



# An epidemiological study of dengue in children in Kolkata

## Abstract

**Introduction (Objectives):** To study the epidemiology of dengue with reference to serological, demographic profile, spatio-temporal distribution, course of illness and complication and correlation between clinical and laboratory parameters.

**Summary:** All children between 1 month-12 years admitted to our hospital with laboratory confirmed dengue during 1 year period (Jan 2016-Dec 2016) were selected.

**Results:** In my study, total number of cases was 107. Majority of patients were of the age group of 1-5 years (47%). There was equal sex distribution of cases in my study. Mortality was only 4%. Most of the patients were from north 24 parganas (62%). Duration of fever was mostly for 6-10 days (69%) & only 40% of cases had the dengue rash. No of cases with bleeding manifestation was 18% which were mostly petechiae 10%. GI symptoms were the commonest manifestation in this study (90%). Shock in the form of hypotension (14%) and oliguria was (5.6%) were taken as criteria of severe dengue. Another manifestation of severe dengue had been presence of neurological symptoms (18% cases). Distribution of cases according to platelet count was those less than 50,000 were 10.2% Cases with leucocyte count majority were between 5000-10,000 (59%). Management of Dengue was mainly done with IV Fluids (83%). 97% cases were treated in pediatric wards. The duration of hospital stay was mainly for 5-7 days (57%).

There was a strong association between positive Tourniquet tests with bleeding risk. There were significant association between Platelet count & bleeding. Bleeding risk increases with platelet count less than 50000 (around 81%) in our study. DHF is strongly significantly associated with serositis, neurological symptoms like convulsions, drowsiness, and thick oedematous gall bladder. The study emphasizes the need of epidemiological surveillance to monitor trends in dengue distribution, seasonal patterns and circulating serotypes to guide dengue control activities.

**Conclusion:** Kolkata being hyperendemic for dengue infection, but it was not a very severe illness with mortality only 4% and management were mainly done at ward with IV fluids. So, this study emphasizes on the varied clinical presentations and complications for effective and timely management.

**Keywords:** dengue fever, epidemiology, rash, bleeding, complication, laboratory features, treatment.

## Introduction

Dengue is an acute viral infection characterized by fever, rash, myalgia, arthralgia and Abnormalities of haemostasis and capillary leakage (severe infection) [1-7]. In 2013, India's NVBCP reports that the country had experienced an annual average of 20,474 dengue cases and 132 dengue related deaths since 2007 with increase in incidence of outbreak every year. Children and young populations are most affected [3-7].

## Materials and Methods

### ■ Study Site

Pediatrics medicine ward, HDU, PICU of Dr BC Roy Post Graduate Institute of Pediatric Sciences (Tertiary care Government hospital in Kolkata).

### ■ Study population

All children between 1 month-12 years admitted to our hospital and laboratory confirmed dengue during 1 year period (Jan 2016-Dec 2016).

### ■ Study design

A prospective, descriptive, hospital based study.

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### ■ Sample size

$$N = \left[ \left( Z_{\alpha/2} \right)^2 \times P \times Q \right] / L^2$$

N=Sample size,  $Z_{\alpha/2}$ =Standard normal deviate=1.96 (considering 95% confidence interval)

P=estimate proportion, Q=100-p, L=Precision

### ■ Time frame

1 year from Jan 2016-Dec 2016.

### ■ Inclusion criteria

All hospitalised children (1 month-12 years) with dengue tested positive for serology IgM antibodies with/without NS1 antigen positivity.

### ■ Exclusion Criteria

1 Suspected dengue children with negative serology. 2 Serologically positive cases with co-existent infection like hepatitis A, typhoid etc.

### ■ Methodology

After obtaining necessary approval, consenting parents were interviewed using data collection form. Patients were thoroughly examined and necessary laboratory tests results were recorded. Treatment details, including fluid management with escalating dose of IVF, blood products,

vasopressor and ventilator support (if needed) was noted. The Data's are analysed using SPSS software with the help of doctors of Community medicine and Statisticians.

### ■ Sampling method

Statistical method applied was systematic random sampling technique.

## Results

### ■ Epidemiology

Total number of cases was 107. Majority of patients were of the age group of 1-5 years (47%) (FIGURE 1).

There was equal sex distribution of cases in my study. Mortality was only 4%. Most of the patients were from north 24 parganas (62%) which was the prime referral zone of our hospital. Others areas include south 24 parganas 13%, Kolkata 18%, Howrah 4% (FIGURE 2).

Duration of fever was mostly for 6-10 days (69%), and more than 10 days is 21% only (FIGURE 3).

Only 40% of cases had the dengue rash. Positive tourniquet test were found in 6.54%.

FIGURE 1. Distribution of cases according to ages.

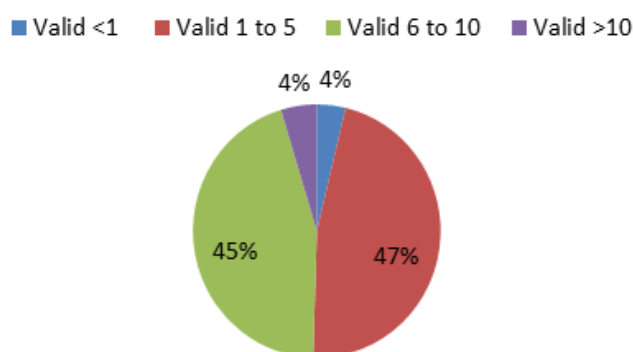
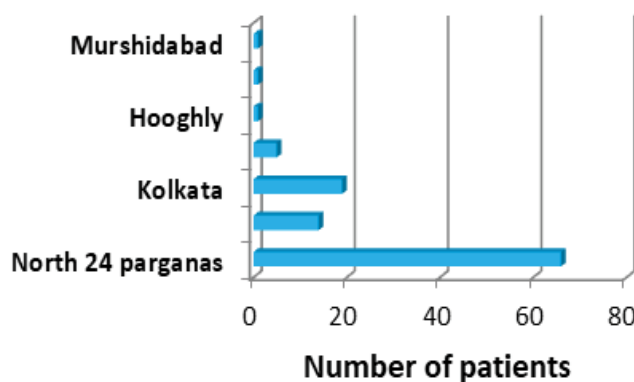


FIGURE 2. Distribution of cases according to districts.



**■ Clinical features**

No of cases with bleeding manifestation was 18% which were mostly petechiae 10%. Others include gum bleeding, hematuria and DIC (each 0.93%), epistaxis 3.74%, hematemesis-malaena is 3.74% (TABLE 1).

Of typical symptoms, there were arthralgia

3.7%, myalgia 3.7%, headache 0.9% and retro orbital pain 0.9% (FIGURE 4).

GI symptoms were the commonest manifestation in this study (90%), which were pain abdomen 35.5%, vomiting 42%, ascites 18.7%, edematous GB 15.9%, deranged liver enzyme 61% and hepatomegaly 45% (TABLE 2, FIGURE 5).

■ ≤5 ■ 6 to 10 ■ >10

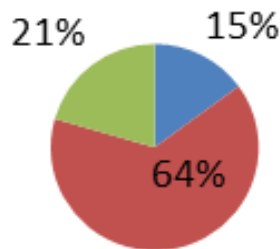


FIGURE 3. Distribution of cases according to duration of fever.

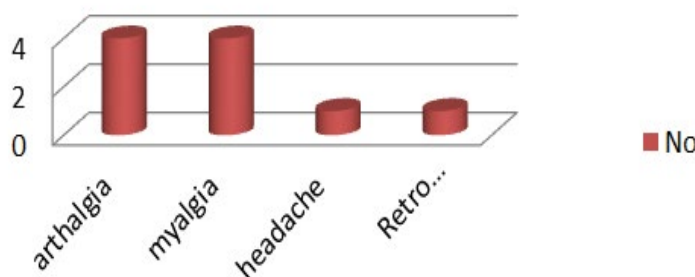


FIGURE 4. Typical dengue symptoms.

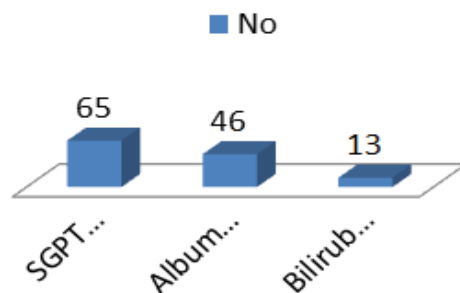


FIGURE 5. Abnormal liver function test.

TABLE 1. No of cases with bleeding manifestation.

Types of bleeding	No (total 107)	%
Petechiae	11	10%
Gum bleeding	1	0.93%
Epistaxis	4	3.74%
Hematuria	1	0.93%
Hematemesis/ Malaena	4	3.74%
DIC	1	0.93%
Positive tourniquet test	7	6.54

TABLE 2. GI symptoms.

GI symptoms	No. of patient	%
Pain abdomen	38	35.5
Vomiting	45	42
Ascites	20	18.7
Edematous GB on USG	17	15.9
Deranged Liver enzyme	65	61
Hepatomegaly	48	44.8

**TABLE 3. Presence of neurological symptoms.**

Neurological symptoms	No	%
Drowsy	8	7.5
Irritable	7	6.5
Convulsion	4	3.7
Nil	88	82

**TABLE 4. Distribution of cases according to platelet count.**

Platelet count	Number of patients	%
<50000	11	10.2
50000-1 lakh	37	34.57
1-1.5 Lakh	13	12.14
>1.5 lakh	46	42.9

**TABLE 5. Management of Dengue.**

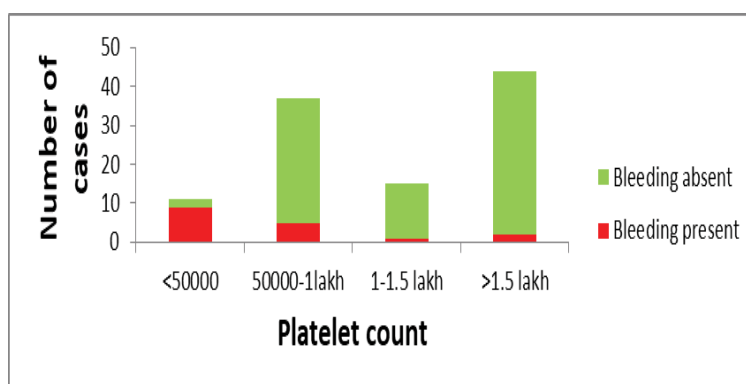
Management received	Number of patients	%
Intra Venous Fluid	89	83
Blood products	27	25
Vasopressor	16	15

**TABLE 6A. Platelet Count and DHF.**

Platelet Frequency Row Pct	DHF		Total
	present	absent	
<50000	9 81.82	2 18.18	11
50000 to <1 Lakh	6 16.22	31 83.78	37
1 Lakh to <1.5 Lakh	1 7.69	12 92.31	13
>1.5 Lakh	3 6.52	43 93.48	46
Total	19	88	107

**TABLE 6B. Chisquare Statistics.**

Statistic	DF	Value	Prob
Chi-Square	3	35.849	<0.0001

**FIGURE 6. Distribution of cases according to platelet count**

Abnormal LFT were recorded.

Another manifestation of severe dengue had been presence of neurological symptoms (18% cases). The various neurological symptoms were drowsiness 7.5%, irritability 6.5%. 3.7% presented with convulsion (TABLE 3).

**■ Laboratory feature**

There was a strong association between positive

Tourniquet tests with bleeding risk.

Distribution of cases according to platelet count were, those less than 50,000 were 10.2%, 50000-1 lakh were 34.5%, 1-1.5 lakh were 12.14%, and more than 1.5 lakh were 42.9% (TABLE 4, FIGURE 6).

**■ Management**

Management of Dengue was mainly done with

FIGURE 7. Duration of hospital stay.

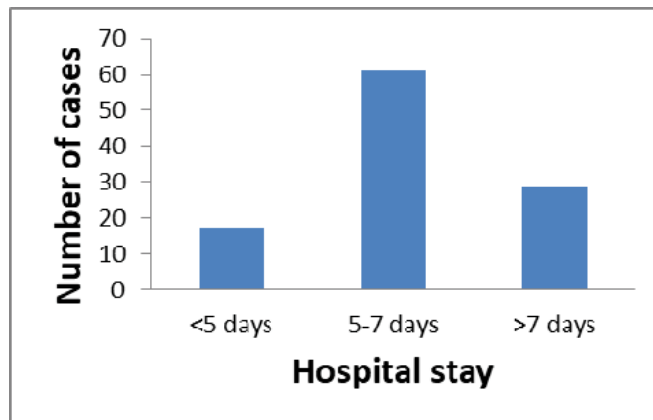
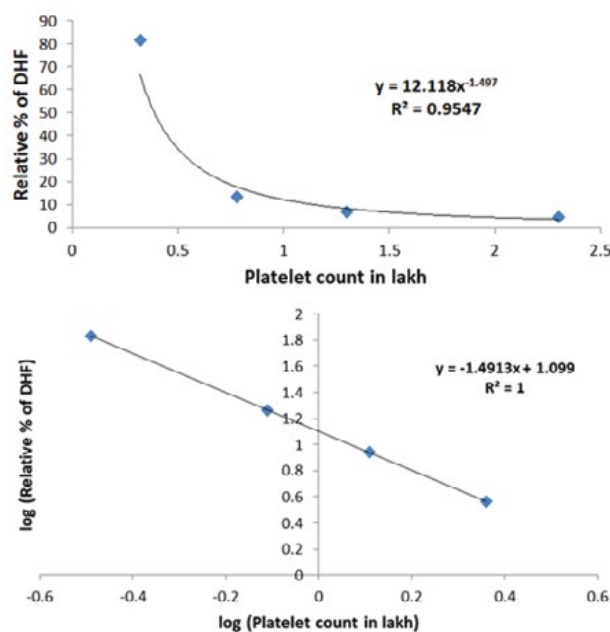


FIGURE 8. Relative % of DHF vs. platelet count.



Neurological symptoms	DHF		
	DHF	No DHF	Total
Frequency			
Row Pct			
Yes	7 41.18	10 58.82	17
No	12 13.33	78 86.67	90
Total	19	88	107

**FIGURE 7B. Chi-Square statistics.**

Statistic	DF	Value	Prob
Chi-Square	1	7.5906	0.0059

**TABLE 8A. Edematous gall bladder and DHF.**

Edematous_GB	DHF		
	present	absent	Total
Frequency			
Row Pct			
Present	6 35.29	11 64.71	17
Absent	13 14.44	77 85.56	90
Total	19	88	107

**TABLE 8B. Chi-Square Statistics.**

Statistic	DF	Value	Prob
Chi-Square	1	4.2564	0.0391

IV Fluids (83%) along with blood products 25% and vasopressors in 15% cases (**TABLE 5**).

24% of cases treated in ICU & rest 97% cases in ward. The duration of hospital stay was mainly for 5-7 days (57%) while more than 7 days was only in 27% cases (**FIGURE 7**).

#### ■ Various co-relations

In Chi-Square test,  $\chi^2=35.84$ ,  $df=3$ ,  $p<0.0001$ . p value is statistically significant ( $<0.0001$ ). More bleeding found in those cases of DHF with lower platelet counts (**TABLE 6A and TABLE 6B**).

There is a significant ( $p=0.00002$ ) negative correlation ( $r= -0.99$ ) between “log (Relative % of DHF)” and “log (Platelet count)”. Lesser the platelet count more was the incidence of bleeding (**FIGURE 8A and FIGURE 8B**).

There is a significant ( $p=0.00002$ ) negative correlation ( $r= -0.99$ ) between “log (Relative % of DHF)” and “log (Platelet count)” (**TABLE 7A and TABLE 7B**).

In Chi-Square test,  $\chi^2=4.25$ ,  $df=1$ ,  $p=0.0391$ . p value is 0.0391, which is statistically significant. My study gave conclusion that DHF is more associated with Thick GB (**TABLE 8A and TABLE 8B**).

In Chi-Square test,  $\chi^2=7.59$ ,  $df=1$ ,  $p=0.0059$ . p value is 0.0059, which is statistically significant. In my study also more neurological symptoms present in DHF cases.

## Discussion

In this study, mortality is 4%. In, Duane JG, et

al., [5] the mortality in their study is 5% which is more than this study, where as in the study Pothapegada S, et al., [8] the mortality is only 2.3%. Thus from my study, as well as from other studies it is seen that mortality rate of dengue infection is low.

#### ■ Distribution according to sex

There is equal sex distribution of cases in my study. Various text books of paediatrics [2,3] corroborates with the finding of this study. Thus it can be concluded that dengue is equally distributed in males and female with some local variations.

#### ■ Distribution according to age

Majority of patients are of the age group of 1-5 years. According to Nelson's Textbook of Pediatrics [2], Ghai Essential Pediatrics [3], dengue infection can affect any age group. There are very few studies giving data's on prevalence of dengue in various age groups in children.

#### ■ Distribution according to district

Most of the patients are from north 24 parganas which the prime referral zone of our hospital. According to Nelson's Textbook of Pediatrics [2], Ghai Essential Pediatrics [3], dengue cases are possible in areas where climate is suitable for mosquito breeding. Since this is a hospital based study where we get patients from a particular referral area, it is very difficult to comment about any particular high risk areas, from this study.

#### ■ Analysis of cases according to clinico-laboratory parameters

**Rash :** 40% of cases have rash %. In the study, Mallhi TH, et al., [9] skin rash was 44.1% overall. The results obtained in my study and the above study is very close. So, we can see rash may not be present in all cases.

**Bleeding manifestation:** No of cases with bleeding manifestations is 18%. Positive tourniquet test 6.54%. Pothapegada S, et al., [8] the percentage of bleeding was 19.9%. Mallhi TH, et al., [9] the results are, more or less similar to the study above but distribution of bleeding are quite different. Wali JP, et al., [10] says 56.4% had bleeding and tourniquet test positive among them are 50%. The no of bleeding manifestations and positive tourniquet test were both much less in my study.

**Neurological symptoms:** No of patients with neurological symptoms are 18%. Comparison of this study with Mallhi TH, et al., shows higher percentages of neurological symptoms in mine. Whereas comparison with the study by Pothapegada S, et al., [8] shows much lower percentage. The possible explanation of this is that, children with dengue fever presents with much higher percentages of irritability and convulsion.

**Typical dengue symptoms:** Typical symptoms have occurred in very less no of hospitalized patients. Since my study is a hospital based study where complicated cases are admitted and simple dengue cases are treated in an outpatient department, we got more atypical symptoms.

**GI symptoms:** Of the total GI symptoms (90%), pain abdomen is 35.5%, vomiting 42%, ascites 18.7%, edematous GB 15.9%, deranged liver enzyme 61% and hepatomegaly (>2 cm) 45%. Distribution of cases according to deranged LFT (SGPT>45 U/L) SGPT 61%, Albumin (less than 3.5 g/dl) 43%, bilirubin (more than 1mg/dl) 12.1%. GI symptoms are the commonest manifestation in this study.

As per Ghai's Text Book of Pediatrics [3], one of the criteria for severe Dengue is Liver >2 cm [3]. The cut of range is taken as per normal reference interval given in Nelson Text Book of Pediatrics [2], where SGPT in 1-12 months is 12-45 U/L and in 1-19 yrs is 5-45 U/L. Levels of Albumin 1-3 yrs is 3.4-4.2 g/dl and 4-9 yrs is 3.5-5.6. The range of bilirubin between 1 mon-adult is given as 1 mg/dl.

**Manifestation of shock:** Distribution of cases according to different manifestation of shock is hypotension 14%, oliguria 5.6%.

BP <50<sup>th</sup> percentile is taken as hypotension from the age and height related Normogram from Bagga's Textbook of Pediatric Nephrology.

Pothapegada S, et al., [9] gives that shock present in 39.1%, oliguria in 18.4%. There was much less prevalence of shock and oliguria among pediatric patients in the current study.

**According to management:** The duration of hospital stay shows less than 5 days is 16% cases, 5-7 days is 57. In Mallhi TH, et al., [8], the duration of hospitalization was mainly found between 2-8 days. Since the duration of fever and atypical symptoms are more in my study, the duration of hospital stay is also more in this study as compared to others.

### ■ Association between clinico-laboratory parameters in our study

**Platelet count and DHF:** Falling platelet count can be taken as a useful predictor of bleeding and thus useful during management. Low platelet count is one of the warning signs in dengue [2,4] and thus can be useful in epidemics and also useful in guiding management strategies.

**Atypical symptoms and DHF:** Serositis (pleural effusion or ascitis) and DHF. p value is 0.0019, which is statistically significant. In the study by Mallhi TH, et al., [9] more patients with DHF have more leakage of fluid, more serositis (pl effusion and ascitis). My study also shows similar results. Thus, sonological parameters are also useful in predicting severe dengue.

**Neurological symptoms (drowsy, irritable, convulsion) and DHF:** This particular study show statistically significant association. Mallhi TH, et al., [9] shows among Neurological symptoms lethargy was 24.1 (DF) and 39.2% (DHF). Restlessness was 17.9% (DF), 13.9% (DHF). Confusion 3.6% (DF), 3.85 (DHF) and Convulsion was 1.4% (DF) and absent in DHF. So, these findings also relate higher percentages in DHF.

**Thick edematous GB & DHF:** Statistical significance is found in my study. A similar study shows thick GB present in 43% of DHF. In Mallhi TH, et al., [9] Thick GB was 0.9% (DF) and 5.1% (DHF). My study gives similar conclusion that Thick GB is more associated with DHF.

**DHF vs. oliguria:** Though my study has found an association, but oliguria is mainly associated with organ (kidney) involvement 1-4 not only with bleeding (DHF).

**IVF required in DF vs. DHF:** IVF requirement



depends on whether hypotension/shock is present which is more common in severe Dengue (DHF).

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### Conclusion

It can be concluded from the study that Dengue though is a self-limiting viral illness can lead to mortality with varied clinical manifestations and complications. The management is mainly symptomatic with close monitoring needed in severe cases.

More attention to be given to epidemiological characteristics like association of age distribution with severity of dengue infection which could not be concluded from this study. The main focus of epidemic to be searched for better epidemic preparedness which was not possible to be found out from this study as this is a hospital based study.

More detailed study about clinical manifestations, and their association with complications or severity of illness for better and effective management of cases. More focussed study on treatment received with the course of illness and their mortality and morbidity is also expected.

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### Limitations

- Single centred study focussing on limited area of study
- It is a hospital based study mainly dealing with complicated cases
- Long term follow up of cases after discharge cannot be done due to time constraint
- Some laboratory tests like amylase, lipase, PT, APTT are not available in our hospital hindering results to some extent



## References

- Savargaonkara D, Sinha S, Srivastava B, et al. An epidemiological study of dengue and its coinfections in Delhi. *Int J Infect Dis.* 74: 41-46 (2018).
- Halstead BS. Dengue fever and dengue haemorrhagic fever. In: Kliegman, Stanton, St Geme, Schor, Editors. *Nelson Textbook of Pediatrics.* 20<sup>th</sup> edition. *Elsevier.* 2: 1629-1632 (2012).
- Tanu S, Rakesh L, Kabra SK. Infections and infestations. In: Paul KV, Bagga A, Ed. *Ghai Essential Pediatrics.* 8<sup>th</sup> Edition. *CBS Publishers and Distributors Pvt Ltd.* 10: 224-228
- Parthasarathy A, Nair MKC, Agrawal R, et al. IAP Textbook of Pediatrics. 5<sup>th</sup> edition. *Jaypee Gwalior.* 514: 219-230 (2013).
- Duane JG, Eng Eon Ooi, Subhas V, et al. Dengue and Dengue Haemorrhagic Fever: Edition 2. *CAB International.* 624 (2014).
- Halstead BS. Dengue and dengue haemorrhagic fever and severe Dengue. In: Cherry, Harrison, Kaplan, Steinbach, hotez. Feign & Cherry's Textbook of Pediatrics Infectious Disease. 7<sup>th</sup> Inc. 2278-2291 (2014).
- WHO Western Pacific Region. Update on the Dengue situation in the Western Pacific Region (2015).
- Pothapregadas S, Kamalakannan B, Thulasingham M, et al. Clinically Profiling Pediatric Patients with Dengue. *J Glob Infect Dis.* 8: 115-120 (2016).
- Malhi TH, Khan AH, Adnan ZA, et al. Clinico-laboratory spectrum of dengue viral infection and risk factors associated with dengue hemorrhagic fever: a retrospective study. *BMC Infect Dis.* 15: 399 (2015).
- Wali JP, Biswas A, Aggarwal P, et al. Validity of tourniquet test in dengue hemorrhagic fever. *J Assoc Physicians India.* 47: 203-204 (1999).