to be seen more. Other observers have also noted that vivax is more common than falciparum in our nation. We observed that the majority of patients in the age range of 21 to 40 years were male. The increased exposure to the outdoors could be the cause of both.[21]

In India, Plasmodium vivax continues to pose a significant health and economic threat and has proven to be challenging to eradicate, especially in populated areas. The proportion of P. vivax cases is rising relative to the decrease in malaria infections in the recent past. In addition to being spread by a range of vectors in a variety of biological environments, Plasmodium vivax exhibits variability in its relapse patterns and may go unnoticed as a pathogen in situations when a mixed infection with P. falciparum is present. Growing data suggests that P. vivax is linked to cerebral and severe malaria in India.[22]

In India, malaria has been a serious vector-borne illness for the past few years. Over the past 20 years, India has seen sharp decrease in the number of malaria cases. Between 2000 and 2019, there was a 71.8% decrease in cases and a 73.9% decrease in death.[23]

CONCLUSION:

Malaria remains a significant public health concern in India, particularly in regions like Lucknow. This study provides valuable insights into the incidence and demographic distribution of malaria among febrile patients attending a tertiary care hospital. The findings emphasise the need for ongoing surveillance, early detection, and targeted interventions to control malaria transmission effectively. By addressing these challenges, we can work towards reducing the burden of malaria and improving health outcomes in affected populations. New treatments to stop the negative effects of malaria on health may be developed as a result of a deeper comprehension of the disease's pathophysiology during pregnancy.

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