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A Study on the Paradoxical Prevalence of Urban and Rural Falciparum Malaria

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Abstract—*Cerebral malaria is caused by Plasmodium falciparum, a protozoan parasite. Plasmodium gets transmitted to human via infected female anopheles mosquito bites. Cerebral malaria is the most dangerous and life threatening form of malaria that effects the brain and causes much morbidity and mortality.*

Objectives*: To know the Prevalence of falciparum malaria in urban and rural areas of kurnool district Andhra Pradesh, India.*

To assess the influence of various factors in occurrence of malaria.
To assess the different clinical presentations of malaria in children and adults of Urban and rural areas.

Material and Methods*: The present study was carried out on 162 cases of falciparum malaria in the DTR Hospital Kurnool,from April 2016 to March 2017.*

A detailed epidemiological, clinical and blood examinations were performed.

Result *: A Total number of cases 162 were enrolled for the study,102 cases were(63%)urban and 60 were (37%)rural.*

Out of 102 cases of Urban 56(55%)were children and 46(45%) were adults had falciparum malaria.

Out of 60 cases of rural 32(53%) were children and 30(50%)were adults .The prevalence of cerebral malaria was seen more in children than adults. The socio-economic factors had a major influence upon the prevalence of malaria in urban area. Anemia was seen in 75 % cases,40 % from urban and 35%from rural population. Splenomegaly was leading sign in all forms. Respiratory distress syndrome was also observed in the patients especially among those admitted in intensive care units.

Conclusion*: The result demonstrated that economic and environmental deterioration conditions contribute to increase urban populations with higher rates of malaria. These statistics indicated that morbidity and mortality are mainly due to infectious disease in endemic area.*

Keywords*: falciparum malaria, socio-economic status, anemia, respiratory distress syndrome, splenomegaly.*

1. INTRODUCTION

Malaria is the most important of the protozoan parasitic diseases of humans and its neurological complication, cerebral malaria is arguably one of the most common non-traumatic encephalopathies in the world. There are four species of human malaria, but plasmodium falciparum causes nearly all the deaths and neurological complications. Although malaria is typically considered mainly a problem of the rural poor, this disease has been a concern in urban settings for centuries. It is essential to know whether people are being Infected in the urban areas perse where infection and disease are being diagnosed. If not, then information on travel histories becomes critical to determine activities and locations of risk. For infections that are acquired in urban settings, it is then important to understand when and where transmission is occurring and how urban transmission may differ from that in rural settings. In particular, it is crucial to characterize and understand how urban microhabitats promote Anopheles vector abundance and influence their behavior of biting humans. Urban microclimate variables ex; temperature, relative humidity and precipitation are also crucial to mosquito survival, reproduction and development, thereby influencing vector presence and abundance in urban environments (1-2) movement of a more permanent nature, in particural the migration of rural residents to urban and peri urbans is a major demographic trend with health impacts occurring in many parts of the globe. Travel by residents of urban areas can put them at increased risk of both infection and disease and may thus limit the accuracy of inferences about urban transmission based on the diagnosis of malaria in urban areas. These may be short-term visits to more rural areas of high risk, longer term residency shifts, or more permanent migration. More generally, travel is a potential risk factor for malaria among residents in both urban and rural settings in India. (3-5).

Majority of malaria subjects in this area are residing in kachcha houses, in both urban slums and rural areas.

Adequacy of natural lighting and ventilation of dwelling is parallel to each other. Thus inadequate ventilation and inadequate lighting in the dwelling provide favourable shelter to vector of malaria. A wide variety of risk factors socio-economic environmental, including housing condition and others for malaria infection and disease, mostly specific to the local context, have been identified.

2. MATERIALS AND METHODS

The present study was carried out in the DTR Hospital Kurnool from April 2016 to March 2017 total 162 cases were enrolled from 102 urban and 60 rurals. The samples had taken in the disposable syringes were transferred in the sample tubes were immediately centrifuged and the serum separated were used for the analysis. The history and chemical examinations results of the patients of falciparum malaria shows the symptoms of fever and headache, rigors chills body aches in and vomiting, splenomegaly was seen almost in all the patients adults and children. The biochemical examination shows decreased level of hemoglobin and in severe malaria patients respiratory distress syndrome. Acidosis is also observed.

3. RESULTS

Total of 162 falciparum malaria patients were analyzed 102 were (63%) urban and 60 were (37%) rural out of 102 cases of urban 56 (55%) were children age between 1-13years and 46(45%) were adults age between 52-78 years had falciparum malaria out of 60 cases of rural 32 (53%) were children and 28 (47%) were adults. The prevalence of falciparum malaria was seen in children than the adults, and children to adults ratio 1.5:1 (Table:1:Fig:1)

Table 1: Area and Age wise distribution of patients.

Areas/ Age (Years)	Urban		Rural		Total	
	N:102	Percentage	N=60	Percentage	N=162	Percentage
Children (1-13)	56	55%	32	53%	88	54%
Adults (52-78)	46	45%	28	47%	74	46%

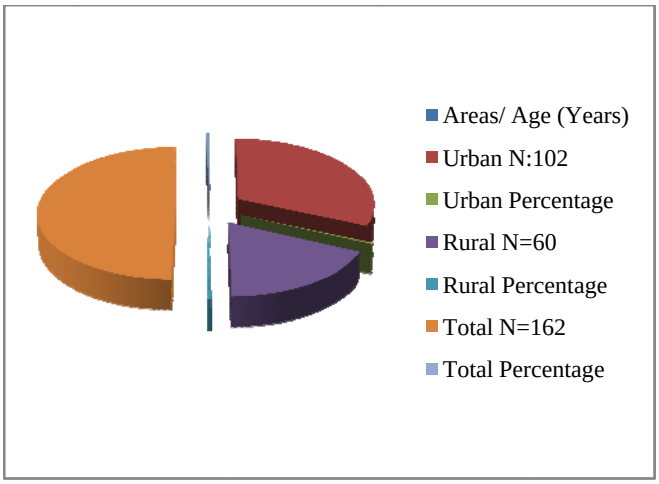

Fig. 1 Area and Age wise distribution of patients

Table 2: Socio-Economic Profile of Malaria Cases.

Environmental Variables	Urban N=102		Total	Percentage	Rural N=60		Total	Percengage	Total N = 162	Percentage
	Children	Adults			Children	Adult				
Shelter / Flat	14	8	22	23%	-	-	-	-	22	14%
Houses	41	38	79	77%	09	13	22	37%	101	62%
Huts	01	-	01	0.01 %	23	15	38	63%	39	24%
Ventilation / Adequuate	18	9	27	26%	13	05	18	30%	45	28%
Inadequate	38	37	75	74%	19	23	42	70%	117	72%
Water supply/ Hand Pumps	02	-	02	0.02 %	24	17	41	68%	67	41%
Tap water	54	46	100	98%	08	11	19	32%	119	73%
Waste water drainage / closed	24	15	39	38%	12	05	17	28%	56	35%
Open	32	31	63	62%	20	23	43	72%	106	65%
Garbage collection / Daily	16	10	26	25%	-	-	-	-	26	16%
Weekly	40	36	76	75%	32	28	100	100	136	84%

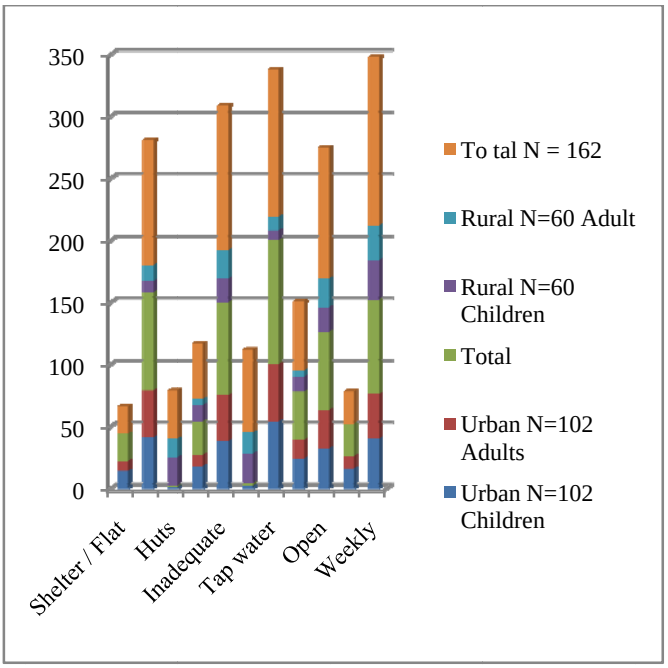

Fig. 2: Socio-Economic Profile of Malaria Cases.

Table 3: Clinical Manifestations of cerebral malaria.

Sign.	Urban				Rural				Total	
	Children No.56%		Adults No.46%		Children No. 32		Adults No.28		No. 162	%
Fever	56	100%	46	100 %	32	10 0%	28	100 %	162	100 %
Chills	48	86	38	83	27	84	18	64	131	81
Vomiting	39	70	25	54	24	75	11	39	99	61
Headache	41	73%	32	70%	31	97 %	25	89%	129	80%
Convulsions	32	57	18	39%	26	81	14	05	90	56
Anemia	38	68	27	59	29	91	27	96	121	75
Thrombocyytopenia	29	52	21	46	19	59	21	75	90	56
Serum Bilirubin	42	75	41	89	27	84	22	79	132	81
Splenomegtaly	55	98%	43	93	29	91	23	82	150	93
Acute RDS	39	70	22	48	21	66	19	68	101	62
Chronic RDS	28	50	09	20	05	16	08	29	50	31
Acute Renal Failure	04	07	06	13	11	34	14	50	35	22
Coma	01	0.02 %	-	-	-	-	01	0.04	02	0.01

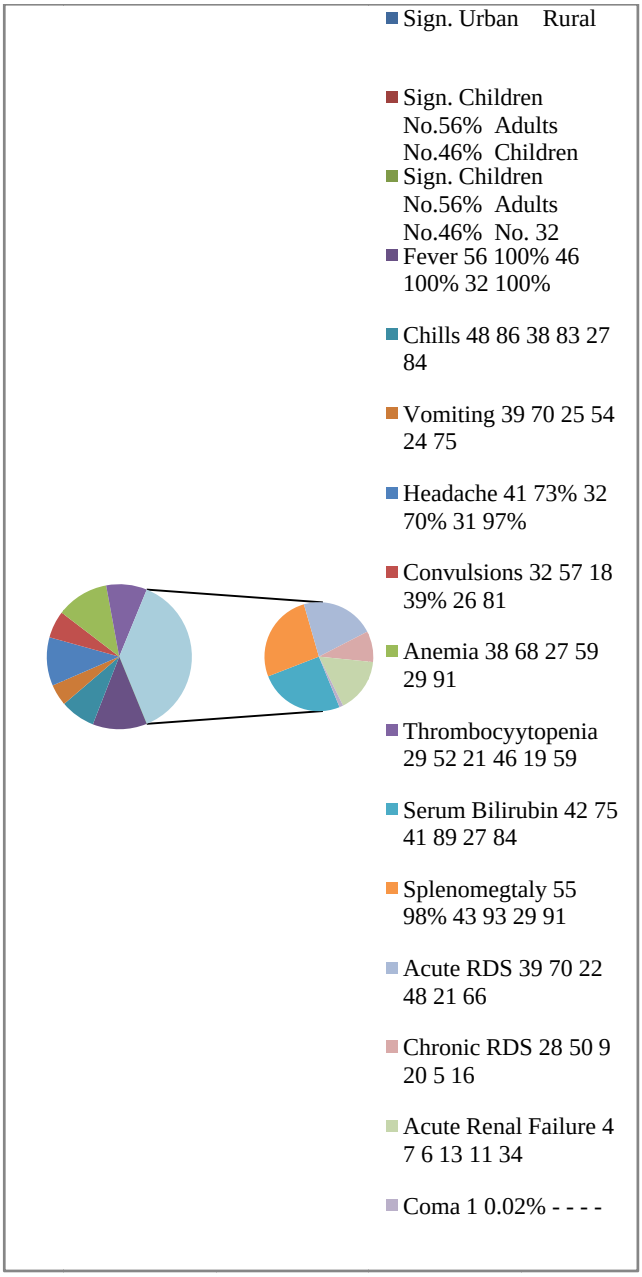

Fig. 3: Clinical Manifestations of cerebral malaria.

Malarial transmission is intimately associated with the socio-economic status and the environmental variables of dwellings . As table: 2 shows majority of malaria cases were residing in houses, in both urban (77%) and rural areas (37%). The total study population (62%) of malaria cases.

Inadequate ventilation promotes various vectors inside the dwelling due to favourable conditions.As table:2 reveals that occurrence of disease was 74% in inadequately ventilated urban and 70% in rural areas. Malaria cases were more in the area where waste water drainage system is of open type with typical absence of closed drainage for both sewage and sullage. 62% in urban and 72% in rural total 65% affected. In places where garbage collection was not frequent but seen only once in a week this also promotes flourishing of malaria vectors and occurrence of disease was 75% in urban and 100% in rural population and total 84%.

Clinical manifestations of subjects with falciparum malaria shown in Table:3. Fever, chills, vomiting, headache and convulsions were leading clinical presentation in urban and rural alike. Children were more when compare to adults. Splenomegaly was leading sign in urban and rural population total 93% was seen. Anemia was seen 68% of urban children and 59% in adults, where as in rural population children were 91% and adults were 96% and total 75% of cases. Hemoglobin in falciparum cases was below 10gm/dl. Thrombocytopenia in urban group was 1,20,000/cumm in 29 children (52%) and 21(46%) in adults where as in rural population 1,16,000 /cumm was seen in 19(59%) children and 21(75%) in rural adults total 90(56%). Serum bilirubin raised in 75% of children and 89% of adults urban population where as 84% of children and 79% of adults in rural population total 132 cases 81%. Acute respiratory distress syndrome was seen in 101 cases (62%) of total population and chronic respiratory distress syndrome was observed in 50 cases (31%). Acute renal failure was observed in more in rural (34% in children and 50% in adults) than urban 07% in children and 13% in adults) total 22% only one malaria affected children urban and one adult from rural population went into coma observations were noted in Table:3.

4. DISCUSSION

Majority of malaria cases (63%) were found in urban while 37% cases in rural area. Regarding age wise distribution, overall prevalence of malaria in children (1-13 years) was 54% and 46% in adults (52-78years).

The poorly ventilated and open drainage houses provide ideal indoor resting and breeding sites for mosquitoes as it was evident from our study that ventilation was inadequate in both and urban. Result indicates that incidence of cerebral malaria paradoxically more in civilized habitat when compared to sparsely populated areas. Unhygienic environment combined with neglect of personal hygiene and community hygiene, haphazard and unplanned growth of towns has resulted in creation of urban slum with poor housing and sanitary conditions promoting vector mosquito breeding potential . Scarce and irregular public water distribution system has led to water storage practices in artificial containers These have generated a new set of breeding potential for vectors of urban malaria. Due to ineffective and faulty disposal of sewage and sullage, pockets of stagnant water have in fact multiplied. In our study total 75% patients had anemia, rural patients had 91% in children and 96% in adults in urban population while anemia in rural subset is 68% in children and 59% in adults. Earlier studies demonstrated that there is parenchymal damage of bone marrow, in effective erythropoiesis and a reduced rate of erythropoitic proliferation in patients with acute falciparum malaria (Dormer et al. 1983), these factors can culminate in the chronically low Hb values observed.Another important fact is that, high levels of parasitemia, particularly in low immunity status individuals can certainly result in massive lysis and clearance of RBCs resulting in profound anemia. There is platelets hypoactivity seen in patients. Serum bilirubin was found raised more frequently in p.falciparum 81%.

The study focuses on clinical manifestation splenomegely was recored 93% and acute respiratory distress syndrome was seen more in children than in adults 62% of total cases and chronic RDS was seen in 31% of total population. It appeared after treatment for malaria. While over-hydration may be the cause in some cases of pulmonary distress or increased permeability of pulmonary capillaries. Acute renal failure was seen only in 22% of total population. Several factors contribute to ARF in falciparum malaria such as parasitized erythrocytes causing micro vascular obstruction and causing hemolysis (wilairatana.p.1999). apart from parasites, glycosyl-phosphatidyl-inositol which is a receptor on monocytes covalently bound to the surface of antigens of falciparum malaria parasites. The monocytes are then stimulated to release the tumor necrosis factor. which in turn enhances synthesis of various cytokine cascades and mediators. These mediators also cause changes in blood volume status, vasodilation and increase vascular permeability resulting in hypovolemia which contribute to ischemic renal failure. Early detection of acute kidney injury may help in the proper management resulting in better outcomes.

5. CONCLUSION

Malaria must be considered as a leading differential diagnosis in acute febrile patients with abnormalities like splenomegaly, fall in hemoglobin level, platelet count and raised bilirubin levels.

Thus it can be concluded that the problem of malaria is prevalent in urban and rural areas because of the eco-environmental variables with a paradoxical higher prevalence in urban areas.

The goal of these studies is to identify patterns across the urban sites can be used to improve malaria control. Both the areas need community based strategy to control the vector of malaria namely the mosquito control measures so that malaria no longer remains a public health problem.

6. ACKNOWLEDGEMENT

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