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Original Article

The Scenario of Dengue-like Illness in Paediatric Population of Southern Bangladesh

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Abstract

Dengue is one of the most important mosquito-borne viral diseases affecting humans. Dengue infections can result in a broad spectrum of disease severity ranging from an influenza-like illness (DF) to the life-threatening dengue hemorrhagic fever (DHF)/dengue shock syndrome (DSS). Although adults do experience shock, vascular leakage is generally more severe in young children, and in endemic areas, DSS is seen primarily in the pediatric population. The detailed clinical and laboratory profile is crucial for the diagnosis and the successful management of the patients.

This study aims to observe the clinical features and laboratory results for the better understanding of patient management to reduce child death in case of dengue fever. A prospective cross-sectional study was conducted at the dengue ward of Khulna Medical College Hospital; 167 suspected dengue patients were enrolled in our research during the period from 7th August to 8th November 2019. Patients attending the emergency department and pediatric outpatient department with complaints of fever and features of dengue with positive NS1 antigen test and/or positive dengue specific antibody IgM or IgG or both were included in this study. Diagnosis of dengue was made on the basis of compatible clinical features and NS1 antigen positivity and/or detection of IgM and IgG antibodies. Patients were classified according to WHO 2012 protocol, and data was analyzed.

One hundred sixty patients (95.8%) were diagnosed as having dengue illness, and the rest 7(4.2%) as fever other than dengue. Among the dengue illness, dengue fever (DF) 87(52.1%), DF with warning signs 51(30.5%), DHF 19(11.4%), and DSS 3(1.8%).The most common sign-symptoms of dengue was fever(100.0%),vomiting(52.1%),abdominal pain(38.3%), headache(23.4%),skin rash(13.25%), melena (7.8%), abdominal tenderness(28.7%),palpable liver (24.6%),and palpable spleen(3.0%). NS1 antigen was found positive in 88.6% cases, negative 3.0%, and NS1 antigen test not done 8.4% cases due to time constrain. Anti-dengue antibody IgM positive in 10(6.0%),IgG positive 7(4.2%),both IgM & IgG positive 7(4.2%),both IgM & IgG negative 57(34.1%) and antibody test not done in 86(51.5%) cases due to time constrain. Anti-dengue antibody not done in 86(51.5%) cases; among them most of the cases (98.8%) are found NS1 positive and 1.2% NS1 test negative(P<0.001) in our study which is statistically significant.

Observation of clinical and laboratory parameters is helpful for dengue classification and management to reduce child death.

***Key words: Dengue, clinical features, NS1*.**

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Introduction

Dengue is one of the most important mosquito-borne viral diseases affecting humans. Infection can be caused by any one of four dengue viruses (DENV-1 to DENV4), transmitted by Aedes mosquitoes.[1] These four serotypes are genetically similar and share approximately 65.0% of their genomes. The fifth variant DEN-5 has been isolated in October 2013.[2] Infection with one of the serotypes confers serotype-specific lifelong immunity; however, secondary infection with a heterogenous serotype often creates devastating outcomes, which may be due to antibody-dependent enhancement.[3] These infections may be asymptomatic or may lead to (a) "classic" dengue fever(DF), or (b) Dengue hemorrhagic fever(DHF), or (c) Dengue hemorrhagic fever with shock, also known as Dengue shock Syndrome(DSS).[4] An estimated 2.5 billion people worldwide are at risk of dengue. More than 50 million dengue infections are estimated to occur annually, of which approximately 500,000 result in hospital admissions for severe dengue in the form of dengue hemorrhagic fever (DHF) or dengue shock syndrome(DSS), principally among children.[5] At present, dengue is endemic in 112 countries in the world[6]. Approximately 36% of annual dengue infections occur among children aged 1-9 years, and the average age of infection is 12 years.[7] Ninety percent of DHF occur in children less than 15 years of age.[8] The disease has a seasonal pattern, and the cases peak after the monsoons.[9] The most notable complication of dengue is an unexplained vasculopathy that manifests as a transient increase in vascular permeability resulting in leakage of plasma from the circulation. Substantial plasma losses may occur, leading to the potentially fatal dengue shock syndrome (DSS). Although adults do experience shock, vascular leakage is generally more severe in young children[9] and in endemic areas DSS is seen primarily in the paediatric population. There is currently no specific treatment for DENV infection[8] although several potential vaccines are in development; therefore, the only method of preventing transmission is vector control.[6] In 2009 World Health Organization (WHO) revised the classification for dengue, defining two major entities dengue and severe dengue. Severe dengue is characterized by severe plasma leakage leading to shock, fluid accumulation with respiratory distress, severe bleeding and severe organ involvement evidenced by AST or ALT> 1000, impaired consciousness, cardiac and other organ involvement.[10] The new classification also encompasses a set of "Warning signs" intended to help clinicians identify patients likely to develop complications during the critical phase of the illness. Dengue infections can result in a wide spectrum of disease severity ranging from an influenza-like illness (DF) to the life-threatening dengue hemorrhagic fever (DHF)/dengue shock syndrome (DSS)[8]. The exact clinical and laboratory profile is crucial for diagnosis as well as for the successful management of the patients. The aim of this study is to observe the clinical features and laboratory results for a better understanding of patient management to reduce child death in case of dengue fever.

Materials and Methods

A descriptive type of cross-sectional study was conducted at the special dengue ward of Khulna Medical College Hospital over 167 suspected dengue patients during the period from 7th August to 8th November 2019. Patients who attended the emergency and pediatric outpatient department with complaints of fever and features of dengue with or without positive NS1 antigen test or dengue specific antibody IgM or IgG or both were included in the study. Diagnosis of dengue was made on the basis of compatible clinical features and NS1 antigen positivity and/or detection of IgM and IgG antibodies. NS1 antigen test was done in all patients with clinical features suggestive of dengue infection presenting within 5 days of onset of symptoms and patients who presented beyond 5 days of illness, dengue-specific antibody IgM and IgG were done. A thorough physical examination was carried out in all cases. Data were collected by using a preformed questionnaire. The relevant investigations were done for every patient. According to WHO 2012 classification, patients were classified as dengue fever (DF), DF with

warning signs, dengue hemorrhagic fever DHF), and DHF with shock, also known as dengue shock syndrome (DSS). Consent was taken from patients, parents, or caregivers. Data were analyzed using SPSS 16.0 program.

Results

A total of 167 patients were enrolled in this study. Among them, 99 (59.3%) were boys, and 68 (40.7%) were girls (Figure-I). The majority of the patients, 81(48.5%), belonged to the age group 5 - 10 years, and the age distribution has been shown in (Table-I). In our study majority (26.9%) of patients came from the Jessore district, followed by Khulna (20.4%), Pirozpur (16.2%), and Satkhira (13.2%). Figure II showed the area of distribution of the patients. Traveling history was present at 4.8% cases, and history of the same type of illness at the family and at the neighbor was present 15 (9.0%) and 17 (10.2%) respectively (Table-II).The most common sign-symptoms of dengue was fever (100.0%), vomiting (52.1%), abdominal pain (38.3%), headache (23.4%) and melena 13 (7.8%), abdominal tenderness (28.7%), palpable liver (24.6%), skin rash (13.2%), palpable spleen (3.0%) and tourniquet test was positive in 3.6% cases (Table-III &Table-IV). It was found that in most of the cases (92.8%) fever persisted for 7 days and 7.2% cases for more than 7 days (Figure-III). About eighty (79.0%) patients had temperatures less than 102^0F followed by 18.0% patients who had 102-104^0 F (Figure-IV). The studies revealed that diarrhea (8.9%) and cough (13.8%) were the commonly associated symptoms (Table-V). Leucopenia and thrombocytopenia were seen in 10.2% and 38.3% cases, respectively (Table-VI). Majority [85 (50.9%)] patients had haematocrit value 30.0 - 35.0% and 31.1% patients had haematocrit value 35.0 - 45.0% (Table-VI). It was found that 88.6% of cases became NS1 antigen-positive, 3.0% of cases were negative (Table-VII). The study showed that 6.0% of patients became anti-dengue antibody IgM positive, 4.2% cases IgG positive, 4.2% had both IgM & IgG positive, 34.1% cases became both IgM & IgG negative, and antibody test not done in 86 (51.5%) cases due to time constrain (Table-VIII). Table IX shows anti-dengue antibody test not done in 86 (51.5%) cases; among them, most of the cases (98.8%) were NS1 positive and 1.2% NS1 negative (*P<0.001*) in our study. One hundred sixty patients (95.8%) were diagnosed as having dengue illness and the rest 7 (4.2%) as fever other than dengue. Among the dengue illness; dengue fever (DF) 87 (52.1%), DF with warning sign 51 (30.5%), DHF 19 (11.4%) and DSS 3 (1.8%) [Table-X].

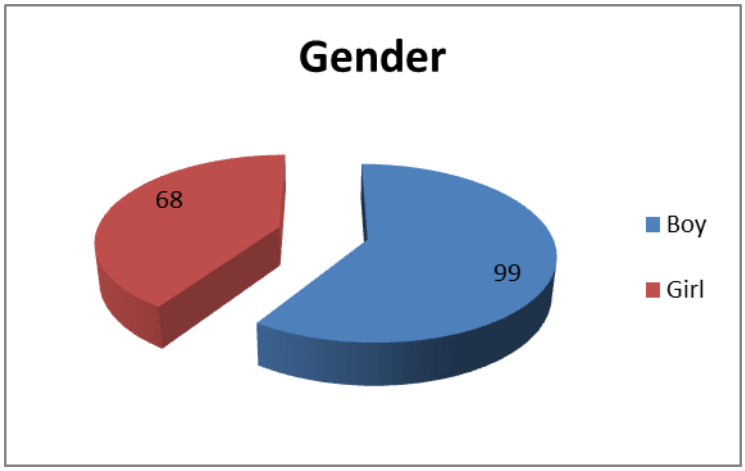

Figure I: Distribution of the respondents by gender

Table I: Distribution of the respondents by age group

Age	Frequency	Percent
Less than 1year	10	6.0
1-5 years	51	30.5
5-10 years	81	48.5
Above 10 years	25	15.0
Total	167	100.0

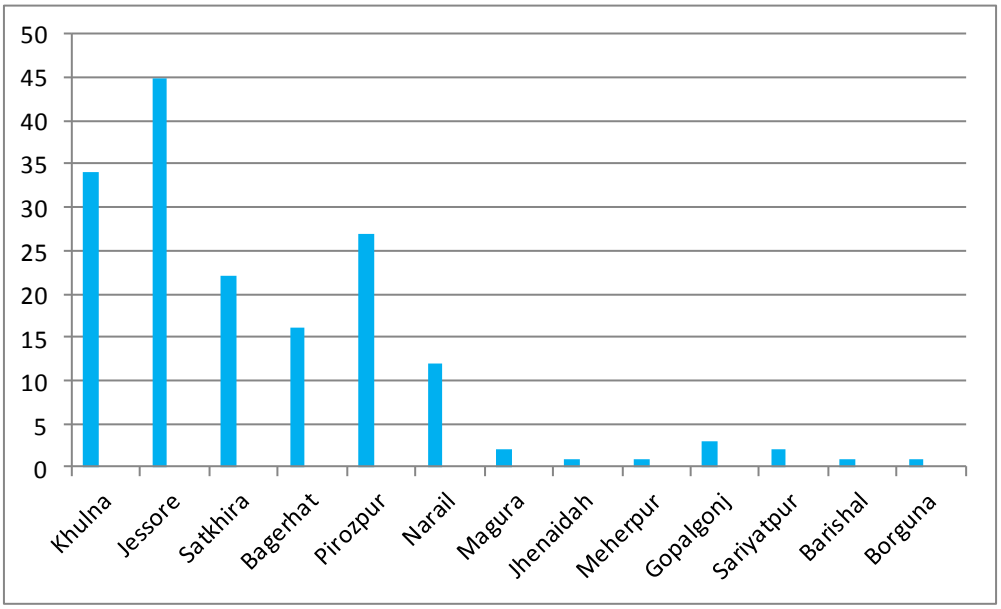

Figure II: Distribution of the respondents by area.

Table II: Distribution of the respondents by history

History	Frequency	Percentage
Travelling		
Yes	8	4.8
No	159	95.2
Same illness at family		
Yes	15	9.0
No	152	91.0
Same illness of neighbor		
Yes	17	10.2
No	150	89.8

Table III: Distribution of cases by symptoms

Symptoms	Frequency	Percent
Fever	167	100.0
Headache	39	23.4
Retro-orbital pain	8	4.8
Bodyache	40	24
Joint pain	9	5.4
Vomiting	87	52.1
Abdominal pain	64	38.3
Convulsion	2	1.2
Skin rash	22	13.2
Gum bleeding	4	2.4
Epistaxis	6	3.6
Hematemesis	3	1.8
Melena	13	7.8
Menorrhagia	1	0.6

Table IV: Distribution of respondents by signs

Signs	Frequency	Percent
Abdominal tenderness	48	28.7
Coated tongue	20	12.0
Strawberry tongue	1	0.6
Skin rash	22	13.2
Palpable liver	41	24.6
Palpable spleen	5	3.0
Pleural effusion&Ascites	8	4.8
Torniquet test	6	3.6

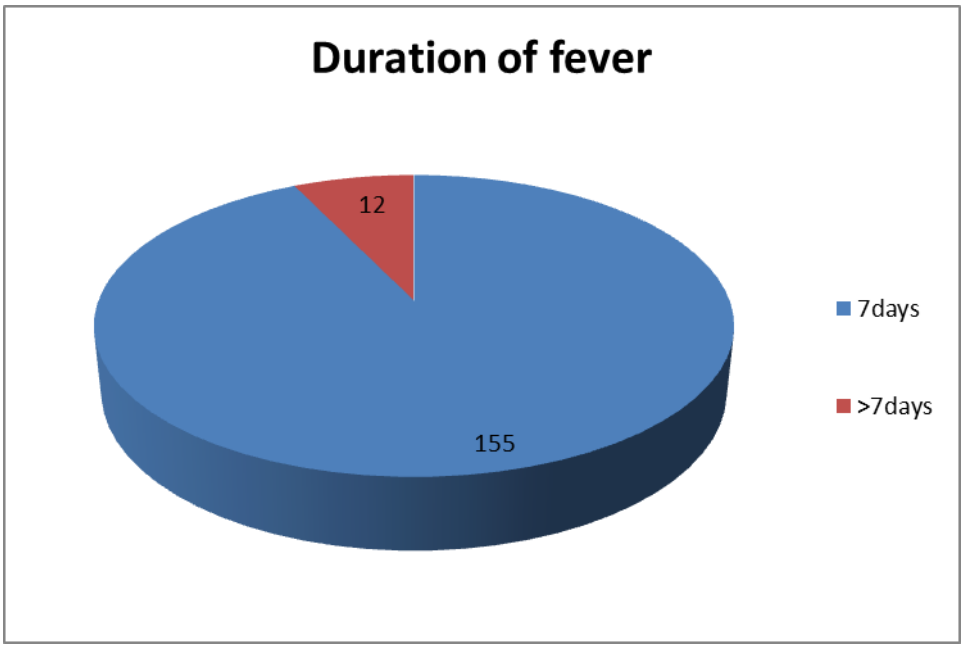

Figure III: Distribution of the respondents by the duration of fever.

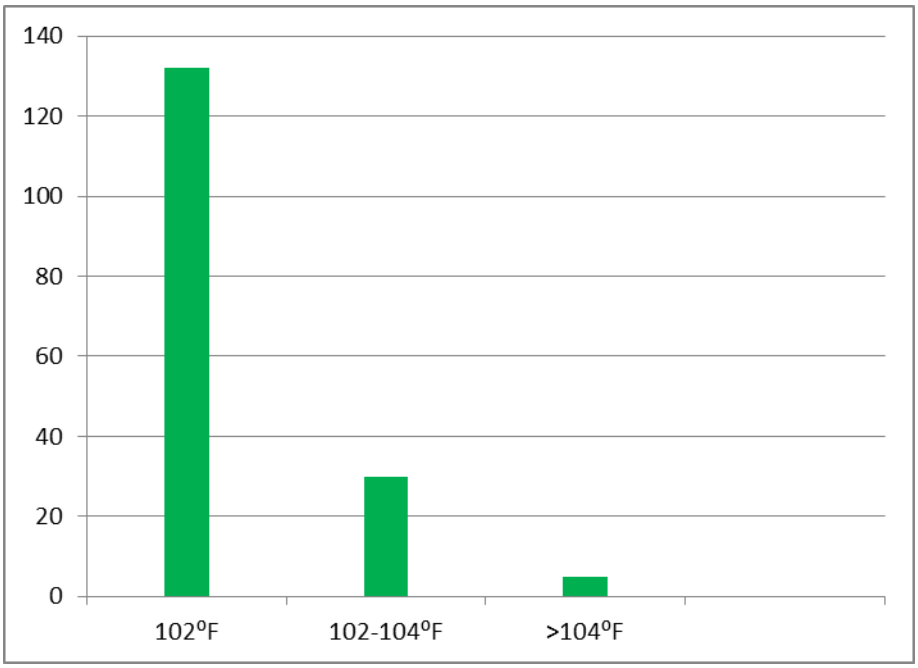

Figure IV: Distribution of the respondents by temperature

Table V: Distribution of the respondents by associated symptoms

Associated symptoms	Frequency	Percent
Cough	19	11.4
Diarrhea	13	7.6
Cough & diarrhea	2	1.2
Runny nose	2	1.2
Red-eye	4	2.4
Burning micturation	1	0.6
Mixed symptoms	3	1.8
None	123	73.7
Total	167	100.0

Table VI: Distribution of the respondents by hematological parameters

WBC count(per cu.mm)	Platelet count(per cu.mm)	Haematocrit (%)
<2000	<100,000	<30.0
1(0.6)	28(16.8)	29(17.4)
2000-4000	100,000-150,000	30.0-35.0
16(9.6)	36(21.6)	85(50.9)
4000-11000	150,000-350,000	35.0-45.0
137(82)	99(59.3)	52931.1)
>11000	>350,000	>45.0
13(7.8)	4(2.4)	1(0.6)

*Figure in the parenthesis indicates percentage

Table VII: Distribution of patients by status of NS1 antigen

NS1	Frequency	Percentage
Positive	148	88.6
Negative	5	3.0
Not done	14	8.4
Total	167	100.0

Table VIII: Distribution of patients by Anti-dengue antibody reactivity

Anti-dengue antibody	Frequency	Percentage
IgM positive	10	6.0
IgG positive	7	4.2
Both IgM & IgG positive	7	4.2
Both IgM & IgG negative	57	34.1
Not done	86	51.5
Total	167	100.0

Table IX: NS1 antigen and anti-dengue antibody status of the patients

NS1	Anti-dengue antibody					Total	P-value
	IgM(+ve)	IgG(+ve)	IgM&IgG (+ve)	IgM&IgG (-ve)	Not done		
Positive	4(2.7) (40.0)	2(1.4) (28.5)	4(2.7) (57.1)	53(35.8) (92.9)	85(57.4) (98.8)	148(100.0) (88.6)	
Negative	1(20.0) (10.0)	2(40.0) (28.6)	1(20.0) (14.3)	00	1(20.0) (1.2)	5(100.0) (2.9)	0.000
Not done	5(35.7) (50.0)	3(21.4) (42.9)	2(14.9) (28.6)	4(28.6) (7.0)	00	14(100.0) (8.3)	
Total	10(5.9) (100.0)	7(4.1) (100.0)	7(4.1) (100.0)	57(34.1) (100.0)	86(51.5) (100.0)	167(100.0) (100.0)	

Table X: Distribution of the respondents by diagnosis

Diagnosis	Frequency	Percent
Dengue fever	**87**	**52.1**
DF with warning sign	**51**	**30.5**
DHF	**19**	**11.4**
DHF with shock	**3**	**1.8**
Other than dengue	**7**	**4.2**
Total	**167**	**100.0**

Discussion

There were 99 (59.3%) boys, and 68 (40.7%) girls, and the boy-girl ratio was 1.45:1 in our study, which is similar to the finding (1.4:1) of Hoque MS[11] et al. Commonest age group in our study was 5 - 10 years. Hoque MS et al., Vikram B[12] et al., and Haridharshan G J[13] et al. showed similar findings with the common age group being 5 - 10 years. Rasul CH[14] et al. showed 10-14 years as the most commonly affected age group. History of fever was present in all cases (100.0%). In the

majority (92.8%) of cases, fever persisted for less than seven days. Vomiting was observed in 52.1% of cases in our study. Hoque M S[11] et al. found vomiting in 56.8% of cases, and Wang C C[15] et al. found vomiting (60.5%) in their study, which is higher in proportion to our finding. In our study, abdominal pain and skin rash was present in 38.3% and 13.2% cases respectively, which has similarity with the findings (35.4%) and (15.6%) of Patel M I [16] et al. In our study headache was present in 39 (23.4%) cases where as Oncog A S[17] et al found 11.67%, Patel M I et al[16] found 74.4%, Shultana K[18] found 12.35% and Hoque M S[11] found 10.0% cases. There is a wide variation of perception of headache between the studies in children. In our study, 13 (7.8%) children presented with melena which coincides with the finding (9.6%) of Patel M I[16] et al. Only one (0.6%) girl presented with menorrhagia. The abdominal tenderness and tourniquet test was positive in 48 (28.7%) and 6 (3.6%) cases, respectively. Shultana K[18] found abdominal tenderness in 17.9% of cases, and the tourniquet test became positive in 4.49% of cases. In another study in Bangladesh[19] tourniquet test was positive in 32.0% of cases. The low proportion of positive tourniquet tests in Indian studies may be due to the darker skin color in Indian children[20]. But in a study in Brazil[21] tourniquet test was positive in 81.8% of cases. The liver was found to be palpable in 41 (24.6%) cases in our study, which is similar to the findings of Patel M I[16] et al. (29.3%) and Hammond[22] et al. (22.0%). Pleural effusion and ascites were seen in 8 (4.8%) cases in our study, whereas Chowdhury J[23] et al. found pleural effusion and ascites in 25.0% of cases. Leucopenia was seen in 17 (10.2%) cases in our study. Patel M I[16] et al. and Mishra S[20] et al. found leucopenia in 25.77% and 64.3%, respectively. In our study, thrombocytopenia was seen in 64 (38.3%) cases, and Priyanka[24] et al. found thrombocytopenia in 59.0% of cases. It was found that 52.1% of children suffered from dengue fever (DF), 30.5% of children from DF with warning signs, 11.4% of patients from DHF, and DSS 3 (1.8%) in our study. Alam ABM[25] et al. found DF 40.7% and DHF 27.8% cases in their study. Jasmin RO[26] et al. reported that, in India, 90.0% of cases were DF, 10.0% were DHF, and no case of DSS. Rahman[27] et al. found DF 56.0%, DHF 27.6%, and DSS 1.5% which has a similarity with that of our study. Tewari K[28] et al. found DF 85.8%, DF with warning sign 11.0%, severe dengue with hemorrhage 2.0%, and severe dengue with severe plasma leakage 1.2%. In our study, 6.0% cases became IgM positive, 4.2% cases were IgG positive, 4.2% cases became both IgM and IgG positive, 34.1% cases were both IgM and IgG negative, and anti-dengue antibody test not done in 86 (51.5%) cases. The study showed that 88.6% of cases were NS1 antigen positive. Among them, 2.7% of patients became anti-dengue IgM positive, 1.4% cases were IgG positive, 2.7% cases became both IgM & IgG positive, 35.8% patients were both IgM & IgG negative and antibody test could not be done in 57.4% cases. An Anti-dengue antibody test was not done in 51.5% of cases. Among them, most of the cases (98.8%) were NS1 positive, and 1.2% cases were NS1 negative *(P<0.000*) in our study, which is statistically significant. Mishra S[20] et al. found that 47.4% of cases were NS1 positive, 32.9% patients became IgM positive, 3.0% cases were IgG positive, 11.3% patients became both IgM and IgG positive, and 5.1% cases were NS1 and IgM positive. Three (1.7%) patients died due to dengue in our study. Among them, two patients died due to DSS, and one patient due to expanded dengue syndrome. Rahman M[27] et al. found a case fatality of 1.14%, which is similar to our study.

Conclusion

Dengue is a self-limiting disease and sometimes becomes devastating if appropriate measurement is not taken timely. A high index of suspicion on the basis of clinical and laboratory parameters help early diagnosis of dengue at their initial stages and thus facilitate monitoring, prompt fluid management, and supportive treatment as per WHO guideline can reduce mortality in patients of severe dengue.

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