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MALARIA: ADDRESS DIFFERENCE IN PATIENTS SUFFERING FROM MALARIA

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Abstract:

Background: *Frequency of malaria infection had been changed in regions according to environmental factors and diseases. Location (address) is a common indicator of malaria. Malaria is highly and frequently prevalent in different areas the world, some are at high risk and other at low risk. Pakistan is a high risk area for malaria prevalence. Studies suggest that there is difference in prevalence of malaria between urban and rural areas.*

Objective: *The main goal of this research is to find out difference of malaria prevalence between the urban and rural areas in district Shaheed Benazirabad and its associated peripheries.*

DESIGN: *This study was cross sectional.*

SETTING: *Medical department of Peoples Medical College Hospital Nawabshah was chosen to carry out this research from May 2017 to December 2017.*

Sample Size: *After achieving the selection standards total 385 subjects of either sex with malaria were included in study.*

Material and Methods: *The patients for variable analyses like; age, gender, malarial features, and presence of malaria were categorized after brief interview. Addresses of subjects were noted and patients were grouped as urban and rural. Clinical examination was carried outon all study subjects followed by collection of blood samples for malaria parasite.*

Results: *Out of 385 subjects, 208 male and 177 were females. Address grouping was done as urban and rural groups and different groups were analyzed for malaria parasite positive. Majority of subjects 282 were reported from rural while 103 from urban areas. In relation to address and gender of patients, 282/385 belonged to rural setup and in them 145 male and 137 were females. While 103 were belonged to urban setup and in them 63 males and 40 were females.*

Conclusion: *Malaria was more common in the rural patients as compared to urban patients.*

Key Words: *Malaria, Malaria Parasite, Urban, Rural.*

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INTRODUCTION:

Malaria caused by a parasite is a highly life-threatening disease. Malaria parasites are named as Plasmodium that inhabitant the red blood cells, multiply there and often lead to rupture of the host cells. Probably about 2 billion subjects up to 2014 were at risk of infection by malaria throughout the world, of them round 84% were from sub-Saharan Africa [1-3]. Malaria is a most important disease related with morbidity and mortality throughout entire world. Young African offspring's, expecting females and travelers of all age groups from non-endemic regions are predominantly infected by the virulent parasite [1,4]. The disease caused by plasmodium falciparum is the most deadly form of disease out of all the species of plasmodium that infect humans because due the rosetting characteristic of the infected RBCs infected [5-8]. Malaria is endemic in most regions of Pakistan; about 60% of population is related to these endemic areas [9, 10]. Malaria is endemic in Pakistan since 1970. In previous years the malaria prevalence increased in Pakistan affecting near twenty million people from 60 districts [10]. Every year 50,000 deaths and more than 500,000 infections due to malaria are reported in Pakistan [11], 37% of these cases occur adjacent to Iran and Afghanistan borders [12]. In Pakistan studies on malaria indifferent areas are infrequent, and most of these were done retrospectively. This study will help in making public health policies in relation to urban and rural location of subjects where malaria is more prevalent. The identification of subjects from different areas suffering from malaria will be concluded to isolate whether which areas are more prevalent in our setup that in future proper management should be carried out to treat the malaria properly and patient may be prevented from the deadly complications related to malaria. Further research on different areas of malaria is needed in Pakistan. This study estimates the risk of acquiring malaria in relation to location of the patients and its occurrence in Pakistani populace.

OBJECTIVE: The key goal of current research was concerned to observe the difference in occurrence of malaria in relation to rural and urban setup.

Operational Definitions:

Malaria:

Malaria is an infectious disease of parasitic protozoans (a single celled micro-organism) related to Plasmodium, causing diseases in human beings and also other animals. All the species of plasmodium causes diseases. P. falciparum causes severe diseases, whereas other plasmodium (vivax, ovale and malariae) are frequently associated with milder forms of disease. P. knowlasi may rarely cause disease in mankind. Thick and thin film microscopy bygeimsa staining and/or antigen related quick tests are used for the malaria diagnosis [13, 14].

DESIGN: This study was cross sectional.

SETTING: The current study was conducted in the department of medicine, during the period from May 2017 to December 2017 at PMC Hospital Nawabshah.

SAMPLE SIZE: After achieving the selection criterion, 385 subjects from either gender with malaria were recruited in the study.

Inclusion and exclusion criterion

All patients of either gender with clinical history of malaria and positive malaria parasite antigen (MP/ ICT Antigen) were included and patients not willing for taking part in study, known cases of blood disorders, HBsAg positive and sickle cell disease were excluded from study.

Ethical consideration

Approval of study was sought from the hospital ethics committee PMCH Nawabshah. Permission for data collection was taken from the head of department of the Medicine. Subjects were thoroughly informed about the objectives and methods of the study. Written informed consent obtained from adult subjects while ensuring that the data will be kept confidential.

MATERIAL AND METHODS:

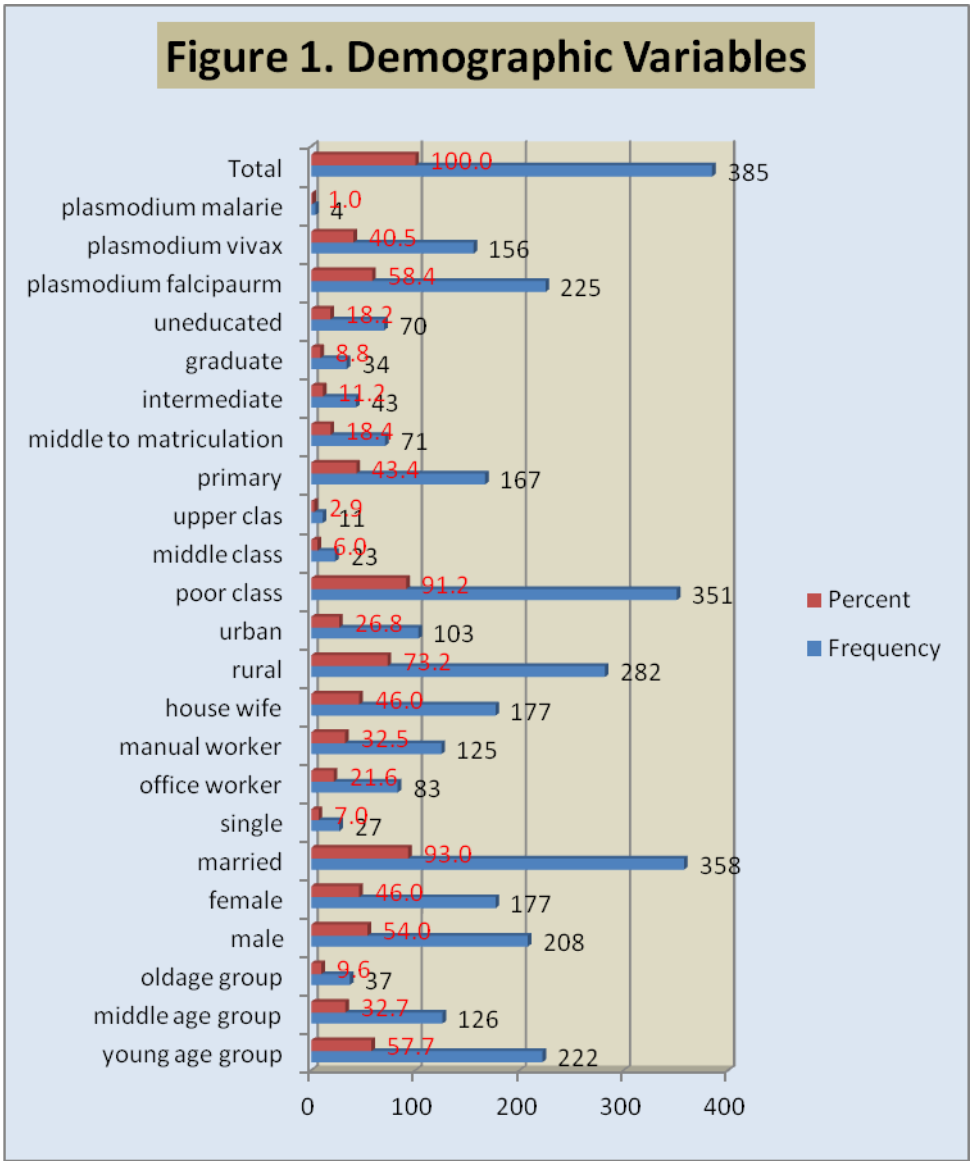
Different variables such as sex, age, address, presence of malaria parasite and type of plasmodium of patient were obtained subsequent to brief consultation. Clinical examination of subjects was carried out for malarial diagnosis. Samples of blood for malaria parasite and plasmodium type were collected. Data was collected through interview based questionnaire. After all aseptic measures blood sample were collected from a vein in all subjects of malaria. Rao Software was used to calculate the sample size from 1.6 million population of district Shaheed Benazirabad with confidence level of 95%, margin of error 5% and 50% distribution response rate. Sample size included 385participants.

Blood samples were collected in all subjects. Antigen based rapid test and/or thick and thin films by Geimsa staining were used for malaria parasite to analyze the frequency of different types of plasmodium of malaria parasite. Addresses of subjects were correlated with gender and plasmodium types.

Table 1. Descriptive Statistics								
	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Age (years)	385	55.00	20.00	75.00	39.6364	.68569	13.45412	181.013

Descriptive statistics:

A total of 385 adult subjects from either gender were included in the present research, mean age of participants was 39.63 with SD±13.45 years, and minimum age 20 years while maximum was 75 years. Table 1.



Demographic variables

Out of 385 subjects, 208 male and 177 were females. 358 were married while27 unmarried. There were 222 subjects from young age group while 126 and 37 subjects from middle and old age groups respectively. By occupation house wives 177, manual workers 125 and office workers were 83. Majority of subjects (282) were reported from rural while 103 from urban areas. 351, 23 and 11 subjects were from lower, middle and upper class respectively. There

were 70 uneducated subjects; while167, 71,43 and 34 were primary, middle to matriculation, intermediate and graduate respectively. Plasmodium falciparum was detected in 255 subjects while in rest 156 plasmodium vivax was detected. Figure 1

Table 3. Correlations of address with age groups.

			Age_Group			
			Young Age Group	Middle Age Group	Old age Group	Total
Address	Rural	Count	161	93	28	282
		% of Total	41.8%	24.2%	7.3%	73.2%
	Urban	Count	61	33	9	103
		% of Total	15.8%	8.6%	2.3%	26.8%
Total		Count	222	126	37	385
		% of Total	57.7%	32.7%	9.6%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.191[a]	2	.909
Likelihood Ratio	.193	2	.908
Linear-by-Linear Association	.188	1	.665
N of Valid Cases	385		

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.022	.050	-.433	.665[c]
Ordinal by Ordinal	Spearman Correlation	-.021	.051	-.415	.678[c]
N of Valid Cases		385			

Correlations of address with age groups.

In relation to address (location) and age group of patients, 282/385 belonged to rural setup and in them 161, 93 and 28 subjects' belonged to young, middle and old age group.While 103 belonged to urban setup and in them 61, 33 and 9 belonged to young, middle and old age group.

For assessment of address with age group category Pearson chi square was 0.191, df 2, Asymp. sig.(2-sided) 0.909.Likelyhoodratio .193 df 2, Asymp. sig.(2-sided) 0.908. Linear by linear association was .188, df 1, Asymp. sig.(2-sided)0.665. Interval by interval pearsons R value was -.022, Approx. Sig .665. Ordinal by ordinal Spearman correlation value was -.021, Approx. Sig .678. Table 3.

Table 4. Correlations of address with gender.

			Gender		
			Male	Female	Total
Address	Rural	Count	145	137	282
		% of Total	37.7%	35.6%	73.2%
	Urban	Count	63	40	103
		% of Total	16.4%	10.4%	26.8%
Total		Count	208	177	385
		% of Total	54.0%	46.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.885[a]	1	.089		
Continuity Correction[b]	2.506	1	.113		
Likelihood Ratio	2.908	1	.088		
Fisher's Exact Test				.106	.056
Linear-by-Linear Association	2.878	1	.090		
N of Valid Cases	385				

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.087	.050	-1.701	.090[c]
Ordinal by Ordinal	Spearman Correlation	-.087	.050	-1.701	.090[c]
N of Valid Cases		385			

Correlations of address with gender.

In relation to address and gender of patients, 282/385 belonged to rural setup and in them 145 male and 137were females. While 103 were belonged to urban setup and in them 63 males and 40 were females. For assessment of address with gender category Pearson chi square was 2.885, df 1, Asymp. sig.(2-sided) 0.089.the continuity correction was 2.506, df 1 and Asymp. sig.(2-sided) .113. Likelyhood ratio 2.908df 1, Asymp. sig.(2-sided) 0.088. Linear by linear association was 2.878, df 1, Asymp. sig.(2-sided) 0.090. Interval by interval pearsons R value was -.087, Approx. Sig ..090. Ordinal by ordinal Spearman correlation value was -.087, Approx. Sig .090. Table 4.

Table 5. Correlations of address with type of Plasmodium.

			Type of Plasmodium			
			Plasmodium Falcipaurm	Plasmodium Vivax	Plasmodium Malarie	Total
Address	Rural	Count	168	111	3	282
		% of Total	43.6%	28.8%	.8%	73.2%
	Urban	Count	57	45	1	103
		% of Total	14.8%	11.7%	.3%	26.8%
Total		Count	225	156	4	385
		% of Total	58.4%	40.5%	1.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.586[a]	2	.746
Likelihood Ratio	.584	2	.747
Linear-by-Linear Association	.400	1	.527
N of Valid Cases	385		

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.032	.051	.632	.528[c]
Ordinal by Ordinal	Spearman Correlation	.037	.051	.728	.467[c]
N of Valid Cases		385			

Correlations of address with type of Plasmodium.

In relation to address and type of plasmodium out of 385, 282 belonged to rural setup and in them 168 had plasmodium falciparum, 111 plasmodium vivax and 03 had plasmodium malarie. While 103 belonged urban setup and in them 57 plasmodium falciparum, 45 plasmodium vivax and 01 had plasmodium malarie. For assessment of address with plasmodium type category Pearson chi square was .586, df 2, Asymp. sig.(2-sided) .746.Likelyhood ratio .584df 2, Asymp. sig.(2-sided) 0.747. Linear by linear association was .400, df 1, Asymp. sig.(2-sided).527. Interval by interval pearsons R value was .032, Approx. Sig .528[c]. Ordinal by ordinal Spearman correlation value was .037, Approx. Sig.467[c]. Table 5.

Table 6. Correlations of address with other variables of study. N=385

		Address	Age_ Group	Gender	Ms	Occupation	S_E	Education	Addiction	Type Of Plasmodium
Address	Pearson Correlation	1	-.022	-.087	-.074	-.046	-.015	.091	-.013	.032
	Sig. (2-tailed)		.665	.090	.147	.368	.766	.076	.802	.528
Age_Group	Pearson Correlation	-.022	1	-.047	-.031	-.009	.016	.061	.726**	.090
	Sig. (2-tailed)	.665		.361	.544	.858	.757	.234	.000	.079
Gender	Pearson Correlation	-.087	-.047	1	.155**	-.207**	.056	-.057	-.066	-.040
	Sig. (2-tailed)	.090	.361		.002	.000	.272	.266	.198	.437
	N	385	385	385	385	385	385	385	385	385
Ms	Pearson Correlation	-.074	-.031	.155**	1	-.137**	-.080	-.025	-.026	-.051
	Sig. (2-tailed)	.147	.544	.002		.007	.116	.624	.611	.319
Occupation	Pearson Correlation	-.046	-.009	-.207**	-.137**	1	-.016	.018	.009	.030
	Sig. (2-tailed)	.368	.858	.000	.007		.748	.724	.857	.561
Socio-Economic Class	Pearson Correlation	-.015	.016	.056	-.080	-.016	1	.046	.053	.109*
	Sig. (2-tailed)	.766	.757	.272	.116	.748		.365	.303	.032
Education	Pearson Correlation	.091	.061	-.057	-.025	.018	.046	1	.033	.406**
	Sig. (2-tailed)	.076	.234	.266	.624	.724	.365		.514	.000
Addiction	Pearson Correlation	-.013	.726**	-.066	-.026	.009	.053	.033	1	.032
	Sig. (2-tailed)	.802	.000	.198	.611	.857	.303	.514		.535
Type Of Plasmodium	Pearson Correlation	.032	.090	-.040	-.051	.030	.109*	.406**	.032	1
	Sig. (2-tailed)	.528	.079	.437	.319	.561	.032	.000	.535	

Correlations of address with other variables.

The relationship between address and different demographic variables were analysed by bivarate analysis. There was strong correlation of age group with addiction, gender with marital status and occupation, plasmodium with socio economic status and educational status. The other parameters of study were not showing significant correlation with address as shown in table 6.

Table 7. Test Statistics

	Age In Years	Age_ Group	Gender	Ms	Occupation	Address	S_E	Education	Addiction	Type Of Plasmodium
Chi-Square	108.93	133.40	2.49	284.57	34.55	83.22	580.07	145.32	22.46	199.23
df	51	2	1	1	2	1	2	4	1	2
Asymp. Sig.	.000	.000	.114	.000	.000	.000	.000	.000	.000	.000

Test statistics of demographic variables (non parametric chi-square).

The test statistics for age in years , age groups, marital status, occupation, address, socio-economical class, education, addiction and plasmodium type was analysed and it had shown the p value <0.001 except gender of patients which was 0.114. The chi-square and df is shown in table 7 for the above mentioned demographic variables.

Table 8. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Address - Age_Group	-.25195	.80778	.04117	-.33289	-.17100	-6.120	384	.000
Pair 2	Address - Gender	-.19221	.69555	.03545	-.26191	-.12251	-5.422	384	.000
Pair 3	Address - Ms	.19740	.52786	.02690	.14451	.25030	7.338	384	.000
Pair 4	Address - Occupation	-.97662	.91968	.04687	-1.06878	-.88447	-20.836	384	.000
Pair 5	Address - S_E	.15065	.60221	.03069	.09030	.21099	4.908	384	.000
Pair 6	Address - Education	-1.13247	1.56645	.07983	-1.28943	-.97550	-14.185	384	.000
Pair 7	Address - Addiction	-.11169	.66183	.03373	-.17801	-.04537	-3.311	384	.001
Pair 8	Address - Type Of Plasmodium	-.16883	.69975	.03566	-.23895	-.09871	-4.734	384	.000

Paired sample test (address with other demographic variables)

It was calculated with 95% confidence interval of the difference lower and upper, mean, SD, Std Error mean, with sig. (2-tailed) had shown a valid statistics and here the p value =<0.001 in total eight pairs. Table 8.

DISCUSSION:

Malaria is a common disease reported all over Pakistan. Seasonal effects had a great impact on its prevalence. It is common in urban as well as rural areas. Proper diagnosis and accurate treatment and valid management of complications related to malaria may prevent morbidity and mortality. Malaria was more common in the rural patients as compared to urban patients. There is big list of possible risk factors seems to be responsible for this like low socioeconomic conditions, low education, large number of peoples residing in rural areas, poor sanitations, contaminated water pools, lack of knowledge in relation to more preventive measures, ineffectiveness of malaria control program. Further studies are needed to evaluate the different aspects of

malaria in Pakistan.

Malaria is the major health issue of the globe that usually affects the poor communities of Africa, Asia and America (Latin). Globallyin 2013 about 198 million cases of clinical malaria and about 584,000 deaths due to malaria were reported [1]. Plasmodium Falciparum was responsible for nearly 80% of these cases and plasmodium vivax for 20% of reported cases. Plasmodium malariae and ovale had limited number of cases [1].

A main community health query is that can urbanization change malaria from a disease of rural community to a disease of urban community. Yet variations about definition of urban situations, urban malaria infection, and whether or not malaria infection management ought to differ between rural and urban areas complicate each the analysis of obtainable knowledge and therefore the development of intervention ways. It is essential to verify whether or not cases diagnosed in urban regions were brought in from encompassing rural regions or as a consequence of transmission from the urban regions.If it is noted that the source of the malaria cases is from the rural regions steps for the control must be directed towards the vectors, sites of malaria breeding and infected humans in those regions of rural community. In the same way if the disease is acquired in the urban regions so the measures to control the disease more effectively should be targeted to those urban regions. The optimum control of malaria infection in the urban areas is dependent on the correct epidemiological and entomological knowledge of transmission of disease [15].

In rural regions, anti-malarial medicines are usually used incorrectly in spite of the provision of ACT. Increased occurrence of malaria in rural regions is due to the poor socioeconomic conditions and less knowledge about the malaria. Use of bed nets and awareness about malaria disease had been related with decreased incidence of malaria infection in Lastour ville. Results of a study from France ville are also consistent with former study, the use of bed nets were assured and were found to be helpful in prevention of malaria. The infection by plasmodium had high prevalence in Gabonese patients was due to the low socioeconomic conditions. Subsequently, there's a crucial requirement to re-inforce techniques in contradiction of malaria infection in each urban and rural areas, and to observe ACT.[16] The finding of current study are also supporting that malaria is more common in low socioeconomic class as compares to upper and middle classes here in our setup.

In Sonsoro (rural) and Gansosso (Urban) regions 126 mosquito larval habitats had been recognizes during May 2012 and April 2013 and of that through the dry season30.95% were documented. In general the maximum anopheline larvae were related to domestic environment (68.42% in rural Kandi, and 66.67% in urban Kandi)[17]. There is no globally agreement on the description of urban malaria and administrative description (definition) is used by almost all the countries [18].

97.5% of malaria cases were diagnosed in people who were young with decreased educational status and living in the risky peri-urban areas. A significant high incidence of malaria was observed in the children that could be elucidated by the age arrangement of populace [3]. There were 222 subjects from young age group while 126 and 37 subjects from middle and old age groups respectively. In Our findings were not in matching with the above study.
It is observed that high risk of malaria is related with the low level of community education [19]. Our study also supports above study There were 70 uneducated subjects; while 167, 71,43 and 34 were primary, middle to matriculation, intermediate and graduate respectively.

The malaria infection is observed to affect those individuals who usually remain at homes as in a study which had shown that 78.6% of mature volunteers were house wives, unemployed, students and merchants with malaria. The risk of malaria was less observed who were related to work places, thus the possibility of bias associated with occupational risk is reduced.

The results of current study by occupation house wives 177, manual workers 125 and office workers were 83.
A study from Quibdó had shown that there was no any transmission of urban malaria. The evidence of increased incidence was observed with transportation of malaria to urban areas from other cities or peri urban areas. Thus, malaria transmission is mainly peri-urban, and autochthonous transmission occurs mainly in indigenous communities. Malaria is mainly found in the local communities due to peri-urban and local transmission [20]. This current research was also representation of local community of district Shaheed Benazirabad.

A note worthy quantity of malaria cases in the Americans are contributed from Colombia, that are usually of rural origin. As officially reported study on

urban malaria cases shown that 10 % of the endemic municipalities had informed the urban and peri-urban malaria cases during the last 8 years that alarms a rising problem for authorities related to health [21]. Most of the malaria cases ensue in the rural regions of the world, although since last 30 years increasing number of malaria cases are also reported in the urban and peri-urban areas. In a systemic review of a number of studies the effect of urbanization was observed on the transmission of malaria in countries of Sub-Saharan Africa [22, 23, 24]. The ratio of patients was high from rural areas as compared to urban populace of present study. Many of the African cities had shown increased gradient from urban to peri-urban and to rural areas on the basis of the annual EIR (Entomological Inoculation Rates) [22]. In Indian cities like Mumbai, New Delhi and Chennai the malaria recurrence had related with the increase in the peri-urban population and also with increased poverty [25, 26]; it had also noted that malaria vectors had assumed urban environment in India[27, 28, 29]. Jamali et al concluded that main habitation proportion was from rural arrangement as compared to urban arrangement. Habitation proportion was prevailing from rural set up as compare to urban arrangement. Greater parts of general public were belong to rural arrangement. [30][31][32].

CONCLUSION:

Malaria was more common in the rural patients as compared to urban patients. Address grouping was done as urban and rural groups and different groups were analyzed for malaria parasite positive. Majority of subjects were reported from rural as compared to urban areas. The possible reasons seems to be low socioeconomic conditions, low education, large number of peoples residing in rural areas, poor sanitations, contaminated water pools, lack of knowledge in relation to more preventive measures, ineffectiveness of malaria control program. Further logical studies are needed to evaluate the different aspects of malaria in Pakistan.

Conflict of Interests

No conflict of interest

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Contribution of Authors

Shamasuddin Shaikh and Anwar Ali Jamali planned the current study. The study was supervised by MA Channa. Jamali GM ,Tanwani BM , Jamali AA and Lighari JH had contribution in all aspects for research as data gathering, scrutiny, explanation and in writing of the document. Other authors took active part in the data gathering. All writers read the manuscript and approved it.

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