

## **Prevalence of Malaria/ Co-Infection Dengue fever among adult febrile patients in Al-Sadaqa Teaching Hospital- Aden**

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### **Abstract**

Malaria and dengue are the most prevalent vector-borne diseases worldwide and represent major public health problems; both are endemic in similar tropical regions and, therefore, may result in the possibility of co-infection. Aim: To determine the occurrence of concurrent malaria and dengue infection Methods: we carried out retrospective cohort study for a total of 218 febrile patients attending Al-Sadaqa Teaching Hospital Out Patient Department over a period from August to November 2019. Blood samples were collected for malaria and dengue investigations and were tested for thin and thick film for malaria and NS-1 antigen and IgM ELISA for dengue fever. Result: Out of 218 patients, the total prevalence in malaria, dengue and co-infection patients were 50%, 62.4%, and 40.3% respectively. In term of age, the highest percentage was recorded among patients with malaria of the age over 58 was 78.3%, in dengue fever patients of the age 38-47 was 72.5 % with p value 0.05 and in co-infection among of the age 18-27 was 49.3% with p value 0.001. In term of sex the prevalence was 66.9%, 43.5% and 39.1 % in malaria, co-infection and dengue fever respectively. Conclusion: High prevalence of co-infection was observed among febrile infection compared to the isolated infection. Simultaneous infection among febrile patients is a true burden and there is a need for further study for patients in endemic areas.

**Keywords:** Co-infection, Dengue fever, Malaria.

### **Introduction:**

The spread of vector borne diseases has gained concern worldwide, especially in tropical and subtropical regions because of their recurring outbreaks. The most common of these diseases includes Malaria, Dengue disease. (13) Dengue is a viral disease transmitted by *Aedes aegypti* and female and *Anopheles* mosquito is the vector for malaria which is a parasitic disease. (26)

In geographical areas where both the vectors coexist, simultaneous occurrence of malaria and dengue in an individual cannot be ruled out. The two diseases share many clinical features and may be clinically indistinguishable. It is important; however, to differentiate between the two conditions, otherwise, it may result in a poor outcome. (6) These two vectors borne diseases share endemic profiles, (2) and an overlapping epidemic pattern with most cases reported from tropical regions of the world. Several studies have been published reporting co-circulation of Malaria and Dengue fever (10) and co-exist simultaneously in an individual. (27)

There are several distinguishing features, like periodic increase and decrease of fever in Malaria, hemorrhagic conditions and depletion of platelet count in dengue infection. (29) Global travel and rapid urbanization are important factors that have contributed in the expansion of disease endemicity by introducing the vector population to exotic surroundings. (21) Due to the similar nature of initial symptoms for malaria and dengue and overlapping endemicity, misdiagnosis of dual infection as mono-infection is a real possibility. These arthropod borne diseases affect some of the poorest countries and in resource poor settings; clinician might rely on symptoms and endemicity for diagnosis, which might lead to under diagnosis of co-circulating pathogens. (28) Both malaria and dengue can cause acute febrile illness. However, malaria can be chronic in contrast to dengue. (30) Simultaneous infections with more than one infectious agent complicate the diagnosis and course of treatment available. (17) Despite similar clinical presentation, the

course of treatment is entirely different. Malaria is treated by using antimalarial drugs. In case of Dengue no vaccine or drug is available and clinicians rely on supportive therapy; any delay in either diagnosis or start of therapy for any of these infections could have fatal outcomes. Also, there is lack of sufficient information on how concurrent infections affect disease severity and outcome. (29)

**Methods:** We carried out an retrospective cohort study on 218 patients including 103 males and 115 females of aging between eighteen to fifty eight years and above (range 18 – 58 and above) with mean age of 43.6, who conducted AL-Sadaga Teaching Hospital for fever compatible, with malaria and/or dengue fever during 3 months period, from December 2018 to February 2019. A total of 218 blood samples were collected from clinically suspected cases of acut febrile illness compatible with suspected malaria and/or dengue fever (fever, headache, intense muscle pain, lower back pain, nausea and vomiting for concurrent infection as share symptoms. Pain behind the eyes and rash for dengue fever and chills and sweating following increase in temperature for malaria). Patients suffering from fever were investigated for dengue fever, malaria and concurrent infection. All samples were tested for dengue NS-1 antigen through enzyme-linked immunosorbent assay (ELISA) during 5 days of onset of illness and serologic immunoglobulin Ig M after 5 days of onset of illness. Malaria diagnosis was based on the identification of Plasmodium falciparum parasites on a thin and thick blood films. Data were analyzed using statistical package for social sciences (SPSS) version 21.0 and Chi-square test was used to determine if the relationship between the malaria parasite infection and dengue fever is actually significant.

**Results:** Blood samples were collected from a total of 218 individuals. These blood samples were examined for the presence of malaria, dengue fever and malaria/ dengue fever co-infection in relation to age/Sex among patients attenuating Al - Sadaqa Hospital. Table 1 shows the prevalence of malaria parasite among all the age groups in the sampled population [137 (62.4)] were positive with significant p value (0.04\*). Across the age, the total percentage prevalence ranged from 32.3 to 78.3. The highest and lowest percentage prevalence was recorded in the age groups more than 58 and 48-57 respectively. In term of sex, females had a total prevalence of 77 (66.9) and their highest number (30) of infected patients was recorded within ages 18-27 (P 0.001), while males had a total prevalence of 60(58.3) their highest 23(76.7) recorded within ages 28-37 (P 0.003).

Table 1: Prevalence of malaria parasite in relation to age/sex

Age (years)	Total NO	Male		Female		Total prevalence	P value
		Examined	Infected	Examined	Infected		
18-27	71	33	17 (51.5)	38	30(78.9)	47(66.2)	0.001**
28-37	53	30	23(76.7)	23	14(60.9)	37(69 .8)	0.003**
38-47	40	18	9(50.0)	22	13(59.1)	22(55.0)	0.05*
48-57	31	13	5(38.5)	18	8(44.4)	13(32.3)	0.681
≥58	23	9	6(66.7)	14	12(85.7)	18(78.3)	0.086
Total	218	103	60(58.3)	115	77(66.9)	137(62.4)	0.04*

Table (2) Reveals that, dengue fever was prevalent among all the age groups. Out of 218 serum samples tested, 109 (50.0) were positive for dengue fever, with significant p value (0.01\*). The total percentage prevalence ranged from 36.6% to 72.5 % across the age groups. The highest and

lowest percentage prevalence was recorded in age groups 38-47(72.5) and 18-27(36.6) respectively. regarding sex, the total prevalence for females was 45(39.1) and a highest number 12(54.5) of infected patients was recorded among patients aging 38-47 (P>0.05). Males had a total prevalence of 64(62.1) were the highest number 17 (94.4) of infected patients was recorded among ages 38-47 with p value 0.05\*.

**Table 2: Prevalence of Dengue fever infection in relation to age/sex**

Age (years)	Total NO	Male		Female		Total prevalence %	P value
		Examined	Infected	Examined	Infected		
18-27	71	33	16 (48.5)	38	10(26.3)	26(36.6)	0.001* *
28-37	53	30	16(53.3)	23	9(39.1)	25(47.2)	0.003* *
38-47	40	18	17(94.4)	22	12(54.5)	29(72.5)	0.05*
48-57	31	13	8(61.5)	18	7(38.9)	15(48.4)	0.527
≥58	23	9	7(77.8)	14	7(50.0)	14(60.9)	0.001* *
Total	218	103	64(62.1)	115	45(39.1)	109(50.0)	0.01*

Table (3) Shows, the prevalence of malaria/dengue fever co-infection among the sampled population .Out of 218 individuals tested for Malaria / dengue co-infection, 88(40.3) were positive with significant p value (0.01\*) .The total percentage prevalence ranged from 28.3 to 49.3 across the age groups. The highest and lowest percentage prevalence of co-infection was recorded within the age of 18-27 35(49.3) and 28 – 37 15(28.3) respectively. In terms of sex, females had a total prevalence of 50(43.5) and patients of the age groups 48-57 had the highest number (55.6) of infected individuals. Males had a total prevalence of 38(36.9) and the highest prevalence 16(48.5) of co-infected patients was recorded among age 18 – 27.

**Table 3: Prevalence of Malaria and dengue fever co-infection in relation to age/sex**

Age (years)	Total NO	Male		Female		Total prevalence	P value
		Examined	Infected	Examined	Infected		
18-27	71	33	16(48.5)	38	19(50.0)	35(49.3)	0.001* *
28-37	53	30	8(26.5)	23	7(30.4)	15(28.3)	0.05*
38-47	40	18	8(44.4)	22	9(40.9)	17(42.5)	0.003* *
48-57	31	13	3(23.1)	18	10(55.6)	13(41.9)	0.758
≥58	23	9	3(33.3)	14	5(35.7)	8(34.8)	0.003
Total	218	103	38(36.9)	115	50(43.5)	88(40.3)	0.01*

**Discussion:**

Concurrent dengue and malaria infection tends to be more severe than single infections. Malaria and dengue recommended the systematic testing for cases with acute febrile syndrome. The unexceptional nature of the association of dengue and malaria was confirmed in our study.

The study recorded a high prevalence of malaria (62.4 %) among the patients attending Outpatient Clinic -Al-Sadaqa Teaching Hospital. This result is found to be higher than the 43.1%

prevalence recorded by Wogu et al, (31) in University of Port Harcourt Teaching Hospital and other prevalence reports from the Southeast Nigeria. (18) Another study done by Ezenwaka , (9) revealed a high prevalence, 80% of malaria among students attending the University Health Centre in Otuoke (Nigeria), which depicts the endemicity of the infection in the area. According to the information a report of the World Health Organization from malaria –endemic countries, (32) this high prevalence could be attributed to poverty and lack of the preventive measures, such as keeping good sanitary conditions, avoiding of indiscriminate disposal of garbage and use of long-lasting insecticide treated nets .(32)

The study also revealed that, females being more infected (66.9 %) than males (58.3) %. This result are being is in agreement with the findings of Adeyemo et al, (3) and Mgbemena et al, (18) who found that, females had higher prevalence than the male. However, the result of this study contradicts with the findings of Oyinlola et al ,( 20)who found that, male individuals have a higher risk of being infected with malaria compared to the female participants. Females being more infected than the males, as recorded in this study, could be because of the disparity in the sample size.

In our study, 78.3% prevalence was recorded among those aged  $\geq 58$  years when compared with other age groups, this indicates that, older populations have low and weak immune system and are easily susceptible to infections, (4) Similarly, Mgbemena et al., (19) reported highest prevalence among population of the age 50-60 years, while Mackey, (15) stated that malaria which is a major cause of morbidity affects all age groups.

Dengue was laboratory confirmed in 50% of our patients, this result found to be nearly similar in a study done by Khair Alah et al , (12) where dengue was confirmed in approximately 49.3%, while a percentage was slightly less in a study done by Laurent et al , (14) where the prevalence was documented in 46.4% of the clinically suspected dengue patients. Age as an important modulator of clinical dengue explains recent increase in dengue notifications in ageing countries in Southeast Asia, and moreover, poses a paradoxical problem of an increase in adult patients resulting from a decline in the force of infection, which may be caused by various factors, including time-dependent variations in epidemiological, ecological and demographic dynamics. (26)

In our study high prevalence with statistically significant found among age 38-47 and 18-27 (72.5% with p value 0.05 and,36.6 with p value 0.001 respectively) Low scores for knowledge about dengue fever was significantly associated with those in the age groups of  $\leq 20$  years and 21–30 years , (12) while in Thailand, affected adults over 15 years of age comprise 30–40% of dengue cases, ( 24) another study found that, severity of dengue infections has been associated with younger age, (11) in the Philippines dengue was highest over 80% occurring among individuals of less than 20 years of age. (5)

In our study, out of 2018 patients, 88 (40.3%) with significant p value 0.01 had smear-positive malaria and dengue fever, were confirmed in 50 (43.5) within female patients and 38 (36.9) within male patients. Less than this result reported by Loïc et al, (7) who found that, 17(0.9%) had concurrent dengue and malaria. In an endemic areas of dengue fever and vivax malaria, found a high prevalence of the co-infection, mainly among those with malaria. In Brazil, a prospective study performed on 132 patients with malaria found 11 co-infected with dengue fever and the prevalence was 8.3%. (16) During outbreak in India, the prevalence of co-infection was 5.8% among all cases of fever 77 of 546, (19) while in the French Guiana, the prevalence of co-infection of dengue and malaria among 17 of 238 patients was 7.1%, (7) which was too less in compare to our results. The findings in our study corroborate the results of a long case series in Pakistan, which presented longer disease duration on patients co-infected with malaria and dengue , however, the prevalence found was as high as 23.2% ,(1) thus, the prevalence of co-infection may fluctuate, depending on local endemicity.

In the present study there was no pregnant female addressed among studied cases, although several studies had been touched upon such cases. Remi et al stated that, co-infections in pregnancy are a challenge for diagnosis and clinical management due to the additional stress of the physiological changes during pregnancy and demonstrates the importance of early diagnosis to be lifesaving for both mother and fetus. (22) Malaria and dengue co- infection as first case in pregnant was reported from a northern province in India, where a 6- months pregnant woman admitted for suspected malaria, later diagnosed with malaria and dengue co- infection.(23) In another Indian study, a total of 300 blood samples from febrile pregnant women were tested to rule out dengue infection. Dengue infection was detected in 7.3% cases. Two women had co-infections with malaria and dengue. The outcome of a patient co-infected with dengue and malaria in the study was reportedly intrauterine death of the foetus at Week 37. (22)

### **Conclusion:**

In this study, the prevalence was estimated on patients attending the out patients clinic, and therefore it could not be extrapolated to the community-based level. Since the biological and clinical characteristics of dengue and malaria are very similar, the suspicion of malaria – dengue co-infection increase.

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## انتشار الملاريا / حمى الضنك العدوى المشتركة بين مرضى الحمى البالغين في

### مستشفى الصداقة التعليمي

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### الملخص

الملاريا وحمى الضنك هما أكثر الأمراض التي تنقلها النواقل انتشاراً في جميع أنحاء العالم وتمثلان مشاكل صحية عامة رئيسية. كلاهما مستوطن في مناطق استوائية مماثلة، وبالتالي، قد يؤدي إلى احتمال الإصابة المشتركة.

لتحديد مدى حدوث الملاريا المتزامنة وطرق الإصابة بحمى الضنك: أجرينا دراسة جماعية بأثر رجعي لما مجموعه 218 مريضاً مصاباً بالحمى في قسم المرضى الخارجيين بمستشفى الصداقة على مدار فترة من أغسطس إلى نوفمبر 2019. تم جمع عينات الدم الخاصة بالملاريا تم اختبار تحقيقات حمى الضنك بحثاً عن غشاء رقيق وسميك للملاريا ومستضدات لحمى الضنك.

من بين 218 مريضاً، كان معدل الانتشار الإجمالي في مرضى الملاريا وحمى الضنك والإصابة بالعدوى المرافقة 50% و62.4% و40.3% على التوالي. من حيث العمر، كانت أعلى نسبة مسجلة بين مرضى الملاريا فوق سن 58 كانت 78.3%، في مرضى حمى الضنك في سن 38-47 كانت 72.5% مع أهبة الدلالة الإحصائية 0.05 وفي العدوى المشتركة بين سن 18-27 كانت 49.3% بقيمه إحصائية 0.001 من حيث الجنس، كان الانتشار 66.9% و43.5% و39.1% في الملاريا والعدوى المرافقة وحمى الضنك على التوالي. لوحظ ارتفاع معدل انتشار العدوى المرافقة بين العدوى الحموية مقارنة بالعدوى المعزولة. تعتبر العدوى المتزامنة بين مرضى الحمى عبئاً حقيقياً وهناك حاجة لمزيد من الدراسة للمرضى في المناطق الموبوءة.

**الكلمات المفتاحية:** العدوى المتزامنة، حمى الضنك، الملاريا.