

Frequency of co-existence of dengue and malaria in patients presenting with acute febrile illness

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Abstract

Objective: To find out the frequency of co-existence of malaria and dengue fever in patients presenting with acute febrile illness.

Methods: The descriptive cross-sectional study was conducted at the Military Hospital Rawalpindi from June to November 2012. A total of 500 patients with complaint of acute febrile illness were selected after applying the inclusion and exclusion criteria. Preliminary data was collected on a pretested proforma. Blood samples of patients were tested for dengue serology and malaria parasite. Results were entered in respective proforma. Co-existence was considered present when a patient had both dengue serology and malaria parasite slide positive. SPSS 20 was used for data analysis.

Result: Of the total, 349 (69.8%) were males and 151 (30.2%) females. Dengue serology was positive in 16 (3.2%); 81 (16.2%) had malaria parasite slide positive; 403 (80.4%) had none of the two findings. Co-existence of both dengue and malaria was nil among the whole sample. In males, 67 (13.4%) had malaria, while 11 (2.2%) had dengue. In females, 14 (2.8%) had malaria, while 5 (1%) suffered from dengue fever.

Conclusion: Co-existence of dengue and malaria was zero per cent in 500 patients visiting Military Hospital Rawalpindi. More studies shall be conducted to find out whether the reason of having zero per cent co-existence is that dengue or/and malaria epidemic did not occur in 2012 or whether there are some other factors involved.

Keywords: Co-existence, Dengue, Malaria, Acute febrile illness. (JPMA 64: 247; 2014)

Introduction

Dengue is a mosquito-borne viral infection. The infection causes flu-like illness, and occasionally develops into a potentially lethal complication called severe dengue. The global incidence of dengue has grown dramatically in recent decades. About half of the world's population is now at risk. Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas. Severe dengue is a leading cause of serious illness and death in Asian and Latin American countries.¹

Dengue virus (DENV) infection is a global health threat affecting at least 3.6 billion people living in more than 125 countries in the tropics and subtropics.² All four dengue virus serotypes (DENV-1, DENV-2, DENV-3 and DENV-4) can cause dengue. The disease can present as a mild self-limiting illness, dengue fever (DF), or as the more severe forms of the disease, dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS).³

Dengue is currently present in more than 100 countries, while up to 3 billion people are estimated to be at risk of infection.⁴ In Pakistan, the first case of dengue was

reported in Karachi in 1994 and after that it has been slowly spreading towards the northern parts of the country. In 2007, a rapid increase in dengue cases was reported in Pakistan, especially in Karachi, and that year the disease rapidly engulfed Lahore city. In 2011, Punjab saw an alarming rate of dengue cases. In Punjab overall, 4,000 people have been affected. Overall 270 people died of it in Sindh.⁵

Children are usually the most affected group, but in recent years, dengue and severe dengue have become more common among adults. Uncommon presentations seen among fatal cases are likely a reflection of the changing demography of dengue from children to more of an adult disease in dengue-endemic countries.⁶ There are not yet any vaccines to prevent DENV infection and the most effective protective measures are those that avoid mosquito bites. When infected, early recognition and prompt supportive treatment can substantially lower the risk of developing severe disease.⁷

Another important rather endemic mosquito-borne disease is malaria caused by a parasite. People with malaria often experience fever, chills, and flu-like illness. Left untreated, they may develop severe complications and die.⁸ Malaria is transmitted via the bites of infected mosquitoes. In the human body, the parasites multiply in

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the liver, and then infect red blood cells (RBCs).⁹ Five species of plasmodium can infect and be transmitted by humans. The vast majority of deaths are caused by *P. falciparum* and *P. vivax*, while *P. ovale*, and *P. malariae* cause a generally milder form of malaria that is rarely fatal.¹⁰ Malaria is endemic in Pakistan and constitutes a national health priority. The provinces of Balochistan, Sindh, Khyber Pakhtunkhwa and the Federally Administered Tribal Areas (FATA) have the highest malaria burden.¹¹

Rainfall, warm temperatures and stagnant waters provide habitats ideal for mosquito larvae. Disease transmission can be reduced by preventing mosquito bites by distribution of mosquito nets and insect repellents, or with mosquito-control measures such as spraying insecticides and draining standing water.¹⁰

Dengue fever and malaria are the most common arthropod-borne diseases in humans and represent major public health problems. Dual infections were only described for the first time in 2005. Reports of these concomitant infections are scarce and there is no evidence of more severe clinical and biological pictures than single infections.¹² Concurrent infection with two infectious agents can result in an illness having overlapping symptoms, resulting in a situation where both diagnosis and treatment of a patient may become difficult for a physician. In malaria and dengue-endemic areas, the instances of mixed infections of pathogens is a well-known fact.¹³

Dengue virus (family Flaviridae, genus Flavivirus) and plasmodium parasites are widespread in American and Asian tropical regions and their endemic areas overlap extensively. Nevertheless, reports of malaria and dengue dual infection are scarce. Dengue infections have been reported with plasmodium falciparum and/or plasmodium vivax in Pakistan, India, Southeast Asia, French Guiana and Brazil.¹² Malaria and dengue are the two common mosquito infections that are very important and cause high morbidity and mortality for many patients around the world.¹⁴

The percentage of dual dengue and malaria in Karachi is 23%,¹⁵ therefore it is essential to determine co-existence of dengue and malaria cases in Rawalpindi. Our study aimed at finding out the frequency of co-existence of malaria and dengue in patients presenting with acute febrile illness to Military Hospital Rawalpindi where both infectious diseases are endemic.

Patients and Methods

The descriptive cross-sectional study was conducted at

the Military Hospital, Rawalpindi, from June to November 2012. A sample size of 500 was calculated using World Health Organisation (WHO) calculator with confidence level of 95%, anticipated population proportion of 0.12 and absolute precision of 0.04. Purposive sampling technique was used. Patients were selected on the basis of inclusion criteria that entailed patients of any age group with sudden onset of fever of more than 98.6°F. Acute febrile illness was considered with illness of sudden onset (<10 days) accompanied by fever of more than 98.6°F. Those who had fever for more than 10 days and/or were already diagnosed with diseases other than malaria and/or dengue were excluded. Patients coming to the outpatient department (OPD), emergency and different wards of the hospital were selected by consecutive sampling technique. Informed verbal consent from patients and permission from the hospital ethical committee was taken. Brief history was taken and general physical examination was done.

Blood samples were drawn for malaria and dengue serology. Preliminary data was collected on a pretested proforma and their laboratory investigations were sent to the Armed Forces Institute of Pathology (AFIP) for dengue serology and malaria parasite slide. Malaria cases were confirmed by identification of haematozoa on thick and thin films stained with Giemsa. Dengue cases were confirmed by dengue IgM serology by enzyme-linked immunosorbent assay (ELISA) method taken on 4-10 day of presentation of acute febrile illness. Verified results were collected at the end of each week from the laboratory and findings were collected and entered in respective proforma.

Data was entered and analysed using SPSS version 20. Data, including qualitative variables such as gender, education occupation, dengue serology, malaria parasite slide and their co-existence, was presented in the form of frequencies and percentages.

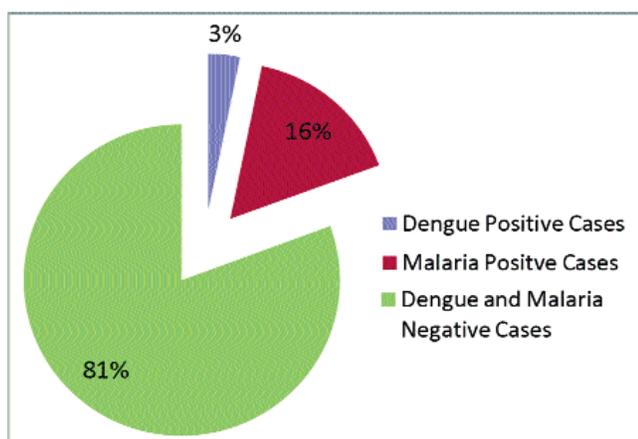
Results

Of the 500 patients, 349 (69.8%) were males and 151 (30.2%) females. The overall mean age was 33.78±16.119 years. Dengue serology was positive in 16 (3.2%); 81 (16.2%) had malaria parasite slide positive; 403 (80.4%) had none of the two diseases (Figure). Co-existence of both dengue and malaria was nil (0%) in the entire sample.

Out of 81 malaria-positive cases, 67 (13.4) were males and 14 (2.8%) were females. Gender difference ($p=0.006$) was significant in malaria cases as evaluated by Chi-square test. Out of 16 dengue-positive cases, 11 (2.2%) were males, while 5 (1%) were females. Gender difference was not significant in dengue cases ($p=0.926$). Among the

Table: Descriptive Statistics of Study Sample (n=500).

Descriptive Statistics	No. of Males	No. of Females	Total No.	Coexistence of Dengue and Malaria
Dengue Serology Positive	11(2.2%)	5(1%)	16(3.2%)	NIL
Malaria Thick and Thin Slide Positive	67 (13.4%)	14 (2.8%)	81 (16.2%)	
Non-Malaria Non-Dengue Cases	271 (54.2%)	132 (26.4%)	403 (80.4%)	
Occupation	Security Related	Medical Related	Office work	Others
	289 (57.8%)	6 (1.2%)	12 (2.4%)	187 (37.4%)
Education	Illiterate	Primary Level	Matriculate	>Matriculate
	38 (7.6%)	110 (22.0%)	167 (33.4%)	185 (37.0%)

**Figure:** Frequency of dengue and malaria in acute febrile illness.

males, 67 (13.4%) had malaria, while 11 (2.2%) had dengue. In females, 14 (2.8%) had malaria, while 5 (1%) suffered from dengue (Table).

Regarding occupation, 289 (57.8%) of the study population were related to security-related professions; 6 (1.2%) to medical; 12 (2.4%) to office work and 187 (37.4%) to others.

Out of the 81 malaria-positive cases, 45 (55.55%) were related to the security profession, while 36 (44.45%) to others. Out of the 16 dengue-positive cases, 7 (43.75%) were related to security, while 9 (56.25%) to others.

Concerning education, 38 (7.6%) were illiterate; 110(22%) had primary level; 167 (33.4%) were matriculate; and 185 (37%) had gone beyond matriculation. Out of the males, 135 (38.68%) were those having more than matriculate level of education, and only 50 (33.11%) females had more than matriculate level of education.

Discussions

Dengue and malaria have increased the overall burden of communicable diseases in Pakistan. Coexistence of these two preventable diseases is very important to understand

as they have entirely different treatment protocols. Simultaneous presence of both viruses in one individual can easily be ignored. The detection of dengue in an acute febrile patient easily masks the diagnosis of malaria and vice versa. Measures regarding vector control, personal protection and health education were very well conquered in 2011-2012 and so the epidemic of malaria and dengue did not occur as it did in 2011. This study was conducted to find out the frequency of coexistence of dengue and malaria in Military Hospital Rawalpindi in 2012 and to spread awareness regarding the coexistence of these two diseases. In our study, the coexistence frequency was zero per cent which contradicts the results of other studies 1%¹⁶ and 23.21%.¹⁵

Abbas et al conducted a case series on clinical features, diagnostic techniques and management outcome of patients having dual dengue and malaria infection in Karachi in 2007-08. Out of 114, antibody titer immunoglobulin (IgM) found positive in 78 (69.64%) patients among which 26 (23.21%) were concomitantly positive for malarial parasite (group A); 52 (46.42%) patients were dengue IgM positive and malarial parasite (MP) negative (Group B); 34 (30.35%) were MP and dengue IgM negative, but were strongly suspected for DHF and malaria on clinical and haematological basis (Group C). The platelet count was markedly low in 84.61% of patients of group A; 57.69% of group B; and 94.11% of group C. Leukopenia was found in 34.61% patients of group A; 78.84% in group B; and 29.411% in group C. The liver function tests (LFTs) were deranged in all groups.¹⁵ Our study sample size was quite large, but had few limitations. If we had time, we could have considered the clinical features, laboratory investigations and/or outcome of management. More interactions between the patients would have given more informative results regarding the coexistence. Contrary to Abbas et al study, in which frequency of dual nature of dengue and malaria was found to be 23.21%, our study had 0% coexistence.

A retrospective study¹⁶ was carried out by testing blood and serum samples on 1,740 patients who consulted the

emergency department of Cayenne Hospital seeking treatment for fever compatible with malaria and/or dengue during a 1-year period. Diagnosis of malaria was done by thick and thin film stained by Giemsa, as was done in our study. Dengue was diagnosed by serologic (IgM) testing and positive cases were confirmed by positive virologic diagnosis (isolation or real-time polymerase chain reaction [RT-PCR]). Of the 1,723 patients, 393 (22.8%) had smear-positive malaria. Dengue was detected in 238 case-patients (13.8%); among these, 73% (174/238) were confirmed by positive virologic diagnosis (isolation or RT-PCR), whereas 27% were probable dengue cases. Concurrent dengue (early dengue cases [EDC] and late dengue cases [LDC]) and malaria were confirmed in 17 of the 1,723 patients (1%), corresponding to 7.1% (17/238) of dengue cases and 4.1% (16/393) of malaria cases. In our study, for dengue diagnosis we did not use RT-PCR, which is faster and more specific. The reason was that it was not available at the AFIP laboratory.⁶

M.K. Mohapatra et al conducted a study to compare the clinical features and outcome of concurrent infection with mono-infection of dengue and malaria in India. During the study period, 367 dengue patients were admitted. Concurrent infection of dengue and malaria was found in 27 (7.4%) patients. There were 27 (5.8), 340 (72.5) and 102 (21.7%) patients in Groups A, B, and C respectively. The study concluded that clinical features of concurrent infection were more like dengue than malaria. Unlike malaria, the outcome of concurrent infection was good.¹⁷ Limitations of our study was that we had zero coexistence of the two diseases. If we did have any coexistence, we could have investigated into the details of risk factors, presentations and outcome.

During epidemics, coexistence of these two diseases in a patient at the same time is not uncommon, but is not reported usually.¹⁴ Malaria and dengue may coexist; dengue should be excluded in clinically suspected cases by laboratory investigations. Furthermore, surveillance strategies, preventive measures and healthcare workers' education is critical for curtailing this problem.¹⁸ Early diagnosis and suspicion of DF in primary care might reduce the complications if handled properly.¹⁹

Although malaria and dengue cases have quite similar symptoms and signs, the treatment of these two illnesses is different. Failure to recognise malaria or dengue co-infection would delay the initiation of proper therapy and result in increased morbidity and even mortality.²⁰ So it is important to note that diagnosis of 1 of these 2 infections should not rule out testing for the other infection.¹⁷

Control of dengue is unlikely to be achieved without

coordinated international financial and technical support for national programmes, which have proven effective in reducing the global burden of malaria.²¹ In our country where there is such a low amount spent on health, how can we ever move forward? There is a need to develop an efficient, low-cost and safe vaccine that can target all the four serotypes of the dengue virus.²² The government really needs to put health among their priorities, especially those preventable communicable diseases which are the leading cause of epidemic in Pakistan. Malaria and dengue are among them.

A number of public awareness campaigns should be launched involving print and electronic media, and, finally, more funds should be allocated toward vaccine and anti-viral research for dengue virus.²³ Health education programmes should include preventive methods. Provision of Insecticide Treated Nets (ITNs) to the displaced population, guidance by health awareness teams, and the replacement of old nets should be ensured to control malaria effectively.²⁴

Despite possessing basic knowledge of the disease, the majority of general physicians (GPs) in the area need training regarding the two diseases and their management. Key targets identified for training programmes include clinical diagnosis and the management of endemic vector-borne diseases.²⁵

We have to make sure that our health awareness efforts, dynamic campaigns regarding spreading awareness and health education should continue and become more intense, especially before, during and after an epidemic. There is a need to increase health promotion activities through campaigns and social mobilisation to increase knowledge regarding dengue fever. This would help to mould positive attitudes and cultivate better preventive practices among the public to eliminate dengue from the country.²⁶

Conclusion

In view of the zero per cent coexistence of dengue and malaria seen in the study, it is suggested that more studies should be conducted to either authenticate the findings or to find the rationale behind it.

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