Survival of dengue children in a tertiary care centre

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Abstract

Background: Dengue infection is an emerging disease and is a major health problem in our country. The annual incidence is estimated to be 7.5 to 32.5 million and case fatality is around 5%. There are few articles on dengue fever in children but no studies till date on survival of dengue children.

OBJECTIVES: To estimate the survival of dengue children admitted to our hospital and analyse its various predictors affecting the survival.

Materials and Methods: This is an analytical observational study conducted in department of paediatrics, Veer Surendra Sai Institute of Medical Sciences & Research, Burla, Sambalpur, Odisha from July 2014 to August 2017 after getting approval from institutional ethical committee. Total 76 sero positive dengue cases attending to our OPD/ IPD were taken by simple convenient sampling method categorized according to WHO 2009 criteria after satisfying the predefined inclusion and exclusion criteria various study and outcome variables were analysed using appropriate statistical tests. Each patient in each category were followed up till discharge or death.

Results: There was statistically significant difference of median survival time for group-1 (2.000 ±0.193), group-2(4.000 ±0.445) and group-3 (2.000 ± 0.295) as evidenced by Kaplan-meier tarone-ware chi-square 19.888(2), p=0.000. There was a statistically significant difference of mean duration of hospitalisation in days between three groups as evidenced by one-way ANOVA; F = 19.395(2,73), p=0.000. Median survival time of dengue children with vomiting, ascites, abdominal pain or tenderness, hepatomegaly was statistically significant as evidenced by Kaplan meier Tarone ware p value<0.05.

Conclusion: Survival of dengue children depends upon the various predictors, which if detected earlier and if monitored regularly, then many children can be survived with decreasing the morbidity and increasing the quality of life.

Introduction

Dengue infection is an emerging disease and is a major health problem in our country. Globally the incidence of dengue has increased in the last few years. The WHO estimates that about two fifths of the world population is at risk for this dengue infection.(1) It is estimated that worldwide nearly 2.5 billion people continue to live at risk of contracting the infection while 50 million cases and 24,000 deaths tend to occur in 100 endemic *countries*. It is a mosquito borne viral infection with four serotypes causing dengue without warning sign, dengue with warning sign, severe dengue according to WHO 2009 guidelines.(2) Recovery from infection by one serotype offers lasting immunity against that particular serotype, but subsequent infections by other serotypes increase the risk of developing severe dengue.(3) The first dengue fever in India was reported during 1956 from Vellore and the first dengue haemorrhagic fever occurred in Calcutta in 1963.(4) In India, the annual incidence is estimated to be 7.5 to 32.5 million.(5) In Odisha, a state of Eastern India, the first outbreak was reported in 2010, followed by extensive outbreaks in 2011, affecting large populations. According to the WHO the case fatality rate for dengue is around 5%.(6) Dengue reinfection is observed to be more severe in children due to immunological phenomenon.(7) In 2010, 25 cases and five deaths were reported from Odisha.(8) Rapid increase in the dengue cases in 2012 became a public health concern in Eastern India as the majority of cases were affecting the young children. The objective of this study was to assess the overall survival of dengue infection in children from 1 year to 14 years of age by considering different clinical manifestations and its outcome.

Materials and Methods

This is an analytical observational study conducted in department of paediatrics, Veer Surendra Sai Institute of Medical Sciences & Research, Burla, Sambalpur, Odisha from November 2015 to October 2017 after getting approval from institutional ethical committee. Out of this 2 years study period, first one year were dedicated for data collection and subsequent year was for data analysis and interpretation. This is a part of the main study whose primary objective is to formulate a new severity scoring system. Due to less number of samples, we have included cases retrospectively from our hospital records from November 2013 to October 2015. All sero positive dengue cases attending to our OPD/ IPD were taken by simple convenient sampling method. Based on a previous study done in 2010(9) the prevalence of deranged LFT (Raised AST/ALT) in dengue children was 97%. Minimum sample size was calculated as 70 using n-Master v2 by single proportion absolute precision method taking proportion as 0.97, absolute precision of 4% & confidence interval (CI) of 95%.

Total 92 cases selected as per inclusion criteria (Fig. 1). Out of which 7 did not give consent and 9 excluded as per exclusion criteria. 76 cases were enrolled as study participants after giving informed consent. Inclusion criteria being 1 year to 14 years old child sero positive for NS1 antigen or IgM or Ig G & exclusion criteria was presence of any severe pre-existing morbidity (CHD, severe malnutrition, developmental delay), child with coexisting malaria or enteric fever or viral hepatitis. All the confirmed cases are categorized according to WHO 2009 criteria.[2] The study population and target population were same, the children who were satisfying the inclusion criteria.

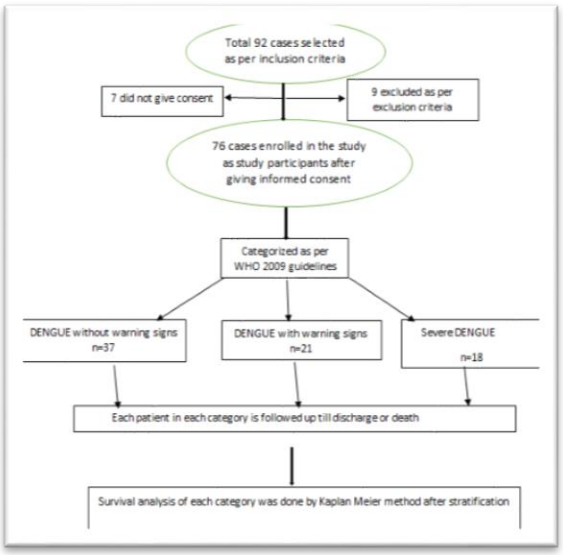

Fig. 1: Study Flow Diagram

The study variables were age(continuous), sex(categorical), clinical manifestations like vomiting(categorical), abdominal pain or tenderness(categorical), ascites(categorical), hepatomegaly(categorical), respiratory distress(categorical), loss of consciousness or convulsion or altered mentation(categorical), shock(categorical), bleeding manifestations(categorical) and duration of hospital stay(continuous). The outcome variables were mortality (categorical) and survival (continuous) analysis.

Each patient in each category satisfying WHO 2009 criteria[2] were followed up till discharge or death. The association of these categories with development of complications, mortality and number of days of hospital stay was studied. After data collection in predesigned proforma, all the data were analysed by using SPSS v24 (IBM, New York) by using Kaplan meier survival analysis plots. One-way ANOVA was used to compare various dependent variables in the three prior mentioned groups.

Results

Among 76 serologically confirmed dengue patients ,49%(37) were dengue without warning signs(group-1),27%(21) were dengue with warning signs(group-2),24%(18) were severe dengue(group-3) according to WHO, 2009 guidelines.[2] Out of 37 dengue without warning signs cases, 16.2%(6) were treated on OPD basis and could not be followed up. Rest all cases in three distinct categories of dengue were followed up till discharge or death. 59%(45) cases were male and 41%(31) cases were female out of 76 cases. There is no statistically significant difference of mean age in years between group-1(7.66 ± 2.92), group-2(7.77 ± 3.18) and group-3(7.47 ± 2.85) as determined by Tukey post hoc, p=0.953. But there was statistically significant difference in median survival time in children of age ≤10 years (2.000±0.172) than >10 years (3.000±0.232) as evidenced by Kaplan-meier tarone-ware chi-squire 4.839(1), p=0.028 (Fig. 2). There is no significant relationship in median survival time between male (3.00 ±0.204) and female (2.00 ±0.384) as evidenced by Kaplan-meier tarone-ware chi-square 0.044 (1), p=0.833. Most common symptom was fever followed by vomiting and least common was bleeding manifestations. Most common sign was abdominal tenderness followed by hepatomegaly. 37%(28) were NS1 positive,72%(55) IgM positive and 16%(12) IgG positive. The total percentage of dengue serology positive was more than 100% as some patients were having multiple seropositive status. Overall median survival time of children with vomiting (3.000 ±0.275) as compared to without vomiting (2.000±0.305) was stastistically significant as evidenced by Kaplan-meier tarone-ware chi-square 5.584(1), p=0.016 (Fig. 3). Median survival time of children having ascites (3.000±0.335) was higher than no ascites (2.000±0.191) as evidenced by Kaplan-meier tarone-ware chi-square 9.078(1), p=0.003 (Fig. 4). Median survival time of patients having abdominal pain or tenderness (3.000±0.304) was statistically significant in comparison with absence of abdominal pain or tenderness (2.000±0.159) as evidenced by Kaplan-meier tarone-ware chi-square 15.278(1), p=0.000 (Fig. 5). There was significant difference between median survival time of dengue children having hepatomegaly (3.000±0.301) than without hepatomegaly (2.000±0.175) as evidenced by Kaplan-meier tarone-ware chi-square 12.250(1), p=0.000 (Fig. 6). Median survival time of children with loss of consciousness or seizure (2.000±0.318) was less than that of without loss of consciousness or seizure but not statistically significant (3.000±0.219) as evidenced by Kaplan-meier tarone-ware chi-square 0.130(1), p=0.718. Median survival time of children with shock (2.000±0.318) was less as compared to children without shock (3.000±0.218) as evidenced by Kaplan-meier tarone-ware chi-square 0.785(1), p=0.376. Median survival of patients having bleeding manifestations

(2.000±0.281) was less than without bleeding manifestations (3.000±0.223) as evidenced by Kaplan-meier tarone-ware chi-square 1.857(1), p=0.173. Median survival time in children having respiratory distress (2.000±0.318) was less as compared to children having no respiratory distress (3.000±0.207) as evidenced by Kaplan-meier tarone-ware chi-square 0.000(1), p=0.983. There was a statistically significant difference of mean duration of hospitalisation in days between three groups as evidenced by one-way ANOVA; F = 19.395(2,73), p=0.000. Mean duration of hospitalisation in days in group-1(1.76 ± 1.09) was significantly lower as compared to group-3(2.72±1.96) and group-2(4.09 ± 1.22) as evidenced by Tukey post hoc, p=0.000. Mean duration of hospitalisation in days in group-2 (4.09 ± 1.22) was significantly higher as compared to group -1 (1.76 ± 1.09) and group-3(2.72±1.96), as evidenced by Tukey post hoc analysis, p =0.044; whereas mean duration of hospitalisation in days in group 3 (2.72±1.96) is significantly lower than group-2(4.09 ± 1.22) but higher than group-1 (1.76 ± 1.09) as evidenced by Tukey post hoc, p=0.008. In our study, mortality in group-1 was 0% (0), group-2 was 5% (1) and group-3 was 89% (16). There was statistically significant difference of median survival time for group-1 (2.000 ±0.193), group-2(4.000 ±0.445) and group-3 (2.000 ± 0.295) as evidenced by Kaplan-meier tarone-ware chi-square 19.888(2), p=0.000 (Fig. 7).

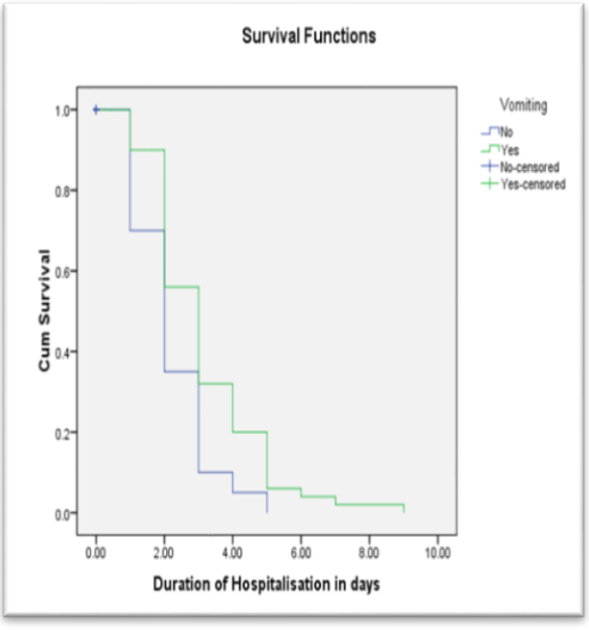

Fig. 2: Survival Functions

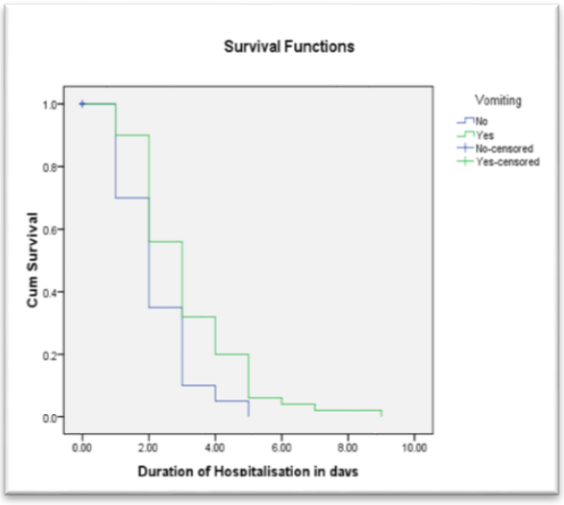

Fig. 3: Survival Functions

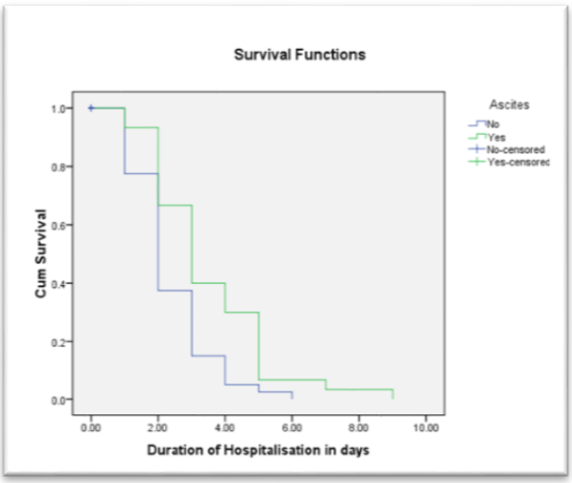

Fig. 4: Survival Functions

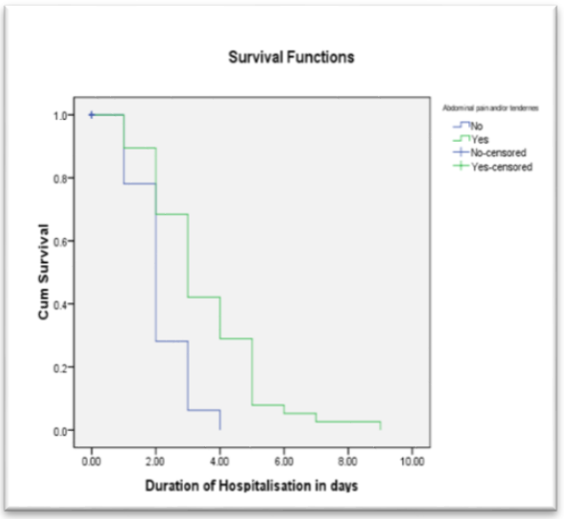

Fig. 5: Survival Functions

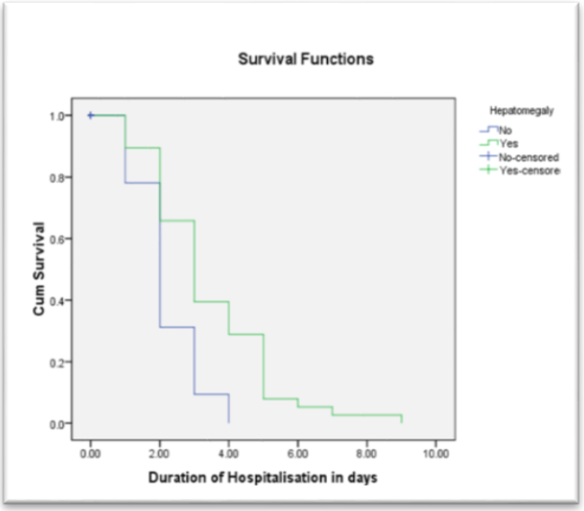

Fig. 6: Survival Functions

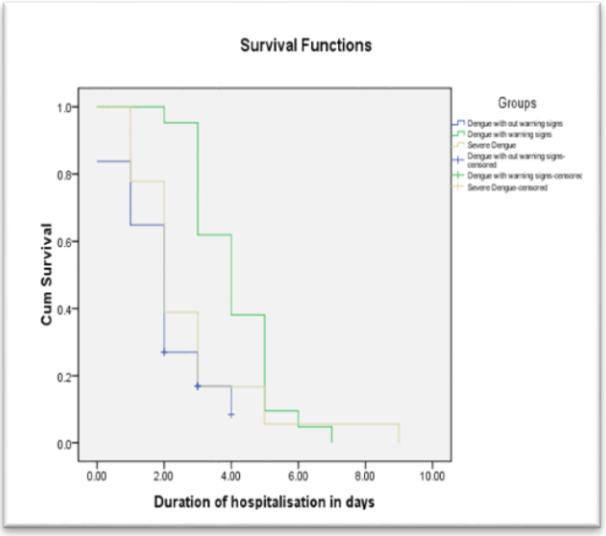

Fig. 7: Survival Functions

Discussion

Dengue is a major international health concern that is prevalent in tropical and sub-tropical countries. Global incidence of dengue fever has increased dramatically in the recent decades. A very few studies are there regarding dengue in children and there is no study related to survival of dengue in children till date. The objective of the study is to analyse the survival of children with dengue infection in a tertiary care centre of western Odisha. In our study, there is no significant difference between mean age and median survival time of male and female.

Male children are more affected than female which was similar to that of previous study[10] due to outdoor activities leading to more chances of daytime mosquitoes' bite. Only serologically confirmed dengue cases are taken for study out of which maximum are IgM positive as our study is conducted in a tertiary care centre and most of the patients are referred from periphery hospital. Fever is most common symptom invariably present in all three groups. Median survival of children with vomiting is more than that of children without vomiting as the prior group is having more duration of hospitalisation. Survival of children having ascites is more as compared to the children not having ascites, may be due to associated complications which contributed to more length of hospital stay. Children with abdominal pain or tenderness had higher median survival time than without abdominal pain or tenderness as requirement of hospital stay more in first category. The children who are having hepatomegaly in our study had higher survival time than that of no hepatomegaly groups as it is one of the warning signs of dengue, strict monitoring is required and hence the duration of hospitalisation increases.

Mean duration of hospitalisation in days in group-2 is more than group-3 and group-1. As group-3 comprises of severe and moribund cases, mortality is higher and as a result duration of hospitalisation decreases. In group-2 relatively less critical children are there, so close monitoring and follow up is needed which prolongs the duration of hospital stay. Group-1 had relatively stable patients, so they hardly required any intervention except observation.

Overall survival of group-2 children is more than other groups. This may be explained by the fact that these children were meticulously monitored, so that they were prevented from becoming group-3 as the latter group consists of more critically ill children.

Loss of consciousness or seizure, shock, bleeding manifestations, respiratory distress does not proved to be an independent predictor for survival of dengue children among three groups as previously categorized by WHO 2009 criteria. This may be due to the fact that the above mentioned predictive variables are more in the group-3 and most of these children succumbed to death.

Like other studies, the current study is also not devoid of limitations. This is a part of the main study, so final result may vary. As it is a hospital based study, its result could not be generalised. It is a single centre study with small sample size, so the results are not devoid of confounder, interactions despite of our relentless efforts. This study is also not devoid of recall bias and reporting bias as we have collected data from past records of hospital registry. In view of the above mentioned limitations, a multicentred study with larger sample size is awaited for upcoming future as this type of studies are currently very few in our country and nearly none in our state.

Conclusion

Overall survival of the children is a lot of in dengue with warning signs as compared to the severe dengue and dengue without warning signs. This might

ensue to meticulous observance and early intervention that prevented these kids from more deterioration. The children of dengue without warning signs desires correct direction of their oldsters relating to consult doctors and to follow up. So, these dengue kids with minor illnesses through proper information will be prevented from further deterioration. So, to conclude that once a child with minor sort of illness(group-1) comes to you needs proper counselling and the children with critical illness (group-2) needs proper observation and follow up so that these two groups of dengue can be prevented from additional deterioration with an aim to scale back the morbidities and mortalities.

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Author's Contributions

BKN done the data collections, KP done the data validation, NRM done the data analysis.

BKN, NRM, SKM, KP are solely responsible for planning of study design proof reading.

Conflict of Interest

Not stated

Funding

Self

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