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MALARIA: PLASMODIUM TYPE DIFFERENCE IN PATIENTS SUFFERING FROM MALARIA

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Abstract:

Background: *Frequency of malaria infection has been changed in region according to environmental factors and diseases. Plasmodium falciparum and vivax are both common in the areas where malaria is frequent. Studies suggest the management validity according to plasmodium type in disease.*

Objective: *The primary goal of study is to find out the plasmodium difference of malaria.*

Design: *This study was cross sectional.*

Setting: *The current study was performed at medical department of Peoples Medical College Hospital Nawabshah in between April 2017 to December 2017.*

Sample Size: *After achieving the selection standards a total of 385subjects from either gender having malaria were recruited.*

Material and Methods: *Variables such as age, gender, malarial features, and presence of malarial parasite and type of plasmodium in patients were analyzed after a brief discussion with patients. All the subjects were clinically examined for diagnosis of malaria. Thick and thin Geimsa stains were prepared to identify the type of plasmodium in the collected samples.*

Results: *In **385** diagnosed patients **of** malaria, 208 (54.0%) male and 177 (46.0%) were females. Plasmodium typing/grouping was done and different groups were analyzed in malarial parasite positive.*

Plasmodium falciparum was observed in 225 (58.4%), plasmodium vivax observed in 156 (40.5%) subjects, plasmodium malaria observed in 04 (01%) cases and plasmodium ovale observed in 0% cases.

Conclusion: *The plasmodium falciparum was common plasmodium causing malaria.*

Key Words: *Malaria, Malaria Parasite, Plasmodium Vivax, Plasmodium Falciparum.*

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INTRODUCTION:

Malaria is the most important parasitic illness of mankind affecting the tropical and sub-tropical areas in most of countries through-out world. Approximately 500 million subjects are affected each year by malaria. 1 to 3 million subjects are killed by malaria, most of them are children under the age of 5 years. Four different protozoae belonging to class haematozoea order haemosporida from the genus *Plasmodium* are responsible to produce disease. Plasmodium falciparum is agent for the tropical malaria. Core and mitochondrial nucleic acid sequence analysis detected genetically various types of plasmodium falciparum. Tertian malaria is caused by plasmodium vivax and plasmodium malariae is responsible for quartan malaria. Plasmodium galli-naceum that originates from Africa is the most closely related agent [1].

Malaria and its mutations had been identified since long. Malaria is a disease with history of thousands of years in different parts of world as reported by. [2].

Mankinds were solely host for four major plasmodium species who are pathogen to humans, while on the other hand animal species had been reported time by time. Occasionally malaria by other species had been reported in humans. Human are host of different species. Crudely 60% (95 million) of our countries population is related to malaria-endemic areas [3-4]. Malaria is endemic in Pakistan since 1970 after with-drawl of eradication program during 1960s.An increase in malaria was noted in recent years that were related to floods that affected round 20 million individuals over 60 districts [4]. In Pakistan 5 million infections, with about half million deaths are related to malaria each year despite of malaria control programs[5].About 37% of the reported malaria cases in Pakistan are from the regions along the borders of Iran and Afghanistan [6].

Rationale

Studies on relation of different species of malaria are infrequent in Pakistan, and most of these were done retrospectively. This study will help in making public health policies. The incidence of different types of malaria parasite in subjects suffering from malaria will be concluded to isolate whether which types 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 different plasmodium causing malaria. Further research on different types of plasmodium causing malaria is needed in Pakistan. This study estimates the risk of acquiring malaria in relation to its types and occurrence in Pakistani populace.

OBJECTIVE:

The primary goal of study is to find out the occurrence of plasmodium difference with malaria.

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 Plasmodium vivax, ovale and malariae are usually responsible for mild forms of disease. P. knowlasi may rarely cause disease in mankind. Thick and thin film microscopy by geimsa staining and/or antigen based rapid diagnostic tests are used for the diagnosis of malaria [7][8].

DESIGN: This study was cross sectional.

SETTING: The current research was carried at department of medicine Peoples Medical College Hospital Nawabshah during the period of May 2017 to December 2017.

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, 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 age, sex, address, presence of malaria parasite and type of plasmodium of malaria parasite 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. Sample extent through 95% confidence level and margin of error of5% from total populace of about 1.6 million and with50% distribution response rate were calculated by using Rao Software. Sample size included **385** participants. Blood sampling were performed in all patients with positive antigen and results were used for malaria parasite to analyze the frequency of different types of plasmodium of malaria parasite.

RESULTS:

Table 1. Age Statistics of patients.

This study comprised a total of 385 subjects from both genders, the mean age of subjects was 39.63 SD±13.45 years, and with minimum and maximum age between20 to 75 years as shown in table 1.

Table 2. Frequency and percentages of different variables with non parametric chi-square test

There were 208(54.0%) male and 177(46.0%) female subjects. Chi-square value 2.496, df 1and p value <0.114.

Subjects were belonging to almost all age groups, young age group was dominant in our study 222 (57.7%), middle age 126 (32.7%) and old age were 37(09.6%).Chi-square value 133.408, df2and p value <0.001.

In current study 358(93%) were married and 27(07%) were unmarried. Chi-square value 284.574, df1 and p value <0.001.

By occupation 83(21.6%) were office worker, 125(32.5%) manual workers and 177 (46.0%) were house wives. Chi-square value 34.556, df 2 and p value <0.001.

Majority of populace were belonging to rural setup 282(73.2%) while 103(26.8%) were from urban setup. Chi-square value 83.223, df 1and p value <0.001.

Regarding economic conditions poor class was dominant as per population ratio 351(91.2%), middle class 23(6.0%) and upper class 11(2.9%).Chi-square value 580.073, df2 and p value <0.001.

Education wise distribution of subjects had shown that 167 (43.4%) were primary level, 71(18.4%) middle to matriculation, 43(11.2%) intermediate, 34(08.8%) graduate and 70(18.2%) were uneducated. Chi-square value 145.325, df 4 and p value <0.001.

Out of 385 subjects 239(62.1%) were not addicted and 146 were addicted to different substances like smoking etc. Chi-square value 22.465, df 1and p value <0.001.

The important aspect of our study results show that there were dominant ratio of plasmodium falciparum 225(58.4%), 156(40.5%) plasmodium vivax and 04(1%) of plasmodium malaria. No case of plasmodium ovale was detected in present study. As shown in Table 2.Chi-square value 199.236, df2and p value <0.001.

Figure 1. Frequency & % of Different plasmodium

Regarding the frequency and percentage of different plasmodium types, there was dominant ratio of p. falciparum 225(58.4%) than p. vivax 156(40.5%), while only 4 (01%) cases of plasmodium malaria were diagnosed and no case of p.ovale detected. As shown in figure 1.

***Table 3. Relationship of different types of malaria with gender and age groups** (crosstabulation)*

The frequency and percentage of different types of malaria species were assessed in gender and age groups. There were 208(54.0%) male while 177(46.0%) female subjects.

There were 117(56.3%) male subjects with positive plasmodium falciparum, out of them 66(31.7%) in young age group, 40(19.2%) middle age and 11(05.3%) from old age group.

There were 89(42.8%) male subjects with positive plasmodium vivax, out of them 47(22.6%) young age group, 34(16.3%) middle age and 8(3.8%) from old age group.

There were 02(01.0%) male subjects with positive plasmodium malarie, out of them 01(0.5%) young age group, 0(0.0%) middle age and 01(0.5%) from old age group.

There were 108(61.0%) female subjects with positive plasmodium falciparum, out of them 69(39.0%) young age group, 32(18.1%) middle age and 07(04.0%) from old age group.

There were 67(37.9%) female subjects with positive plasmodium vivax, out of them 38(21.5%) young age group, 20(11.3%) middle age and 09(05.1%) from old age group.

There were 02(01.0%) female subjects with positive plasmodium malarie, out of them 01(0.6%) young age group, 0(0.0%) middle age and 01(0.6%) from old age group.

For male category Pearson chi square was 4.510, df

4, Asymp. sig.(2-sided) 0.341.Likelyhoodratio 3.509 df 4, Asymp. sig.(2-sided) 0.477. Linear by linear association was .550, df 1, Asymp. sig.(2-sided)0.458. Interval by interval pearsons R value was .052, Approx. Sig .460. Ordinal by ordinal Spearman correlation value was .037, Approx. Sig .592.

For female category Pearson chi square was 6.501, df 4, Asymp. sig.(2-sided) 0.3165.Likelyhoodratio 5.409 df 4, Asymp. sig.(2-sided) 0.248. Linear by linear association was .2.983, df 1, Asymp. sig.(2-sided)0.084. Interval by interval pearsons R value was .130, Approx. Sig .084. Ordinal by ordinal Spearman correlation value was .099, Approx. Sig .190.as shown in Table 3.

Table 4. Bivarate Correlations between different types of malaria with demographic variables.

The relationship between different types of plasmodium assessed through bivarate analysis in relation to demographic parameters. There was strong correlation of plasmodium with socio economic status and educational status, age with age groups and addiction, gender with marital status and occupation and addiction with age and age groups. The other parameters of study were not showing significant correlation with plasmodium species as shown in table 4.

Table 5. Plasmodium species and different demographic variables (paired statistic and correlations.)

The paired sample testing and paired sample correlation were analyzed and found statistically significant. Various means and standard deviations with standard error of mean were checked in parallel to correlations and significance, as shown the p-value was statistically significant with type of plasmodium, age group p<0.079, gender p<0.437, marital status p<0.319, occupation p<0.561, address (p<0.528), socioeconomic status (p<0.032), education level p<0.001 and addiction p<0.535as shown in table no 5.

Table 6. Plasmodium species and different demographic variables parameters (paired sample tests)

In relation to different plasmodium species and demographic statistics paired sample test was performed with mean and SD, upper and lower limits, with 95% confidence interval as shown in table 6, the p-value was statistically significant plasmodium species with demographic variables age group p<0.050, gender p<0.547, marital status p<0.001, occupation p<0.001, address p<0.001, socioeconomic status (p<0.001), educational level p<0.001 and addiction p<0.124as shown in table no 6.

Table 1. Age Statistics of patients. N=385		
Age (in years)		
N	Valid	385
	Missing	0
Mean		39.6364
Std. Error of Mean		.68569
Median		38.0000
Std. Deviation		13.45412
Variance		181.013
Range		55.00
Minimum		20.00
Maximum		75.00

Table 2. Frequency and percentages of different variables with non parametric chi-square test. N=385

		Frequency	Percent	Chi-sqaure	df	p-value
Age Group	Young Age Group	222	57.7	133.408	2	.000
	Middle Age Group	126	32.7			
	OldAge Group	37	9.6			
Gender	Male	208	54.0	2.496	1	.114
	Female	177	46.0			
Marital Status	Married	358	93.0	284.574	1	.000
	Single	27	7.0			
occupation	Office Worker	83	21.6	34.556	2	.000
	Manual Worker	125	32.5			
	House Wife	177	46.0			
Address	Rural	282	73.2	83.223	1	.000
	Urban	103	26.8			
Economical class	Poor Class	351	91.2	580.073	2	.000
	Middle Class	23	6.0			

	Upper Class	11	2.9			
Education	Primary	167	43.4	145.325	4	.000
	Middle To Matriculation	71	18.4			
	Intermediate	43	11.2			
	Graduate	34	8.8			
	Uneducated	70	18.2			
Addiction	Negative	239	62.1	22.465	1	.000
	Positive	146	37.9			
Plasmodium type	Plasmodium Falciparum	225	58.4	199.236	2	.000
	Plasmodium Vivax	156	40.5			
	Plasmodium Malarie	4	1.0			

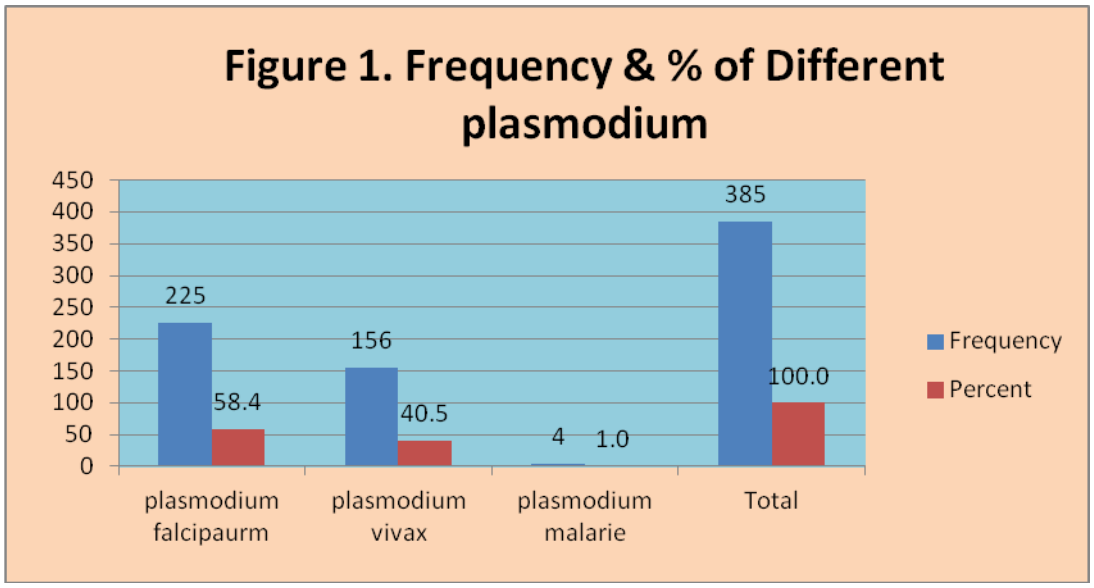

Table 3. Relationship of different types of malaria with gender and age groups. N=385

Gender				Age group			Total
				Young age	Middle age	Old age	
Male	Type of Plasmodium	Plasmodium falciparum	Count	66	40	11	117
			% of Total	31.7%	19.2%	5.3%	56.3%
		Plasmodium vivax	Count	47	34	8	89
			% of Total	22.6%	16.3%	3.8%	42.8%
		Plasmodium malarie	Count	1	0	1	2
			% of Total	.5%	.0%	.5%	1.0%
	Total		Count	114	74	20	208
			% of Total	54.8%	35.6%	9.6%	100.0%
Female	Type of Plasmodium	Plasmodium falciparum	Count	69	32	7	108
			% of Total	39.0%	18.1%	4.0%	61.0%
		Plasmodium vivax	Count	38	20	9	67
			% of Total	21.5%	11.3%	5.1%	37.9%
		Plasmodium malarie	Count	1	0	1	2
			% of Total	.6%	.0%	.6%	1.1%
	Total		Count	108	52	17	177
			% of Total	61.0%	29.4%	9.6%	100.0%

Chi-Square Tests

Gender		Value	df	Asymp. Sig. (2-sided)
Male	Pearson Chi-Square	4.510[a]	4	.341
	Likelihood Ratio	3.509	4	.477
	Linear-by-Linear Association	.550	1	.458
	N of Valid Cases	208		
Female	Pearson Chi-Square	6.501[b]	4	.165
	Likelihood Ratio	5.409	4	.248
	Linear-by-Linear Association	2.983	1	.084
	N of Valid Cases	177		

Symmetric Measures

Gender			Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Male	Interval by Interval	Pearson's R	.052	.079	.741	.460[c]
	Ordinal by Ordinal	Spearman Correlation	.037	.070	.537	.592[c]
	N of Valid Cases		208			
Female	Interval by Interval	Pearson's R	.130	.087	1.737	.084[c]
	Ordinal by Ordinal	Spearman Correlation	.099	.077	1.314	.190[c]
	N of Valid Cases		177			

Table 4. BivarateCorrelations of different types of malaria with demographic variables. N=385

		Type Of Plasmodium	Age In Years	Age Group	Gender	Ms	Occupation	Address	S_E	Education	Addiction
Type Of Plasmodium	Pearson Correlation	1	.084	.090	-.040	-.051	.030	.032	.109*	.406**	.032
	Sig. (2-tailed)		.099	.079	.437	.319	.561	.528	.032	.000	.535
Age In Years	Pearson Correlation	.084	1	.893**	-.052	-.082	.020	.001	.018	.049	.664**
	Sig. (2-tailed)	.099		.000	.307	.109	.696	.983	.724	.337	.000
Age_Group	Pearson Correlation	.090	.893**	1	-.047	-.031	-.009	-.022	.016	.061	.726**
	Sig. (2-tailed)	.079	.000		.361	.544	.858	.665	.757	.234	.000
Gender	Pearson Correlation	-.040	-.052	-.047	1	.155**	-.207**	-.087	.056	-.057	-.066
	Sig. (2-tailed)	.437	.307	.361		.002	.000	.090	.272	.266	.198
Ms	Pearson Correlation	-.051	-.082	-.031	.155**	1	-.137**	-.074	-.080	-.025	-.026
	Sig. (2-tailed)	.319	.109	.544	.002		.007	.147	.116	.624	.611
Occupation	Pearson Correlation	.030	.020	-.009	-.207**	-.137**	1	-.046	-.016	.018	.009
	Sig. (2-tailed)	.561	.696	.858	.000	.007		.368	.748	.724	.857
Address	Pearson Correlation	.032	.001	-.022	-.087	-.074	-.046	1	-.015	.091	-.013
	Sig. (2-tailed)	.528	.983	.665	.090	.147	.368		.766	.076	.802
S_E	Pearson Correlation	.109*	.018	.016	.056	-.080	-.016	-.015	1	.046	.053
	Sig. (2-tailed)	.032	.724	.757	.272	.116	.748	.766		.365	.303
Education	Pearson Correlation	.406**	.049	.061	-.057	-.025	.018	.091	.046	1	.033
	Sig. (2-tailed)	.000	.337	.234	.266	.624	.724	.076	.365		.514
Addiction	Pearson Correlation	.032	.664**	.726**	-.066	-.026	.009	-.013	.053	.033	1
	Sig. (2-tailed)	.535	.000	.000	.198	.611	.857	.802	.303	.514	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table no 5. Paired Samples Statistics &Paired Samples Correlations with different types of malaria with demographic variables. N=385. N

		Mean	N	Std. Deviation	Std. Error Mean	Correlation	Sig.
Pair 1	type of Plasmodium	1.4364		.55596	.02833	.090	.079
	age_group	1.5195	385	.66557	.03392		
Pair 2	type of Plasmodium	1.4364	385	.55596	.02833	-.040	.437
	gender	1.4597	385	.49903	.02543		
Pair 3	type of Plasmodium	1.4364	385	.55596	.02833	-.051	.319
	ms	1.0701	385	.25570	.01303		
Pair 4	type of Plasmodium	1.4364	385	.55596	.02833	.030	.561
	occupation	2.2442	385	.78569	.04004		
Pair 5	type of Plasmodium	1.4364	385	.55596	.02833	.032	.528
	address	1.2675	385	.44325	.02259		
Pair 6	type of Plasmodium	1.4364	385	.55596	.02833	.109	.032
	s_e	1.1169	385	.40098	.02044		
Pair 7	type of Plasmodium	1.4364	385	.55596	.02833	.406	.000
	education	2.4000	385	1.54313	.07865		
Pair 8	type of Plasmodium	1.4364	385	.55596	.02833	.032	.535
	addiction	1.3792	385	.48582	.02476		

Table no 6. Paired Samples Test of different types of malaria with demographic variables. N=385

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	type of Plasmodium - age_group	-.08312	.82812	.04220	-.16610	-.00014	-1.969	384	.050
Pair 2	type of Plasmodium - gender	-.02338	.76170	.03882	-.09970	.05295	-.602	384	.547
Pair 3	type of Plasmodium - ms	.36623	.62367	.03179	.30374	.42873	11.522	384	.000
Pair 4	type of Plasmodium - occupation	-.80779	.94893	.04836	-.90288	-.71271	-16.703	384	.000
Pair 5	type of Plasmodium - address	.16883	.69975	.03566	.09871	.23895	4.734	384	.000
Pair 6	type of Plasmodium - s_e	.31948	.64893	.03307	.25446	.38451	9.660	384	.000
Pair 7	type of Plasmodium - education	-.96364	1.41190	.07196	-1.10512	-.82216	-13.392	384	.000
Pair 8	type of Plasmodium - addiction	.05714	.72662	.03703	-.01567	.12995	1.543	384	.124

DISCUSSION:

Pakistan is a country where malaria infection is very

common; thousands of peoples of different age and gender category were reported at different forums at different times.

This disease is treatable at lot of times when diagnosed and managed properly. Untreated and complicated cases are associated with high mortality. Malaria is a curable disease. Proper diagnosis, proper typing of plasmodium species, sensitivity checking, proper drug and proper dosage of drugs are essential components of management of malaria. The malaria plasmodium species typing are different in different countries.

Malaria is widespread throughout Pakistan. Out of all diagnosed cases of malaria it is reported that Plasmodium vivax is dominant and responsible for up to 64%of cases, and P. falciparum found responsible for 36% of malaria cases respectively [9].

A retrospective cross sectional research conducted during 2009 to 2011 at Agha Khan Hospital Karachi reported that 83.0% cases of malaria had P. vivax, while 17.0% had P. falciparum and they also observed that P. vivax was responsible for severe malaria in 79.9% subjects [10].

In a study P. vivax was seen in 60.25% (232/385) of subjects whereas P. falciparum was seen in 39.74% (153/385) of malaria cases, results of current study were very similar to above study results. Dominancy of plasmodium vivax was seen in patients that suffered from malaria as compared to plasmodium falciparum [11]. Study by Jamali AA et al had shown that female group was slightly more affected from malaria than males [12]. Misdiagnosis, decreased facilities for diagnosis, practice of presumptive treatments and unavailability of ACT are the main issues of Pakistan in controlling and managing malaria [13-14-15].

In 2005 the biggest share of malarial infection (88%) was imported from African countries, 7% from Asia, 03% from America and 02% of malaria cases were reported from Australia/Oceania. Ghana, Nigeria, Cameroon and Kenya were the top most countries from which malaria was imported. In 2005, Plasmodium falciparum was identified as the agent of tropical malaria in 78% of malaria cases, where as P. vivax rated second with 12%, and P. ovale and P. malariae were listed with only 04% and 03% respectively. In 2005 tropical malaria killed 06 persons, out of them P. falciparum, 03 cases mixed infection 01 case was observed, and species were not identified in two cases. [16].

The valid test for diagnosis of malaria is microscopic examination. The frequency of malaria was observed about 15.1% in the traveling populations, in the malaria endemicity areas the occurrence of malaria seems to be high in adult population, in these areas people develop immunity which defends them from high parasitaemia and clinical ailment for a period of years [17] P. falciparum was noted responsible for all malaria cases, P. falciparum was analysed in 87.3% (124/142) cases, while 12.7% (18/142) had malaria due to p. malariae. [18]. P. falciparum and P. malariae infections were the dominant species in the study region; although this was different from that of nationwide usual average [19]. The note worthy decline in occurrence of malaria in Ghana was noted and that could be due to obvious change in the recent species supremacy. In Ghana P. falciparum, P. ovale and P. malariae are the dominant species out of the five species that produce disease in humans [20].

In a study P. falciparum was prevalent species in 90–98%, P. malariae in 02–09% and P. Ovale in 01% of malarial infections [21]. In sub-Saharan Africa [22, 23, 24,25] , Asia [26], and also in Northern Ghana [27] the sub species P. Ovale wallikeri (variant type) and P. ovale curtisi (classic type) had been observed. Plasmodium vivax is largely attributed to malaria infections in Pakistan but P. falciparum and mixed species infections are too prevailing here. Moreover, regional difference in the incidence and species distribution of malaria is also notable [28].

CONCLUSION:

Malaria is still a common health problem in our setup. All the subjects who were infected with plasmodium species were analysed, there was dominant ratio of p. falciparum 225 (58.4%) than p.vivax 156 (40.5%). while only 04 (01%) cases of plasmodium malaria were diagnosed and no case of p.ovale detected. Early diagnosis and management may reduce the morbidity and mortality due to malaria.

Conflict of Interests

There is no conflict of interest to be declared for this study by the authors.

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Contribution of Authors
AAJ and GMJ planned the current study, also 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. The study was supervised by AAJ. The manuscript was read and approved by all writers.

REFFERENCES:

1. Conway DJ. Molecular epidemiology of malaria. Clin Microbiol Rev. 2007;20:188–204.
2. Hartl DL. The origin of malaria: mixed messages from genetic diversity. Nature Rev Microbiol. 2004;2:15–22.
3. WHO. WHO Eastern Mediterranean regional office. Cairo: World Health Organization; 2013.
4. Williams O, Meek S. Malaria: country profiles. London: Department of International Development; 2011.
5. Mukhtar M. Killer number one: the fight against malaria: malaria strategy lags behind the global goals, Humanitarian news and analysis a service of the UN Office for the Coordination of Humanitarian Affairs. Nairobi: IRIN; 2006.
6. Kakar Q, Khan MA, Bile KM. Malaria control in Pakistan: new tools at hand but challenging epidemiological realities. East Mediterr Health J. 2010;16(Suppl):S54–S60.
7. Caraballo H (2014). "Emergency department management of mosquito-borne illness: Malaria, dengue, and west nile virus". Emergency Medicine Practice. 16 (5). Archived from the original on 2016-08-01.
8. "Malaria Fact sheet N°94". WHO. March 2014. Archived from the original on 3 September 2014. Retrieved 28 August 2014.
9. World Health Organization. World malaria report: 2011. Geneva: The Organization; 2011.
10. Zubairi ABS , Nizami S , Raza A , Mehraj V, et al. Anita Fazal Rasheed Severe Plasmodium vivax Malaria in Pakistan. Emerg Infect Dis. 2013 Nov; 19(11): 1851–1854. doi: 10.3201/eid1911.130495. PMCID: PMC3837647. PMID: 24188313
11. Jamali A A, Jamali G M, Tanwani Y, et al. Malaria: The relationship of different ABO blood groups with malaria. Indo American Journal of Pharmaceutical Sciences, IAJPS 2018, 05 (06),5031-5038
12. Jamali A A, Jamali G M, Tanwani Y, et al. Malaria: Gender difference in patients suffering from Malaria. Indo American Journal of Pharmaceutical Sciences, IAJPS 2018, 05 (06), 5425-5434
13. GFATM. Round 7 funding application: Pakistan 2007. Washington, DC: The Global Fund; 2007.
14. SoSec Consulting Services. 19 districts Pakistan (draft final report) Islamabad: Islamabad SoSec Consulting Services; 2009.
15. Rowland M, Rab MA, Freeman T, Durrani N, Rehman N. Afghan refugees and the temporal and spatial distribution of malaria in Pakistan. Soc Sci Med. 2002;55:2061–2072. doi: 10.1016/S0277-9536(01)00341-0. [PubMed] [Cross Ref
16. Blut A, et al. Malaria. Transfus Med Hemother. 2009 Feb; 36(1): 48–60. doi: 10.1159/000197327. PMCID: PMC2928834. PMID: 21048821
17. Stanisic DI, Fowkes FJI, Koinari M, Javati S, Lin E, Kiniboro B, et al. Acquisition of antibodies against Plasmodium falciparum merozoites and malaria immunity in young children and the influence of age, force of infection, and magnitude of response. Infect Immun. 2015;83:646–660. doi: 10.1128/IAI.02398-14.
18. Diallo N, Akweongo P, Maya E Aikins M, Sarfo B. Burden of malaria in mobile populations in the Greater Accra region, Ghana: a cross-sectional study. Malar J. 2017; 16: 109. Published online 2017 Mar 9. doi: 10.1186/s12936-017-1751-xPMCID: PMC5343387. PMID: 28274262
19. Ewurama D. A. Owusu Email author, Charles A. Brown, Martin P. Grobusch and Petra Mens. Prevalence of Plasmodium falciparum and non-P. falciparum infections in a highland district in Ghana, and the influence of HIV and sickle cell disease. Malaria Journal201716:167. https://doi.org/10.1186/s12936-017-1823-y
20. MOH. Anti-malaria drug policy for Ghana. 2014. http://www.ghanahealthservice.org/downloads/GHS_Antimalaria_drug_policy.pdf. Accessed 12 Nov 2016.
21. DFID. Malaria: country profiles. 2011. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/67476/malaria-country-profiles.pdf. Accessed 27 Aug 2016.
22. Fançony C, Gamboa D, Sebastião Y, Hallett R, Sutherland C, Sousa-Figueiredo J, et al. Various

pfcrt and pfmdr1 genotypes of Plasmodium falciparum. Antimicrob Agents Chemother. 2012;56:5271–7.View ArticlePubMedPubMed CentralGoogle Scholar

23. Bauffe F, Desplans J, Fraisier C, Parzy D. Real-time PCR assay for discrimination of Plasmodium ovale curtisi and Plasmodium ovale wallikeri in the Ivory Coast and in the Comoros Islands. Malar J. 2012;11:307–15.View ArticlePubMedPubMed CentralGoogle Scholar
24. Oguike MC, Betson M, Burke M, Nolder D, Stothard JR, Kleinschmidt I, et al. Plasmodium ovale curtisi and Plasmodium ovale wallikeri circulate simultaneously in African communities. Int J Parasitol. 2011;41:677–83.View ArticlePubMedPubMed CentralGoogle Scholar
25. Sutherland CJ, Tanomsing N, Nolder D, Oguike M, Jennison C, Pukrittayakamee S, et al. Two nonrecombining sympatric forms of the human malaria parasite Plasmodium ovale occur globally. J Infect Dis. 2010;201:1544–50.View ArticlePubMedGoogle Scholar
26. Fuehrer HP, Habler VE, Fally MA, Harl J, Starzengruber P, Swoboda P, et al. Plasmodium ovale in Bangladesh: genetic diversity and the first known evidence of the sympatric distribution of Plasmodium ovale curtisi and Plasmodium ovale wallikeri in southern Asia. Int J Parasitol. 2012;42:693–9.View ArticlePubMedGoogle Scholar
27. Dinko B, Oguike MC, Larbi JA, Bousema T, Sutherland CJ, Swoboda P, et al. Persistent detection of Plasmodium falciparum, P. malariae, P. ovale curtisi and P. ovale wallikeri after ACT treatment of asymptomatic Ghanaian school-children. Int J Parasitol Drugs Drug Resist. 2013;3:45–50.View ArticlePubMedPubMed CentralGoogle Scholar
28. Khattak AA ,[1] Venkatesan M ,[2,3] Nadeem MF et al. Prevalence and distribution of human Plasmodium infection in Pakistan. , Malar J. 2013; 12: 297. Published online 2013 Aug 28. doi: 10.1186/1475-2875-12-297.PMCID: PMC3765785. PMID: 23984968