***Original Research Article***

# The Pattern of Hematological Abnormalities in NS1 Positive Dengue Fever


***ABSTRACT***

***Background:*** *Dengue fever, caused by the dengue virus and transmitted by mosquitoes, is a global health threat, especially in tropical regions. The NS1 antigen is a key diagnostic marker for dengue. Hematological changes, such as platelet counts, white blood cells, and hematocrit levels, play a crucial role in diagnosing and managing NS1-positive dengue fever. Studying these abnormalities enhances our understanding of the disease and improves patient care.* ***Aim of the study:*** *The aim of the study was to assess the pattern of hematological abnormalities in NS1-positive dengue fever.* ***Methods:*** *This prospective observational study was conducted at the Department of Transfusion Medicine, Suhrawardy Medical College Hospital, Dhaka, Bangladesh from February 2023 to September 2023.A total of 196 NS1 positive cases enrolled in this study using purposive sampling methods. Demographic and clinical data were meticulously recorded and analyzed with MS Office tools for dissemination.* ***Results:*** *The majority of participants (51.53%) fell within the 16-28 age group, with 61% being male. Prominent symptoms included fever (82.1%), headache (62.8%), nausea (48.5%), and anorexia (42.9%). Dengue fever was the most frequent diagnosis (88.27%), followed by Dengue hemorrhagic fever (9.69%). Among those with leucopenia (n=68), lymphocytosis prevailed (41.18%), followed by neutrophilia (20.59%). In cases with platelet counts ≤20,000, petechiae were observed in 37.9%, hematemesis in 34.4%, and melena in 27.5%.* ***Conclusion:*** *In assessing the NS1 positive dengue fever patients, among cases of leucopenia, lymphocytosis is currently more prevalent than neutrophilia. Among individuals with platelet counts ≤20,000, common bleeding manifestations are currently being observed.Among cases of leukocytosis, neutrophilia is predominantly found in half of such patients.*



***Keywords:*** *NS1 positive, Dengue hemorrhagic fever, Haematological profile, Shock Syndrome*




## INTRODUCTION

Dengue fever and dengue hemorrhagic fever have emerged as significant global public health concerns in recent decades. Dengue fever is typically caused by an arthropod-borne virus and manifests as an acute febrile illness characterized by sudden-onset fever, headache, body aches, generalized weakness, retro-orbital pain, and rash [2]. Diagnosis of dengue fever relies on a combination of clinical evaluation and laboratory data [3]. Clinicians consider clinical symptoms and signs, along with both non-specific parameters like blood count, platelet count, prothrombin time (PT), and liver function tests, as well as specific tests such as viral isolation and serology for antibody examination to make an accurate diagnosis [4]. Dengue infection encompasses a spectrum of manifestations, ranging from undifferentiated fever and dengue fever (DF) to more severe conditions like dengue hemorrhagic fever (DHF) with shock and expanded dengue syndrome [5]. Every year, approximately 50 million dengue infections occur, leading to approximately 500,000 hospitalizations, with a predominant number of these patients being children [6]. Dengue presents a wide clinical spectrum, ranging from asymptomatic fever to life-threatening conditions like dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Since there is no licensed vaccine available, the primary approach to management involves fluid management and monitoring for complications [7]. One of the most notable hematological changes in dengue cases is thrombocytopenia and leukopenia, often accompanied by lymphocytosis characterized by reactive lymphocytes. Additionally, there is a progressive increase in hematocrit concentration during the progression of dengue fever, often reaching up to a 20% increase from the patient's baseline [8,9]. As part of its global strategy from 2012 to 2020, the World Health Organization (WHO) has set the first objective of reducing dengue mortality by 50% by the year 2020 [10]. In addition to dengue-specific parameters, platelet count serves as a prognostic laboratory parameter that can help identify the severity of dengue. While thrombocytopenia may not be an early indicator of severe dengue, it is useful in predicting the progression of the disease [11]. Raising awareness about dengue fever is crucial in its prevention. Unfortunately, the level of awareness among the population remains inadequate. Some studies have shown that only about one-third of the adult population possesses sufficient knowledge about dengue fever and its rapid spread to others. Furthermore, only approximately 17% of them are aware of and knowledgeable about preventive measures [12]. The object of this study was to assess the pattern of hematological abnormalities in NS1-positive dengue fever.

## METHODOLOGY

This prospective observational study was conducted at the Department of Transfusion Medicine. Suhrawardy Medical College Hospital, Dhaka, Bangladeshfrom February 2023 to September 2023. A total of 196 NS1 positive cases were included in this study as the study population. The sample selection process utilized a convenient purposive sampling technique. All cases that tested serologically positive for Dengue NS1 antigen, IgM antibody, or IgG antibody were eligible for inclusion in the study. A comprehensive patient history was documented, which encompassed age, gender, complaints, clinical presentation, and laboratory investigations for all cases. Before data collection, written consent was obtained from all participants following ethical guidelines. Exclusion criteria for this study involved cases where non-cooperation was anticipated from the participants and individuals who tested positive for dengue but also exhibited co-existing infections such as malaria or typhoid. Demographic and clinical information of all participants was meticulously recorded, and data analysis and dissemination were performed using MS Office tools.

## RESULT

The majority of our participants (51.53%) were from the 16-28 years' age group. More than half of the participants (61%) were male and the rest of 39% were female.Among the clinical symptoms reported by patients, the most significant findings were fever (82.1%), headache (62.8%), nausea (48.5%), and anorexia (42.9%). These symptoms were the most prevalent and are likely to be critical indicators for diagnosis and management.Among our total participants, dengue fever was the most common diagnosis, accounting for 88.27% of cases (173 individuals). A smaller proportion of cases were diagnosed with Dengue hemorrhagic fever, representing 9.69% of cases (19 individuals). The least common diagnosis was Dengue shock syndrome, observed in 2.04% of cases (4 individuals).Among those with leucopenia (n=68), lymphocytosis was the most common pattern, observed in 41.18% of cases, followed by neutrophilia at 20.59%. In individuals with normal WBC counts (n=120), lymphocytosis remained prevalent at 47.5%, while neutrophilia was observed at 17.5%. Among cases of leukocytosis (n=8), neutrophilia was predominant in 50% of individuals, with notable lymphocytosis in 25%.Among individuals with a platelet count of ≤20,000, 37.9% (19 individuals) experienced petechiae, 34.4% (18 individuals) had hematemesis, and 27.5% (15 individuals) had melena. No cases of these bleeding manifestations were observed in individuals with platelet counts higher than 50,000. The total number of cases considered in this categorization was 57.

**Table 1:**Age distribution of participants.(N=196)

| Age (Years) | n | % |
|---|---|---|
| 16-28yrs. | 101 | 51.53% |
| 29-38yrs. | 34 | 17.35% |
| 39-48yrs. | 29 | 14.80% |
| 49-60yrs. | 18 | 9.18% |
| >61yrs. | 14 | 7.14% |

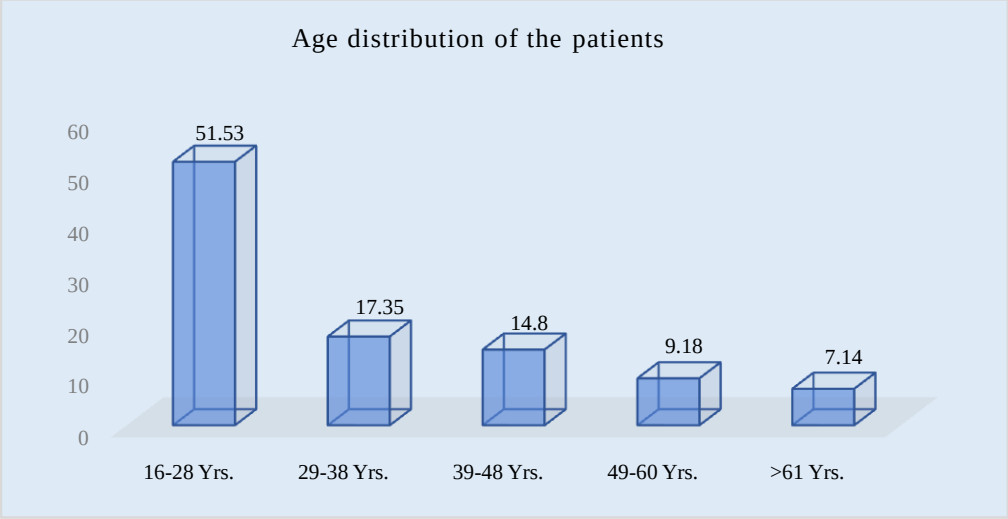


*Figure I: Column chart showed age group wise patients distribution.(N=196)*

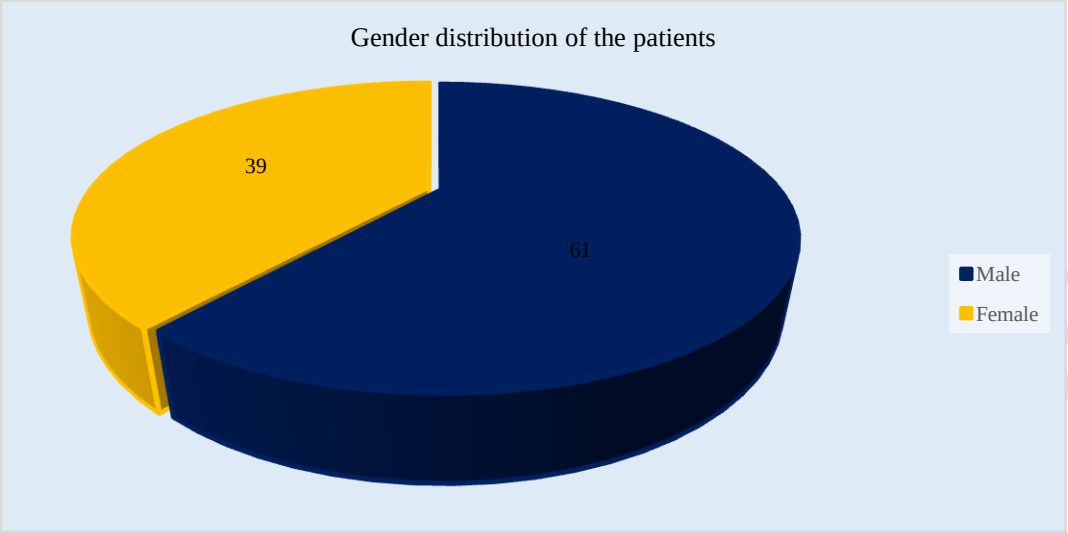


*Figure II:Pie chart showed gender wise patients distribution.(N=196)*

**Table 2:** Clinical symptoms distribution. (N=196)

| Signs/Symptoms | n | % |
|---|---|---|
| Fever | 161 | 82.1% |
| Headache | 123 | 62.8% |
| Nausea | 95 | 48.5% |
| Anorexia | 84 | 42.9% |
| Vomiting | 76 | 38.8% |
| Myalgia | 69 | 35.2% |
| Abdominal pain | 54 | 27.6% |
| Retro orbital pain | 28 | 14.3% |
| Arthralgia | 21 | 10.7% |
| Back pain | 17 | 8.7% |

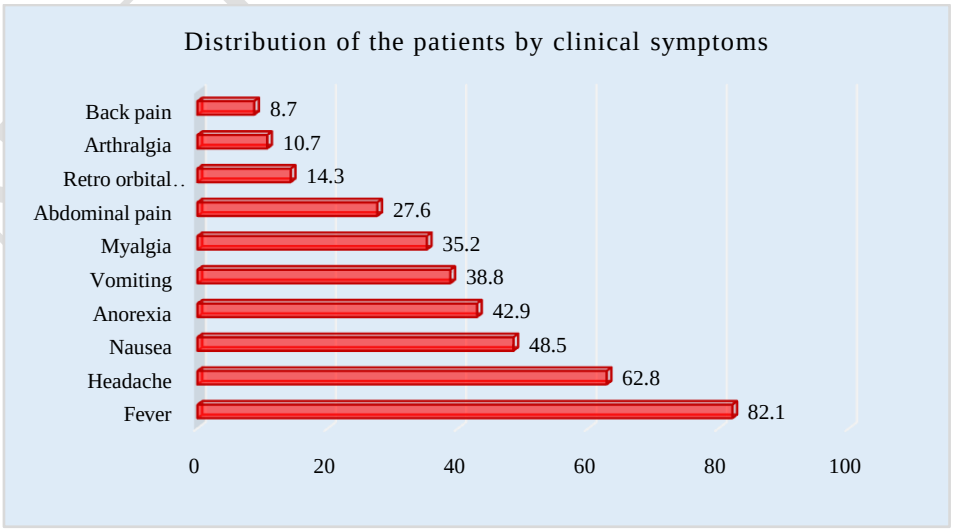


*Figure III:Bar chart showed clinical symptoms wise patients (N=196)*

**Table3:**Clinicalspectrumofdengue.(N=196)

| Diagnosis | n | % |
|---|---|---|
| Dengue fever | 173 | 88.27% |
| Dengue hemorrhagic fever | 19 | 9.69% |
| Dengue shock syndrome | 4 | 2.04% |

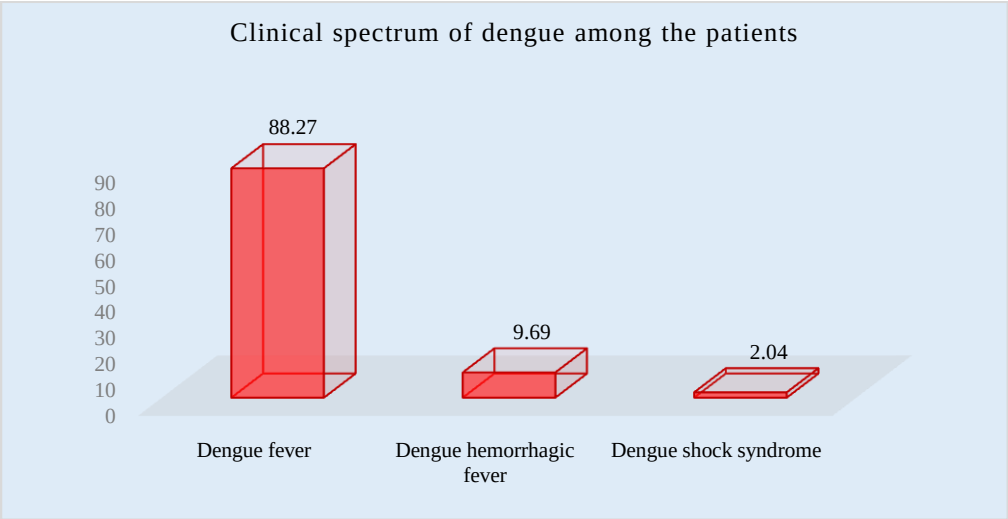


*Figure IV: Column chart showed Clinical spectrum of dengue patients (N=196)*

**Table 4:**DifferentialWBCcountpattern.(N=196)

| Pattern | Leucopenia (n=68) | | Normal WBC (n=120) | | Leukocytosis (n=8) | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| Lymphocytosis | 28 | 41.18% | 57 | 47.5% | 2 | 25.0% |
| Neutrophilia | 14 | 20.58% | 21 | 17.5% | 4 | 50.0% |
| Within normal limit | 26 | 38.24% | 42 | 35.0% | 2 | 25.0% |
| Total | 68 | 34.7% | 120 | 61.2% | 8 | 4.1% |

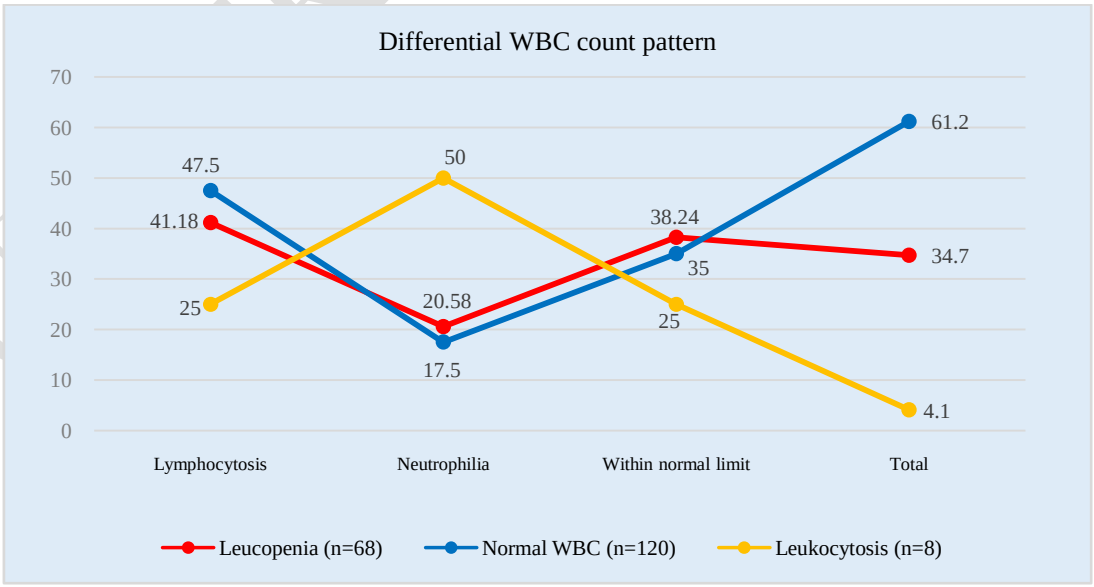


*Figure V:Line chart showed differentialWBCcountpattern of the patients.(N=196)*

**Table 5:** Thrombocytopeniabased onbleedingmanifestations. (n=57)

| Manifestation | ≤20,000 | 21-30,000 | 31-40,000 | 41-50,000 | 51-1 lac | >1 lac | Total |
|---|---|---|---|---|---|---|---|
| Petechiae | 9 | 8 | 7 | 3 | 0 | 0 | 24 |
| Hematemesis | 6 | 6 | 6 | 2 | 0 | 0 | 18 |
| Melena | 4 | 4 | 2 | 0 | 0 | 0 | 10 |
| Total | 19(37.9) | 18(34.4) | 15(27.5) | 5 | 0 | 0 | 57 |

## DISCUSSION

This study aimed toassess the pattern of hematological abnormalities in NS1-positive dengue fever. The majority of our participants (51.53%) belonged to the 16-28 years' age group. In terms of gender distribution, more than half (61%) were male, while the remaining 39% were female. A similar finding was also observed in studies conducted by ShamsunderKhatroth [13] and Yashaswini LS et al. [14]. In this study, the clinical symptoms reported by patients revealed several significant findings. The most common symptoms included fever (82.1%), headache (62.8%), nausea (48.5%), and anorexia (42.9%). These prevalent symptoms are likely to be crucial indicators for diagnosis and management. Similar findings were also observed in studies conducted by other authors [15,16]. Among our total participants, dengue fever was the most common diagnosis, accounting for 88.27% of cases (173 individuals). Dengue hemorrhagic fever was diagnosed in a smaller proportion of cases, representing 9.69% (19 individuals). The least common diagnosis was Dengue shock syndrome, observed in only 2.04% of cases (4 individuals). Similar findings were noted in another study as well [17]. In our study, among the individuals with leucopenia (n=68), 41.18% exhibited lymphocytosis as the most common pattern, followed by 20.59% with neutrophilia. In those with normal white blood cell (WBC) counts (n=120), 47.5% had lymphocytosis, while 17.5% had neutrophilia. Among cases of leukocytosis (n=8), 50% showed neutrophilia as the predominant pattern and 25% had notable lymphocytosis.Ferede et al [16], Priya, and Bindu M [17] showed that maximum cases in leucocyte count range within normal limits. Moreover, JoshiAA et al found that maximum patients in the leucopenia range. [18] In our study, among individuals with a platelet count of ≤20,000 (total cases considered: 57), 37.9% (19 individuals) exhibited petechiae, 34.4% (18 individuals) presented with hematemesis, and 27.5% (15 individuals) showed melena as bleeding manifestations. No instances of these bleeding manifestations were observed in individuals with platelet counts higher than 50,000. Here the findings of Tewari et al. [19] were comparable. All the findings of this current study may provide valuable insights for future research in similar studies.

## LIMITATION OF THE STUDY

This single-center study featured a limited sample size and a short data collection period, potentially restricting its representativeness for the wider national population. While it offers valuable insights within its context, caution is needed when extrapolating to a broader population. Future research with larger, more diverse samples, and longer data collection can enhance our national-level understanding of the topic.

## CONCLUSION & RECOMMENDATION

Drawing insights from this study, it becomes evident that in patients with confirmed NS1-positive dengue fever, several prominent symptoms tend to manifest frequently. These symptoms notably include fever, headache, nausea, and anorexia. Moreover, the most prevalent diagnoses encountered in these cases are dengue fever itself and its more severe form, dengue hemorrhagic fever. When delving into a more detailed examination of NS1-positive dengue fever patients, it becomes apparent that among those exhibiting leucopenia, lymphocytosis tends to prevail over neutrophilia. Furthermore, a noteworthy observation is the presence of common bleeding manifestations among individuals with platelet counts falling at or below 20,000. Among cases of leukocytosis, neutrophilia is found predominant among half of such patients.

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