

Co-Infection of Hepatitis and Malaria and its effect on Pregnant Women of Pakistan. A public Health Concern

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Abstract

The co-infection of Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and malaria poses a serious risk to public health in all parts of the world, In this hospital-based cross-sectional study, hepatitis B surface antigen (HBsAg), Hepatitis C, (HCV) rapid diagnostic tests (RDTs) were used to screen blood samples taken from 500 pregnant women who appeared to be in good health for *Plasmodium falciparum* (*P. falciparum*) and HBsAg, HCV, respectively. Structured questionnaires were used to gather pertinent sociodemographic data. For *P. falciparum* mono-infection, HBV mono-infection, and HCV mono-infection prevalence of the infections was 95(19%), 87(17.4%) and 71(14.2%) respectively.

Ages 31 to 40 were when single and concurrent infections peaked, but as people aged, they were less common. The prevalence of *P. falciparum*, 67 (70.5%) greater than *vivax* 28 (29.5%), the coinfection was highest of 40(8%) of malaria and hepatitis B. Due to high levels of illiteracy and a lack of compliance with the use of nets, malaria is still very common among pregnant women. In order to eradicate malaria in endemic areas, frequent screening and education of expectant mothers are essential. The prevalence of both hepatitis B and C and malaria co-infection with Hepatitis Band C indicates that further requirement in HBV and HCV vaccine availability for free or nominal rates to significantly lessen the illness burden among expectant mothers.

Introduction

Pregnancy is a delicate physiological process during which a human is being developed inside the womb of mother.[1] various factors can affect this process, including environment, nutrition and any pandemic infections. Malaria is a widespread infectious disease of serious community health fear worldwide, Caused by *plasmodium* specie parasite, usually transmitted by female *anopheles* mosquito,[2] According to world health report published in 2020 malaria was said to be main cause for 229 million cases and 409 000 deaths globally[3]. In various parts of the world where malaria is prevalent, pregnant females with low immunity are vulnerable to acquire malaria infection which will cause placental malaria causing inflammatory changes in placenta, whose consequences can lead to maternal and fetal death.[4] In Pakistan the most of the malaria outbreak is observed in Sindh according to national malaria control program, with highest breeding season of August to December[5] Factors contributing to high risk to acquire malarial infection during pregnancy is increased body surface area and specific aromatic discharges during pregnancy[6]. Hepatitis B virus (HBV) is the principal reason of avertible liver disease and mortality worldwide. Accounting for estimated death rate of 887000 [7] Viral spread in the country is facilitated through contact to infectious blood or its products or by means of transdermal contact to infection [8]. Viral hepatitis is accompanied with so many hazards for the pregnant females including vertical transmission resulting in hepatitis of the neonate[9] Malaria and HBV coinfection may become a grave public health issue for expecting females in underdeveloped states where both communicable diseases are widespread [10]. Even if the routes of transmission are not the same but residents of that area are at high risk to acquire co-infection. A study by Scotto and Fazio[11] suggested that since HBV is highly transmittable from one infested individual to another, probability of pathological spread via the similar path of transmission of *Plasmodium* vis-a-vis blood-to-blood contact, sharing needles, and blood transfusions are high.[12] People living in endemic parts have a higher chance of acquiring, Coinfection and pregnancy-induced

immunosuppression may probably change the malarial clinical development and severity.[13].As the development of malaria and HBV infections occurs in and the presence of both infections may lead to damage to liver cells, leading to more generations of malaria[14] and quick multiplication of HBV infection,[15]. As it was suggested in another study that the HBV decreases the chances of hepatocytes to kill plasmodium parasite[16] The reciprocated outcome of coinfection during pregnancy exacerbates symptoms of malaria which can have poor pregnancy outcome, like maternal anemia, preterm birth, low birth weight fetus, intrauterine growth restriction[17] Infection by the HCV virus in pregnant women varied from 1 to 8% over the world. Therefore, it is crucial to prevent HCV vertical transmission. Similar to other methods of transmission, including intravenous drug use and blood product donation, around 4 and 8% of HCV was transmitted from mother to child during delivery of fetus.[18]

This study is designed to evaluate the effect of HBV,HCV and malaria individually as well as coinfection in pregnant women visiting gynecology and obstetrics department Lumhs Hyderabad/Jamshoro.

Material And Methods

This is a cross sectional comparative study conducted at the Obstetrics and Gynecology department of Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad, from 1st July 2021 to 1st jan2022, total 500 participants were selected by simple random sampling, singleton pregnancy with no systemic disease was taken as inclusion criteria, multiple pregnancy, mentally disabled pregnant women, or know cases of hypertension and diabetes were excluded from study. The study group was divided into 3 basic groups according to their age. A self-generated questionnaire was used to collect the demographic data, including maternal-age, gestational age, occupational and educational status, history of infections, immunization, transfusion. Malaria infection was assessed using RTD,5 µl blood was collected from third finger using lancet from which only one drop is used on Care Start RDT to investigate the malarial parasite presence and differentiation of the species, results will be obtained in 15-20 mins of placing blood on kit,5ml blood was taken from each participant for the screening of malaria and/ or hepatitis, under strict aseptic measures. HBV and HCV were diagnosed using enzyme-linked immunoassay (ELISA) method.

Data analysis:

Data analysis was done on SPSS version 22. Categorical variables were stated in percentages and frequencies. chi-square test and student's t-test was applied to evaluate the difference between groups with a p-value < 0.05 taken as significant.

Ethical consideration:

The study was conducted after approval from the ethical review committee of the institution. An informed written consent was sought from all pregnant women participating in the study.

Results:

The mean age of the study population was 28.6±8.31 with a p-value of 0.08, mean weight was 61±5.72 with significant p-value of 0.02, Hb 9.3±1.78 with p-value of 0.05, MCV was noted as 76±14.1 with significant p-value of 0.001, MCH was measured as 29±6.41 with p-value of 0.01, the mean WBC was noted as 6.9±1.82 with significant p-value of 0.07, Platelets measured as 278±63 with significant p-value of 0.01 as shown in Table:1. The prevalence of HBV +ve in 15-20 Years, age group was 27, in 21-30 years group were 21, and 31-40 years were 39, and total 87(17.4%) were HBV +ve, with a 0.034 p-Value, The incidence of HCV in 15-20 Years, age group was 27, in 21-30 years group were 21, and 31-40 years were 23, and total 71(14.2%) were HCV, with a 0.056 p-Value, Malaria prevalence was noted as 31 in 15-20 Years, age group, 19 in 21-30 years group, 45 in 31-40 years and total 95(19%) in study population, with p-Value 0.06 as shown in Table:2, the plasmodium strain in those 95 +ve patients was identified as Plasmodium falciparum 67 (70.5%) with 45 asymptomatic and 22 symptomatic, and of Plasmodium vivax 28 (29.5%) with 11 symptomatic and 17 asymptomatic, with statistically significant p-value, of 0.22 as shown in Table :3. In Table :4, the frequency of the co-infection in the study group, according to different age groups is given, in 15-20 years of age group, Hep-B & Malaria was found in 13 pregnant females, Hep-C&+Malaria was seen in 11, whereas Hep B, C and malaria was found in 4 individuals. Similarly in the 21-30 years age group 09 had co. Infection of Hep-B & Malaria, 13 had Hep-C&+Malaria and 2 had Hep-B&C & Malaria, in 31-40 years age group, of study population 18 pregnant females had Hep-B & Malaria, 8 had Hep-C&+Malaria and 7 had Hep-B&C & Malaria, in total out of 500 study group 40(8%) had Hep-B & Malaria 32(6.4%) had Hep-C&+Malaria and 13(2.6%) had Hep-B&C & Malaria. In Table no: 5, the basic knowledge of the study groups regarding Hepatitis B, Hepatitis C, and malaria was assessed in the study population, according to which, 389 had the basic information about malaria and 111 had

no previous information, 257 pregnant females had knowledge of hepatitis and 243 had no previous information, Usage of coil/dung burning for mosquito prevention was known to 376 individuals but 124 individuals were unaware of that, out of 500 total study group, 345 had transfusion history and 155 had no transfusion, 105 of the study population were immunized against HBV while 395 were not immunized which generate a chi-square of 457.95 and a *p*-value of 0.00001.

In table no :6, the blood parameters of the study population were assessed, in the 15-20 years age group the Hb was 9.1mg/dl, in 21-30 years age groups 10mg/dl, in 31-40 years age group 9.7mg/dl, with *f*-value of 9.19 and significant *P*. Value of 0.062,MCV was 72fl, 79fl, 68fl in all three age groups, respectively with *f*-value of 7.6 and significant *P*. Value of 0.081,MCH was 21pg,26 pg,23pg in the three age groups with *f*-value of 11.3 and significant *P*. Value of 0.05,WBC were found 7.2 mm³ ,9.1 mm³ ,8.9 mm³ with *f*-value of 10.4 and 0.05. Platelets were found 234 mm³,289mm³,276 mm³ *f*-value of 17.3 and 0.03.

TABLE:1. Descriptive statistics

Characteristics	Mean	±SD	P-Value
Age	28.6	±8.31	0.08
Weight	61	±5.72	0.02
Hb	9.3	±1.78	0.05
MCV	76	±14.1	0.001
MCH	29	±6.41	0.01
WBC	6.9	±1.82	0.07
Platelets	278	±63	0.01

TABLE :2. Prevalence of Hepatitis B, Hepatitis C, and Malaria in study population according to age groups.

Age Groups	N=	HbSAg +ve	<i>p</i> -Value	HCV +ve	<i>P</i> -Value	Malaria +ve	<i>P</i> -Value
15-20	213	27	0.056	27	0.034	31	0.06
21-30	198	21		21		19	
31-40	89	39		23		45	
Total	500	87 (17.4%)		71 (14.2%)		95(19%)	

TABLE:3. Prevalence of Strain of malaria among affected population

Malarial Parasite positive 95 out of 500		Symptomatic N (%)	Asymptomatic N (%)	P-Value
Plasmodium falciparum	67 (70.5%)	45	22	0.022
Plasmodium vivax	28 (29.5%)	11	17	

TABLE: 4. Co-infection in the study group according to the age groups.

Co-infection			
Age groups in years	Hep-B &Malaria	Hep-C&+Malaria	Hep-B&C & Malaria
15-20	13	11	4
21-30	09	13	2
31-40	18	08	7
Total N=500	40(8%)	32(6.4%)	13(2.6%)

TABLE:5. Awareness and risk factors for malaria and Hepatitis N=500

s.no	Demographic parameters	Yes	No	X ² Value	P-Value
1.	Knowledge about Malaria	389	111	457.9584	0.00001
2.	Knowledge of Hepatitis	257	243		
3.	Usage of coil/dung burning for mosquito prevention/ Insecticides net	124	376		
4.	History of blood transfusion	345	155		
5.	Immunization against HBV	105	395		

TABLE:6. Mean Values of complete blood picture according to age groups

Discussion:

Variables	15-20years (n=213)	21-30 years (n=198)	31-40 years (n=89)	F-Value	P-Value
Hemoglobin mg/dl	9.1	10.0	9.7	9.19	0.062
MCV femtolitre	72	79	68	7.6	0.081
MCH picograms	21	26	23	11.3	0.05
WBC/mm ³	7.2	9.1	8.9	10.4	0.05
Platelets/mm ³	234	289	276	17.3	0.03

This study assessed the prevalence of Hepatitis B, Hepatitis C, and malaria infection and , and simultaneous occurrence of co. Infection and associated factors among pregnant women in Hyderabad district, in this study, The prevalence of Hepatitis B in pregnant females was noted as 71(14.2%) is close to the national average of Africa i.e., 15%[19] but too much greater than a study carried out in Oman with (1.49%) tested positive for HBsAg [20], and another study conducted at Peshawar with a prevalence of 11.5%[9] the prevalence of HCV is found out 87(17.4%) that is far greater than what is observed in Ethiopia 1.83% [18] and 8.1%[21] and it was found to be 6.7% in Pakistan in 2019 [22]showing there is a far greater increase in the infection in the country during the course of these reduction in red blood cell count and maintain a significant hemoglobin concentration. years, the prevalence of malaria was found to be 19% .which is greater than another study conducted by Qureshi .et al, at Banu district [23] where the prevalence was 2.1% ,our study also showing higher

prevalence than that conducted at Ethiopia with 20.83% incidence,[13] and in Burkina faso it was about 40%,the difference in the results may be due to different geographical conditions, and where the study was conducted in the high pandemic area and what time it was conducted, as we conducted this study in highest transmission season. In this study the plasmodium falciparum strain was predominantly found to be involved in malarial transmission 67 (70.5%) which coincides with another study conducted by Valerie.et.al[24] the predominant co-infection was noted of Hepatitis B and malaria, 40(8%)HBV is thought to raise Hb levels by increasing the release of erythropoietin from regenerating hepatic tissues, whereas P. falciparum is thought to cause anemia by lowering red cell counts [25] Therefore, it makes sense that pregnant women with Malaria and HBV kept their hemoglobin levels at an intermediate range (above the Malaria group and un-infected, and below CHB group). This finding would imply that in women with malaria and HBV, the virus's activities may offset the parasites' reduced RBC count and maintain Hb level, as we can see the Hb is not much disturbed in all the study groups. The general people of Pakistan must get more health education about methods of infection prevention and control, the breeding season of infection, the transfusion protocol, immunization against HBV,HCV, Furthermore, we identified nonusers or sporadic users of the insecticide-treated net, similar results were observed in some studies[26] lacking basic information about the infection and infection control.

Conclusions

The high prevalence of malaria in the study area reaffirms its endemicity, with predominant plasmodium falciparum, Low HBV Mono-infection being observed. High incidence of Hepatitis B and malaria were observed. The government must improve malaria and hepatitis B, hepatitis C preventive initiatives in all socioeconomic sectors of the population of pregnant women to significantly and quickly reduce the burden of malaria and further minimize coinfection with hepatitis B&C.

Authors' Contributions

Saima and Arsalan designed the research, acquired ethical approval, and wrote a draft of the publication, Tazeen carried out the data collection, Komal did statistical analysis. The final manuscript was read and approved by all writers.

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Conflict of interest:

There is no conflict of interest among authors.

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