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To study between dengue and dengue hemorrhagic fever in paediatric patients

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Abstract

Background: Dengue fever is a major public health concern in several Southeast Asian nations. This disease is caused by one of four strains of the dengue virus, which is transmitted by the *Aedes aegypti* mosquito.

Material and Methods: The study was carried out at the Mayo Institute of Medical Sciences in Barabanki, Uttar Pradesh, India. It was a descriptive study. The study included all children who were admitted to the hospital and diagnosed with dengue infection based on their clinical symptoms and/or serology. The study was conducted from January 2015 to December 2015.

Results: The blood tests verified that 150 youngsters were infected with dengue, as shown by the test results. Five cases, which were ultimately excluded as a result of prior illnesses, were determined to be positive for *Salmonella typhi*. The study includes the remaining 145 children and adolescents who met the inclusion criteria.

Conclusion: From the above study concluded that, more access to parent fluids, and strong networks for the support and education of health care workers at all levels have contributed to a dramatic decline in infant mortality.

Keywords: Hemorrhagic fever, dengue, infants, and mortality

Introduction

Dengue viruses belong to the Flaviviridae family and consist of four serotypes. Dengue virus infections can either be asymptomatic or manifest as undifferentiated fever. In some cases, it can develop into dengue fever or dengue hemorrhagic fever, characterized by capillary leakage that may eventually lead to hypovolemic shock. If left untreated, dengue shock syndrome can occur, which has the potential to be lethal. Dengue virus infections pose significant public health challenges in numerous global regions. Over 2.5 billion individuals across 1100 nations globally are currently vulnerable to dengue virus infection^[1-3].

Approximately 50 million infections occur each year, which includes 500,000 instances. Among patients, at least 2.5% of them experience fatal outcomes. Almost all instances, around 95%, occur in children aged 15 and below, while babies account for 5% of all cases. Nevertheless, the occurrence of in newborns during their initial dengue infections has only been documented in a limited number of research investigations, which have involved very small patient populations. The challenges in obtaining the necessary large blood samples from small subjects, as well as the potential limitations imposed by human experimentation protocols, may partially account for the limited research and in infants compared to older children^[4-6].

An often referenced model of the immunopathogenesis of centres on subsequent dengue virus infections in children aged 11 years. This hypothesis proposes that abnormal or inappropriate immune activity specifically targeting cells infected with the dengue virus triggers the production of cytokines, a rise in the permeability of blood vessels, and the activation of the blood clotting system. No published immunologic investigations have compared the hallmarks of severe dengue in infants after their initial dengue virus infection. The research challenge posed by baby has been elucidated. Research using infants who have alongside primary dengue virus infections should offer compelling new evidence regarding the immunological processes that underlie all occurrences^[7-9].

To address the problem of investigating this distinct group of diseases, we carried out a prospective study to examine the clinical and cytokine profiles in babies. This study provides evidence that the clinical and laboratory findings observed in babies are consistent with the diagnostic criteria used in clinical practice^[8-10].

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Materials and Methods

The study was carried out at the Mayo Institute of Medical Sciences in Barabanki, Uttar Pradesh, India. It was a descriptive study. The study included all children who were admitted to the hospital and diagnosed with dengue infection based on their clinical symptoms and/or serology. The study was conducted from January 2015 to December 2015.

Inclusion Criteria

- The trial included all kids

Exclusion Criteria

- Children with pre-existing medical conditions
- Children with co-infections

All children who were admitted to the hospital with a dengue infection were diagnosed solely based on their clinical symptoms. Parents granted their approval after receiving comprehensive background information. Throughout the entire duration from admission to release, all clinical and investigation parameters were meticulously recorded in a well-organized style. Periodic complete blood counts were conducted to monitor the behavior of the mentioned parameters in both age groups. The user's text is a single letter "T". An analysis was conducted on the outcomes of treating the cases in accordance with the guidelines provided by the World Health Organization. The obtained data underwent statistical analysis to ascertain the presence of significant disparities in symptomatology and laboratory values between the two groups. The patient's background, physical exam findings, laboratory results, course of therapy, and any encountered issues were meticulously documented in a standardized format known as a Proforma.

Results

Over the course of the trial, a total of 150 children were identified as having dengue fever using serological testing. Five patients were excluded due to previous problems or dual infections with salmonella typhi. Only 145 children who satisfied the study's criteria were enrolled.

Table 1: Demographic distribution of research participants by age

Age	Minimum	Max	Mean
<2 years	2	22	12.01
>2 years	2	15	9.02

The male-to-female ratio is consistently high across all categories. The median age for dengue infection in those under the age of two was two months.

Table 2: Dietary condition

	Min	Max	Mean
<2 years	6	16.0	9.23
>2 years	10	71.0	25.14

The average weight of the group under 2 years was 9.23 kg, while the average weight of the group over 2 years was 25.14 kg. In both age groups, the nutritional status was within the normal range.

Table 3: Mean duration of hospitalization

	Min	Max	Mean
<2 years	2	15	3.23
>2 years	2	30	6.12

The mean hospitalization duration for children under the age of two is 3.23 days, which is not significantly different from the mean duration of 6.12 days for children beyond the age of two Table 3.

Table 4: Duration of the fever

	Min	Max	Mean
<2 years	3	15	8.11
>2 years	3	14	8.57

The duration of fever in both groups did not exhibit any statistically significant difference, as indicated in Table 4. The group with less than 2 years of age had a mean duration of 8.11 days, while the group with more than 2 years of age had a mean duration of 8.57 days.

Table 5: Maximum recorded temperature

	Min	Max	Mean
<2 years	98.2	104	100.32
>2 years	98.4	103	99.12

The average maximum temperature documented during a hospitalization in the previous two years was 100.32, while in the most recent two years it was 99.12, as indicated in Table 5.

Table 6: Standards employed in the investigation conducted at the laboratory

	Min	Max	Mean
<2 years	3.0	30.5	8.23
>2 years	3.1	20.4	7.14

Table 6 demonstrates that the average total count is greater in the group of individuals aged less than 2 years compared to the group of individuals aged more than 2 years, and this difference is statistically significant.

Table 7: Outcome

Age	Total cases	Recovered	Death
<2 Years	40	40	2
>2 Years	126	123	5

Based on the aforementioned result table, 39 out of 41 cases in the group after two years had positive outcomes, while 2 cases resulted in death, indicating a mortality rate of 6%. Among the 125 cases in the group that were older than 2 years, 124 patients experienced a positive outcome, while 3 deaths were observed, resulting in a mortality rate of 3.5%.

Discussion

Consequently, there is a scarcity of material on dengue fever in western publications due to its lower prevalence in developed nations. The literature predominantly originates from the developing nations of South and Southeast Asia. Infants, who are at a high risk of developing severe disease following a dengue infection, are often neglected in clinical descriptions and studies. This study aims to compare the clinical profiles and outcomes of children under the age of two with those beyond the age of two, in order to identify similarities^[9-11]. Upon comparing the behavior of neonates and older infants, it may be concluded that these two age groups can be grouped together. Hence, we are incorporating infants and young children in our research, and juxtaposing them with older children for comparison. Out of the 166 children involved in

the study, 40 were under the age of two, and their average age was 12 months. Among the 4,595 confirmed cases of dengue patients admitted to the children's hospital within a span of 5 years, there were 245 infants. In 1964, the incidence rate of DHF/DSS among neonates in Bangkok was 17 per 1000. Based on a recent study carried out in Vietnam, Thailand, Burma, and Indonesia, the average age of patients with Dengue Hemorrhagic Fever who were hospitalized to hospitals was seven months [10-12].

The mean body weights for the under-2 and over-2 age categories were 8.38 and 26.78 kg, respectively, indicating good health in both groups. The average duration of fever was approximately equal in both groups. The duration was 6.83 days for children under the age of 2 and 7.30 days for children over the age of 2. There was no significant difference in the frequency of signs and symptoms between the two groups. Children under the age of 2 exhibited a higher prevalence of cough, redness, and irritation. Young children, particularly infants and toddlers, had a higher likelihood of developing a skin rash compared to school-age children. Research undertaken has shown that infants have a higher likelihood of experiencing symptoms of upper respiratory tract infections compared to older children [13-15].

Those aged over 2 years had a higher likelihood of experiencing symptoms such as vomiting, diarrhea, and anorexia compared to those under 2 years old. It was discovered that older patients had nausea and vomiting more frequently, which contradicts the findings of Prasonk *et al.*, who observed that these symptoms were more common in infants and young children. Abdominal pain was only reported in older children, making about 39.68% of all cases. Children under the age of 2 lack the ability to verbally communicate their anguish, making it impossible to make a comparison between the two groups. Abdominal pain was detected, mainly in older children [14-16].

This study also observed that tachypnoea, a rapid breathing rate, was more commonly observed in the same age group. The present investigation revealed that the occurrence of malena was 19% in older children and 12.50% in infants. Children between the ages of 2 and 12 were more prone to experiencing additional bleeding symptoms such as bleeding gums, vomiting blood, nosebleeds, and menstrual bleeding. The study conducted by Prasonk *et al.* revealed a higher prevalence of the condition among infants, indicating a notable divergence from previous findings. Significant bleeding in patients with DHF rarely leads to a fall in hemoglobin levels or requires a blood transfusion. Our findings indicated that there was no requirement for whole blood transfusions in any of the children [17-19].

Splenomegaly is primarily observed in neonates, particularly those under 6 months of age, with a prevalence rate of approximately 10%. The incidence of organomegaly was greater in the group aged 2 years. Children who are diagnosed with dengue through serological testing frequently experience liver damage, but this is less common according to a study conducted in South America. When comparing dengue hemorrhagic fever to dengue fever syndrome, it was observed that hepatomegaly was significantly more prevalent in DHF [18-20].

On the contrary, this was proven by additional investigations. Plasma leakage signs, such as face puffiness, ascites, and pleural effusion, were more prevalent in children under the age of 2. Infants possess capillary beds that are more permeable compared to those of older children or adults. Capillary leak

syndrome heightens the likelihood of premature cardiovascular dysfunction and excessive fluid accumulation in newborns. Upon comparing the blood counts of the two groups, significant disparities were observed. Children under the age of 2 exhibited elevated total white blood cell and lymphocyte counts, whereas their neutrophil counts were lower. One possible reason for these results is that there may be changes in the reference ranges between newborns and older children due to age-related factors. Newborns have greater normal levels for WBC and lymphocytes compared to older children, whereas their normal values for neutrophils are lower [19-21].

The study's analysis of bleeding characteristics revealed that the average partial thromboplastin time in children under the age of two was much longer compared to older children. The group of patients with a duration of 2 years or more showed a higher incidence of liver involvement and/or dysfunction, as indicated by an increase in mean SGOT/SGPT levels, compared to the group with a duration of more than 2 years. The average platelet count for children over the age of 2 was 82387, which was not substantially different from the average of 84558 for younger children. The mean PCV in this study was 30.546 in infants and 35.826 in older children. There was a statistically significant difference in the average PCV between the two groups. Based on serology tests, older children exhibit a greater incidence of secondary dengue compared to newborns. Primary dengue infections were strongly associated with Infant DHF. Prasonk Witayathawornwong discovered that the occurrence of first dengue infection was prevalent in both neonates and young children [20-22].

This study found that infants had a higher prevalence of long-term fever, fulminant hepatitis, and seizures compared to older children. This discovery supports the findings of Kalayanaraj S. and Nimmannitya S., who observed that neonates are more prone than older children to have distinct symptoms of epilepsy. Two children in the group of children older than 2 years have received a diagnosis of acute respiratory distress syndrome, and one kid has acquired encephalopathy. Based on the findings, the death rate for infants and toddlers was higher compared to that of children and toddlers. The study found that the case fatality rate in neonates was 1.2 per 1,000 live births, while in older children it was 0.3 per 1,000 live births [23-25].

Conclusion

Over the past two years, dengue fever has spread rapidly throughout the Indian region. Death rates were especially high among children younger than 2 years old, while dengue fever was a prominent cause of illness among kids of all ages. Dengue's clinical manifestations, laboratory markers, and prognosis differed across age groups. Infants have a higher incidence of complications such as hepatic dysfunction and fluid overload, and a higher case fatality rate as well. Due to the difficulty in early detection and the occasionally unique signs of DHF, management of newborns with the condition is crucial. Many nations in Southeast Asia have seen a significant drop in mortality thanks to the World Health Organization's treatment guidelines, an increase in the availability of parental fluids, and the establishment of good networks for the support and education of health care personnel at all levels.

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Conflict of Interest

None

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