Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/vsgask89

TO EVALUATE DENGUE PATIENTS IN ORDER TO DETECT THE SEVERITY OF THE DISEASE, THE OUTCOMES, AND THE FACTORS THAT INCREASE THE RISK OF DEATH

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ABSTRACT

Background:
Dengue fever, commonly referred to as break-bone fever, is a viral illness transmitted to humans through the bites of Aedes albopictus and Aedes aegypti mosquitoes. The causative agent, known as the Dengue virus (DENV), is a single-stranded RNA virus that belongs to the Flaviviridae family. According to the World Health Organization (WHO), there are between 100 to 400 million reported cases of dengue each year as of March 2023.
A key biomarker for detecting the dengue virus is the non-structural protein 1 (NS1) antigen. This antigen has a specificity of approximately 99% and a sensitivity of about 80%, making it a reliable indicator of infection. Notably, the NS1 antigen can be detected from the first day of infection, facilitating early diagnosis and intervention. Similarly, IgM anti-dengue antibodies are also used to detect dengue virus.
Objective: To evaluate dengue patients in order to detect the severity of the disease, the outcomes, and the factors that increase the risk of death
Study design: An observational study
Duration and place of study: This study was conducted in Muhammad Medical College / Ibn-E-Sina University Mirpurkhas from March 2024 to March 2025
Methodology: This is an observational study which was performed in the Department of medicine in medical wards, and ICUs. There were a total of 160 people of both genders included in this

research. All the participants had symptoms of dengue. Moreover, all the participants were tested positive for the IgM Anti-dengue antibodies and NS1 antigen and they were admitted in the ICU or wards. Routine lab tests were performed as per the local guidelines for dengue management. Participants's blood test results, clinical signs, and biochemical data were gathered. Data was analysed using R Statistical Software.

Results: There were a total of 160 participants in this study. The majority of them were males, representing about 60% of the total participants. The average age calculated was 34.59 years. The average hemoglobin on day 1 was 13.63. It was 13.52 on day 3 and 13.14 on day 5. Similarly, the mean White Blood Cell Count on day 1, 3, and 5 was 5.42, 5.62, and 6.10.

Conclusion: It is important to monitor hematological parameters on a daily basis in patients having dengue infection, along with special attention to WBC count.

INTRODUCTION

Dengue fever is a viral illness which is also called break-bone fever [1]. Humans face this fever after they are bitten by Aedes albopictus and aedes aegypti mosquitoes. A single-stranded RNA virus which belongs to the Flaviviridae family is known as Dengue virus (DENV) [2]. From the Flaviviridae family, it belongs to the Flavivirus genus [3]. There are 4 types of dengue viruses ranging from DENV-1 to DENV-4 [4]. If an individual gets infected with one type, long-life immunity to that specific type is developed but not to the others. Nevertheless, against the other three types, temporary protection may last for a few months. In March 2023, the WHO stated that there are 100 to 400 million cases of dengue reported every year [5]. This means about half of the population worldwide is at risk of dengue. Dengue occurs mostly in semi-urban and urban areas (sub-tropical and tropical regions) [6]. A marker that can be used to detect dengue virus is referred to as non-structural protein 1 (NS1) antigen. This marker has a specificity of about 99% and sensitivity of about 80%. It can be identified from the first day of infection. Similarly, IgM anti-dengue antibodies are also used to detect dengue virus.

In Pakistan, the first case of dengue was reported in 1994 [7]. However, in the mid-2000s, this virus became a major concern because a huge number of cases were reported in a big city like Karachi. The growth of agricultural and urban development elevates the risk of diseases that are caused by insects. This is why big cities are more affected with viruses like dengue. Pakistan falls under the top 10 countries which are most affected by climate change. Many research studies show a strong association between dengue fever and climate change [8]. Recent data states that the severity of dengue in Pakistan may be increasing due to the change in nature of dengue. According to the reports of 2023, Lahore is also among the cities which are at high stake for having a huge number of dengue cases. Diseases like dengue fever are spread due to natural disasters like floods [9].

In order to relieve severe pain in dengue fever, acetaminophen is used [10]. People are advised to mostly have bed rest and plenty of fluids when having dengue fever. The risk of bleeding can be increased if NSAIDs like aspirin and ibuprofen are used. Therefore, NSAIDs should be avoided. People who have had dengue prior in their history are advised to take Dengvaxia vaccine because it is approved with promising results [11]. Among all types of dengue infection, DENV-2 can cause severe illness or even death. In this case, early detection and proper care is necessary because there is no specific antiviral treatment. Dengue shock syndrome (DSS) is a very deadly syndrome. However, if it is detected early and treatment is started, it improves survival rates.

Dengue fever is very common in Pakistan. Therefore, this study was conducted to evaluate dengue patients in order to detect the severity of the disease, the outcomes, and the factors that increase the risk of death.

METHODOLOGY

This is an observational study which was performed in the Department of medicine in medical wards, and ICUs. There were a total of 160 people of both genders included in this research. All the participants had symptoms of dengue. Moreover, all the participants were tested positive for the IgM Anti-dengue antibodies and NS1 antigen and they were admitted in the ICU or wards. A non-probability consecutive sampling was used to select patients. Fisher's formula was used to calculate the sample size as explained by Bolarinwa et al [12]. All the participants were informed about this study and their consent was obtained. The Ethical Review Committee approved this research.

Routine lab tests were performed as per the local guidelines for dengue management. Participants's blood test results, clinical signs, and biochemical data were gathered. Biochemical and clinical parameters were recorded on the day of admission. Other factors such as haemoglobin (Hb), platelet count, and white blood cell (WBC) count were recorded on the 1st, 3rd, and 5th day. All the participants were closely monitored and the results were documented.

Data was analysed using R Statistical Software. Numerical variables were expressed in terms of mean and standard deviation. Categorical variables were expressed in terms of percentages and frequencies. The Cox Proportional Hazards Model was used to predict the results. Kaplan-Meier survival plots were created for significant predictors of death. In order to check whether the data is normally distributed or not, the Shapiro-Wilk test was used.

RESULTS

There were a total of 160 participants in this study. The majority of them were males, representing about 60% of the total participants. The average age calculated was 34.59 years. The average hemoglobin on day 1 was 13.63. It was 13.52 on day 3 and 13.14 on day 5. Similarly, the mean White Blood Cell Count on day 1, 3, and 5 was 5.42, 5.62, and 6.10. Table number 1 shows the characteristics of the participants in this study.

Table No. 1:

Characteristics	**N**	**%**
Gender		
● **Male**	96	60
● **Female**	64	40
Serology		
● **NS-1 antigen**	82	51.25
● **IgM Anti-dengue antibodies**	78	48.75
Dengue Syndrome		
● **Dengue shock syndrome (DSS)**	10	6.26
● **Dengue fever**	77	48.12
● **Dengue Hemorrhagic fever (DHF)**	73	45.62

Clinical Events		
● **Organ dysfunction**	5	3.12
● **FFP transfusion given**	3	1.89
● **Platelet Megaunit required**	47	29.37
● **PCV transfusions given**	10	6.25
● **Pleural effusion**	40	25.00
● **Platelet Concentrate required**	1	0.62
● **Bleeding**	54	33.75
Outcome		
● **Death**	10	6.25
● **Survived**	150	93.75

Table number 2 shows the differences in the hematological parameters according to gender.

Table No. 2:

Parameters	Male	Female
Hemoglobin Day 1	14.44	12.34
Hemoglobin Day 2	14.23	12.23
Hemoglobin Day 2	13.89	12.07

Table number 3 shows the platelets count. All the values are in terms of mean. **Table No. 3:**

Count	Young	Middle Aged	Elderly
Platelets Count Day 1	117.6	66.7	76.6
Platelets Count Day 2	96.3	55.8	67.0
Platelets Count Day 3	107.9	74.9	80.9

Table number 4 shows the differences in the dengue syndrome according to age group.

Dengue syndrome	Elderly		Middle Age		Young	
	Present	Absent	Present	Absent	Present	Absent
Dengue shock syndrome (DSS)	1		3		6	
Dengue fever	3		18		56	
Dengue Hemorrhagic fever (DHF)	1		22		50	

DISCUSSION

This research was an observational study which was performed on 160 dengue patients. All the participants had symptoms of dengue. Moreover, all the participants were tested positive for the IgM Anti-dengue antibodies and NS1 antigen. The majority of the participants were male (60%). This is similar to a study performed by Mahmood R et al. which was conducted in Bangladesh [13]. Mahmood et al. faced a severe outbreak in 2019 and the males were in majority (64.11%) [13]. This difference in the percentage of males and females explains that men are more prone to the infection because they are the ones who are mostly out for work. Mahmood et al. also states that young people were more prone to the infection (49.8%) [13]. This is also similar to our study where we have 46.25% young patients.

Along with having a majority of the study population as young patients, our study also states that the majority of the dengue cases were severe (65.6%) which is either DSS or DHF. A Bangladeshi study of 2023 which was performed by Sami CA et al. also had similar results [14]. They had 47.7% young patients who had severe types of dengue. However, another meta-analysis conducted by Toledo J et al. states that older people were more prone to severe dengue than young people. This is something which is not aligning with our study [15].

Agrawal VK, et al. conducted a study in South India which revealed that Dengue IgM antibodies were detected in 60.7% participants while NS1 antigen was positive in 41.9% participants [16]. These results are somehow similar to our study where Dengue IgM antibodies were detected in 48.75% while NS1 antigen was positive in 51.25%. Their difference in the results of both studies can be explained on the basis of different sample sizes. John Ku et al. conducted a study in South India which revealed that 12.6% participants were affected with dengue fever, 43.4% were affected by DSS and 44% were affected by DHF [17]. Our study also has some similar results showing that 48.12% participants had dengue fever, 6.26% had DSS, and 45.62% had DHF. The results of both studies align because both the countries are common in genetics and culture including rapid growth in urbanization.

Ali et al. also conducted a study in Karachi which revealed that 3.3% lost their lives due to dengue fever and all of them had DD [18]. However, the rest of them were completely recovered and safely discharged. This is similar to our study which reveals that the mortality rate was 6.25% while 93.75% survived and were sent home. Some other research studies also have similar results [19,20].

CONCLUSION

It is important to monitor hematological parameters on a daily basis in patients having dengue infection, along with special attention to WBC count.

Funding source

This study was conducted without receiving financial support from any external source.

Conflict in the interest

The authors had no conflict related to the interest in the execution of this study.

Permission

Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

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