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Universal Journal of Pharmaceutical Research
An International Peer Reviewed Journal
ISSN: 2831-5235 (Print); 2456-8058 (Electronic)

RESEARCH ARTICLE

ASSESSMENT OF SOME CLINICAL AND LABORATORY FEATURES AMONG DENGUE FEVER PATIENTS IN HAJJAH GOVERNORATE, YEMEN

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Article Info:

Article History:
Received: 3 February 2021
Reviewed: 5 March 2021
Accepted: 9 April 2021
Published: 15 May 2021

Cite this article:
Edrees WH, Mogalli NM, Alabdaly KW. Assessment of some clinical and laboratory profiles among dengue fever patients in Hajjah Government, Yemen. Universal Journal of Pharmaceutical Research 2021; 6(2):38-41.
https://doi.org/10.22270/ujpr.v6i2.571

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Abstract

Background and objective: Classical dengue (DF) is a viral disease transmitted by the bite of an infected mosquito, usually *Aedes aegypti* or *Aedes albopictus*. Residents without access to sophisticated laboratory tools need simple clinical and/or laboratory indicators that can provide a reliable diagnosis of dengue fever before admission to the hospital. Therefore, this study was designed to evaluate some clinical and laboratory features among confirmed cases with dengue fever in the government of Hajjah, Yemen to differentiate between dengue (DF) and other febrile diseases in the dengue affected population.
Methods: Clinical data and blood samples were collected from 46 confirmed cases of dengue fever, which were hospitalizedat the Yasser and Thabit Hospital from September to December 2019. The collected samples were examined for some hematological tests, including: hemoglobin (Hb), white blood cells counts (WBCs), and hematocrit (HCT), and a platelet count (PLT). Confirmation of dengue was performed with a non-structural protein tape (NS1).
Results: The results obtained showed that males have a higher infection rate (73.91%) of DF compared to females (26.09%). The recurrence rate was also highest (69.56%) among the 16-30 year-olds. Regarding clinical symptoms, fever and headache occurred in 100%, nausea in 95.65%, and vomiting in 78.26% of the patients, while rashes were less frequent (19.56%). Hematological abnormalities frequently occurred with WBC (89.1%), PLT (84.78%), and Hb (63.04%), while HCT was only abnormal in 23.91% of cases.
Conclusions: A high frequency of clinical and laboratory variants can distinguish dengue fever from other causes of infection; Dengue fever is most common in males between the ages of 16 and 30. This is the first report documenting the occurrence of dengue fever in Hajjah governorate, which requires more attention to prevent and control it. Further prospective studies are needed to build a valid and generalizable algorithm to guide the differential diagnosis of dengue fever in endemic countries such as Yemen.
Keywords: Clinical characterization, dengue fever, Hajjah Government, Yemen.

INTRODUCTION

Dengue fever (DF) is the commonest human infection caused by the Dengue virus that is transmitted by the bite of an infected female of the *Aedes aegypti* mosquito. There are four serotypes of the dengue virus (DEN-1, DEN-2, DEN-3, and DEN-4) that was identified and one of them able to cause the dengue infection. Dengue fever is threatening to human life and causes a serious infection that leads to morbidity and mortality in most tropical and subtropical areas of the world[1]. Globally, it is estimated annually between 50 to100 million cases of dengue fever, including more than half of the million recorded cases of dengue hemorrhagic fever (DHF). Currently, dengue infection is endemic in over 110 countries throughout the world and about 40% of the world's population living in Dengue endemic countries[2,3,4].

Dengue infection may have a high attack rate in all age groups of people, regardless of whether they are inhabitants of or travelers to endemic areas. It is self-limiting disease and there no specific treatment or vaccine is presently available[1,5,6]. The clinical manifestation of dengue disease ranging from asymptomatic to an undifferentiated fever (called Dengue Fever) to the more severe forms such as severe dengue (SD) or DHF. The DF is characterized by headache, fever, arthralgia, myalgia, rash, nausea, and

vomiting[1,6]. However, the manifestations of severe DF are characterized by altered vascular endothelial permeability, reduced platelet levels, plasma leakage, bleeding, dangerously low blood pressure, and shock, which may lead to death[7,8]. Yemen is one of the poorest countries in the world and the absence of a mosquito control system facilitates the dengue prevalent in the warmest area at a different rate. Also, numerous factors attributed to the increase of suspected cases of DENV among study areas. A significant increase in dengue cases was observed at the end of 2019 this Dengue outbreaks have affected 174 of 333 total districts (54%) in 22 of 23 governorates of the country. The highest governorates with suspected dengue cases were Hodeiadah, Taiz, Aden, Hajja and Lahj and death cases reported from Hudaidah, Aden, Hajja, Lahj, Shabwa, Marib and Rayma. The number of affected governorates increased due to the collapse of the health system in Yemen resulting from ongoing complex and protracted conflict, the poor water and hygiene condition in the most affected areas, with limited access to humanitarian support to the most vulnerable and affected populations[9,10,11].

This study was designed to evaluate some clinical and laboratory features among confirmed cases with dengue fever in the government of Hajjah, Yemen to differentiate between dengue (DF) and other febrile diseases in the dengue-affected population.

SUBJECTS AND METHODS

Study Area

This work was carried out at the Gheran Al-Moharqe district that belongs to the Hajjah governorate located in Northwestern Yemen. This district is part of the Tehama coastal plain that is characterized by a warm climate throughout the year except for winter with moderate temperature as well as humid, and a dry climate.

Study Design

This is a cross-sectional study was done at Yaseer and Thabet hospitals during the period from September to December 2019. Patients confirmed (age range, 1 to 70 years) of having DF and showed positive for dengue SN1 stripe test in hospital laboratory examination.

Ethical Approval

The study protocol was permitted by the Ethical Review Committee from the Medical Microbiology Department, Faculty of Applied Science, Hajjah University, and health office in the governorate.

Inclusion and Exclusion Criteria

The inclusion criteria were all patients showed positive test for DF and were hospitalized in the hospitals willing to be included in the study after taken them an agreement. Also, exclusion criteria were included all patients who showed negative for the DF test.

Data Collection

A designed questionnaire was subjected for collecting the required data from enrolled patients. The data collected were personal information (age, gender) signs and symptoms (temperature, headache, skin rash, vomiting, nausea), risk factors (one member of their family's infected and mesquite net used). Each participant was informed about the purpose of this work and the questionnaire was filled by a researcher via face-to-face interview.

Specimens Collection and Examination

Blood specimen was separately collected from each patient by venipuncture and directly transmitted to the laboratory for processing and examination. The hemoglobin (Hb), white blood cells (WBCs), hematocrit (HCT), and a platelet (PLT) count were measured according to WHO[1] protocol. Also, the blood serum was examined for dengue confirmation testing by DENV non-structural protein (NS1) stripe[1].

RESULTS

A total of 46 confirmed patients were enrolled in this study. This finding observed that high frequency of DF disease by sex was 34(73.91%) in males when compared to 12(26.09%) in females with DF (Table 1).

Table 1: The frequency rate of DF among patients according to gender.

Gender	Number of infected	Rate (%)
Male	34	73.91%
Females	12	26.09
Total	46	100%

In this result concerning age group, it was found that the highest rate of DF was 69.56% recorded among the age group of 16-30 years old, followed by age group of 31-45 years old. Also, the lowest rate of DF was 4.34% reported among group aged 46-70 years (Table 2).

Table 2: The frequency rate of DF among age groups.

Age (in years)	Number of infected	Rate %
1-15	5	10.88
16-30	32	69.56
31-45	7	15.22
46-70	2	4.34
Total	**46**	**100**

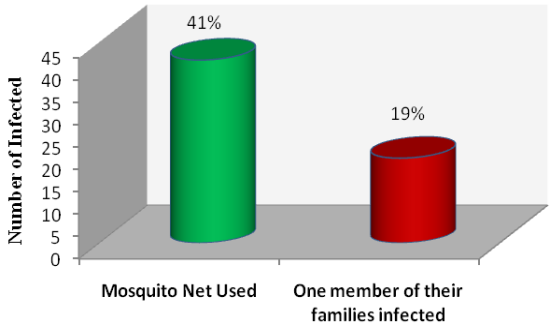

Figure 1: Risk factors among participated patients.

Figure 1 shows that at least one member of participant's families was infected by DF with 41.30%. Also, the frequency of DF was 41(89.13%) recorded among patients who used net mosquito.

Table 3: The clinical symptoms and signs associated with cases.

Clinical Presentation	Number of infected	Rate %
High Fever	46	100
Headache	46	100
Skin Rash	9	19.56
Vomiting	36	78.26
Nausea	44	95.65

The clinical symptoms and signs associated with DF among participated patients were listed in Table 3. It was found that all participated patients were completely (100%) suffered from high fever and headache symptoms. Also, only 9 (19.56%) of cases were presented the skin rash. The vomiting and nausea symptoms were 36 (78.26%) and 44 (95.65%), respect-tively, observed among cases.

Table 4: Hematological test result.

Type of test	Normal result (%)	Abnormal result (%)
Hb	17(36.96)	29(63.04)
WBC	5(10.9)	41(89.1)
PLT	7(15.22)	39(84.78)
HCT	35(76.09)	11(23.91)

Table 4 shows the laboratory result of some hematological examinations. It was observed that there was an increase in Hb level among 63.04% when compared to 36.96% with a normal result. Also, about 89.1% of cases had an abnormality of WBC level. In addition, 84.78% and 23.91% of cases with DF had raised the PLT and HCT levels.

DISCUSSION

The high prevalence of epidemic diseases in Yemen resulting from continue war since 2015 until now that lead to the destruction of the basic services of the healthcare system, sanitation services, shortage of clean water, create the suitable environment for mosquitoes propagation, and absence of mosquitoes control particularly in conflict area facilitating the rise widespread of infectious diseases[11,12]. The present result revealed that the highest prevalence of DF was (73.1%) more among when compared with females (26.09%). In a similar study by Abdullah *et al.*,[11] who found that 67.3% of cases were males and 32.7% were females in Taiz, Yemen. Also, several reports that were carried out in some regions in Yemen documented that males were more affected by fever infection than females[13,14,15]. The high rate of DF present among males might be referring to the work conditions of that performed by males at all time of day outside of the home which make them more exposed to the bite of *A. aegypti*. In the current work, it was found that the age group of 16-30 years old was the most infected by DF than other age groups. This finding is in agreement with the result by Abdullah *et al.*,[11] who found that the age group of 21-30 years the most susceptible for DF than other age groups. Similar findings were also supported with previous reports that observed that the age group of 20-45 years were more exposed to DF[14,15,16,17,18]. This finding implies that the persons in these age groups spent their time outdoors during the day which increased their likelihood to infect with the Dengue virus by vector bite[11].

The present work observed that 41.30% of the members of participant's families were infected with DF previously. It can be implied that the prevalence rate of DF among the population in the study area is more than obtained results. In this study, the commonest clinical manifestations were high fever (100%), headache (100%), nausea (95.65%), vomiting (78.26%), and skin rash (19.56%). The study by Khan *et al.*,[19] found that the most clinical symptoms were fever (98.8%), vomiting (57.8%), skin rash (27.3%), and headache (13%). Also, Chaloem wong *et al.*,[20] showed that the fever was (100%) the most symptoms followed by headache (47.4%), nausea (33.8%), and skin rash (6.5%).The high rate of clinical symptoms in this work may be the precipitants patients at the severe stage of disease. The most frequent hematological abnormality was WBC at 89.1% followed by PLT at 84.78%, Hb at 63.04%, and HCT at 23.91% of cases. Oliveira *et al.*,[21] observed that the abnormality of PLT was 66.5% recorded among cases. Also, a similar observation by Chaloem wong *et al.*,[20] who found that abnormal results of platelet count, white blood cell, hemoglobin, and hematocrit were recorded among the dengue fever patients.

The limitation in this study is representing on the lack of much data due to that may be valuable for comparison and the diagnosis of dengue infection. Also, the study area is very close to war zones, which made it difficult to continue the study for a long time. The serological examination method for the Dengue virus depended on the NS1 stripe due to the absence of modern laboratory equipment such as ELISA. This limitation may influence the obtained data in this work. Consequently, further investigations should be conducted to find out the relationship between the dengue infection and associated factors.

CONCLUSIONS

A high frequency of clinical and laboratory variants can distinguish dengue fever from other causes of infection; Dengue fever is most common in males between the ages of 16 and 30. This is the first report documenting the occurrence of dengue fever in the Hajjah governorate, which requires more attention to prevent and control it. Further prospective studies are needed to build a valid and generalizable algorithm to guide the differential diagnosis of dengue fever in endemic countries such as Yemen.

ACKNOWLEDGEMENTS

The authors forward special thanks to staff members of Yaseer and Thabet hospitals in Gheran Al-Moharqe at Hajjah Governorate for their cooperation. Also, to all the participating investigatorsfor their help in collecting the data and sampling of specimens.

AUTHOR'S CONTRIBUTION

Edrees WH: writing original draft, methodology. **Mogalli NM:** investigation, conceptualization, literature survey. **Alabdaly KW:** interpretation of data. All authors revised the article and approved the final version.

DATA AVAILABILITY

The datasets generated during this study are available from the corresponding author upon reasonable request.

CONFLICT OF INTEREST

None to declare.

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