Missed opportunity for Diagnosing Bacterial Meningitis

An Ongoing Hospital Based Struggle

By
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Definition of terms

Suspected meningitis

<table>
<tr><th>≤1 month</th><th>≤18 months</th><th>>18 months</th></tr>
<tr><td rowspan="2">•Temp instability
•Feed intolerance
•Inconsolable crying
•Apnea
•Lethargy
•Irritability
•Convulsion
•Opisthotonus
•Bulging fontanel</td><td>Fever + Convulsion</td><td>Fever +/- Convulsion</td></tr>
<tr><td>Vomiting
Irritability
LOC
Bulging fontanelle</td><td>Neck stiffness
Kerning’s sign
Brudzinski’s sign</td></tr>
</table>

Definition of terms

Probable meningitis

- A suspected case with CSF showing at least one of the following:
  - turbid appearance
  - leukocytosis (> 100 cells/mm3)
  - leukocytosis (10-100 cells/ mm3) AND either
    ↑protein(>100mg/dl) or
    ↓glucose (< 40 mg/dl)

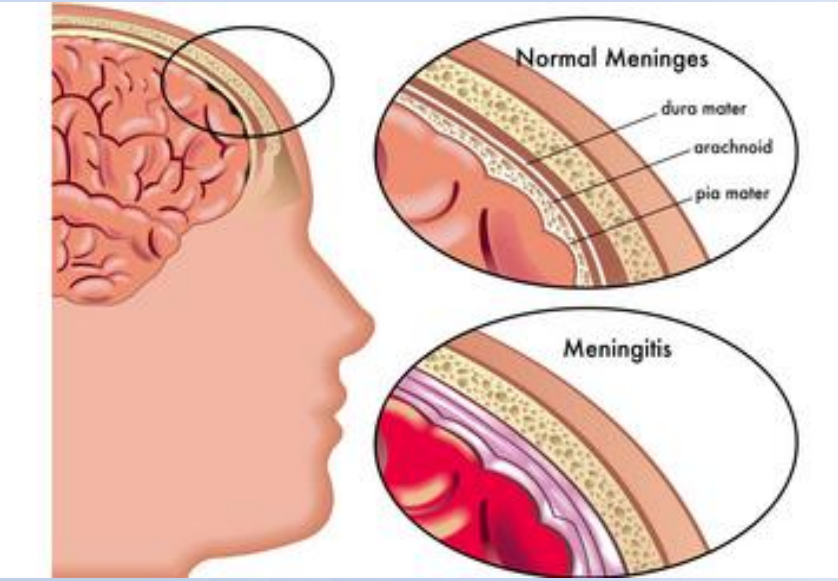
Confirmed meningitis

- By growing (i.e. Culture)
- Identifying (i.e. gram stain or PCR)

Introduction

- Meningitis is inflammation of the protective membranes covering the brain and spinal cord.

(McCracken GH, 2003)



Source: http://www.examiner.com/article/princeton-university, acceced date- 29/10/2013

- Commonest bacterial organism :

Neonates	Infants & Children
Group B Streptococci (GBS) *Escherichia coli* *Listeria monocytogene* *Klebsiella spp*	*Streptococcus pneumoniae* *Haemophilus influenzae* *Neisseria meningitides*

(McCracken GH, 2003)

Introduction…

Prevalence

- 1.6% - 17.9%

Thigpen et al, 2011; WHO, 2010

Mortality

- Globally 170,000 annually
  - Mostly developing countries

Thigpen et al, 2011; WHO, 2010

With appropriate treatment

- ⅓ die
- ¼ sequel

Ramakrishnan et al, 2009

Drug resistance

- Increasing (esp developing countries)
  - Effective treatment more expensive

Nwadioha et al, 2011

Research Question

- What is the prevalence, aetiological agents and antimicrobial sensitivity pattern of bacterial meningitis among children receiving care at KCMC?

Specific objectives

- To determine the proportion of children with meningitis among the suspected cases
- To identify the bacterial organisms causing meningitis in children admitted at KCMC
- To determine antibiotic sensitivity of the isolated organisms

Methodology

Study Design

- Hospital - based Cross-sectional study
- Dec 2013 – May 2014

Study Area

- KCMC in Pediatric wards

Study population

- Suspected cases of acute bacterial meningitis in children aged ≤ 13 years

Data collection technique

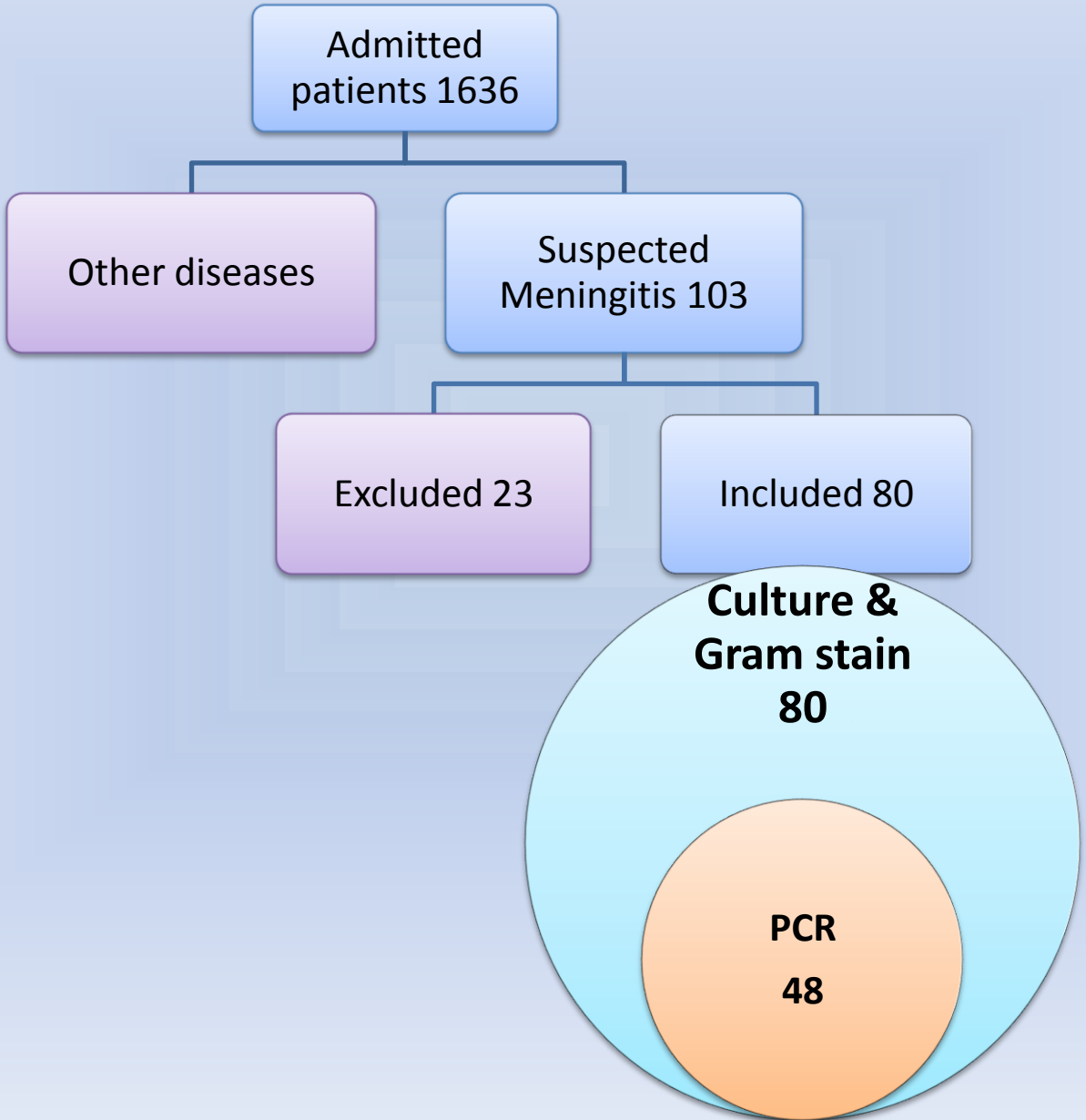
Data collection tools

- Questionnaire
- Laboratory data sheet

Data collection method

- Interview
- Physical examination
- Clinical & Lab investigation

Flow chart


Admitted patients 1636
Other diseases
Suspected Meningitis 103
Excluded 23
Included 80
Culture & Gram stain 80
PCR
48

Study participants

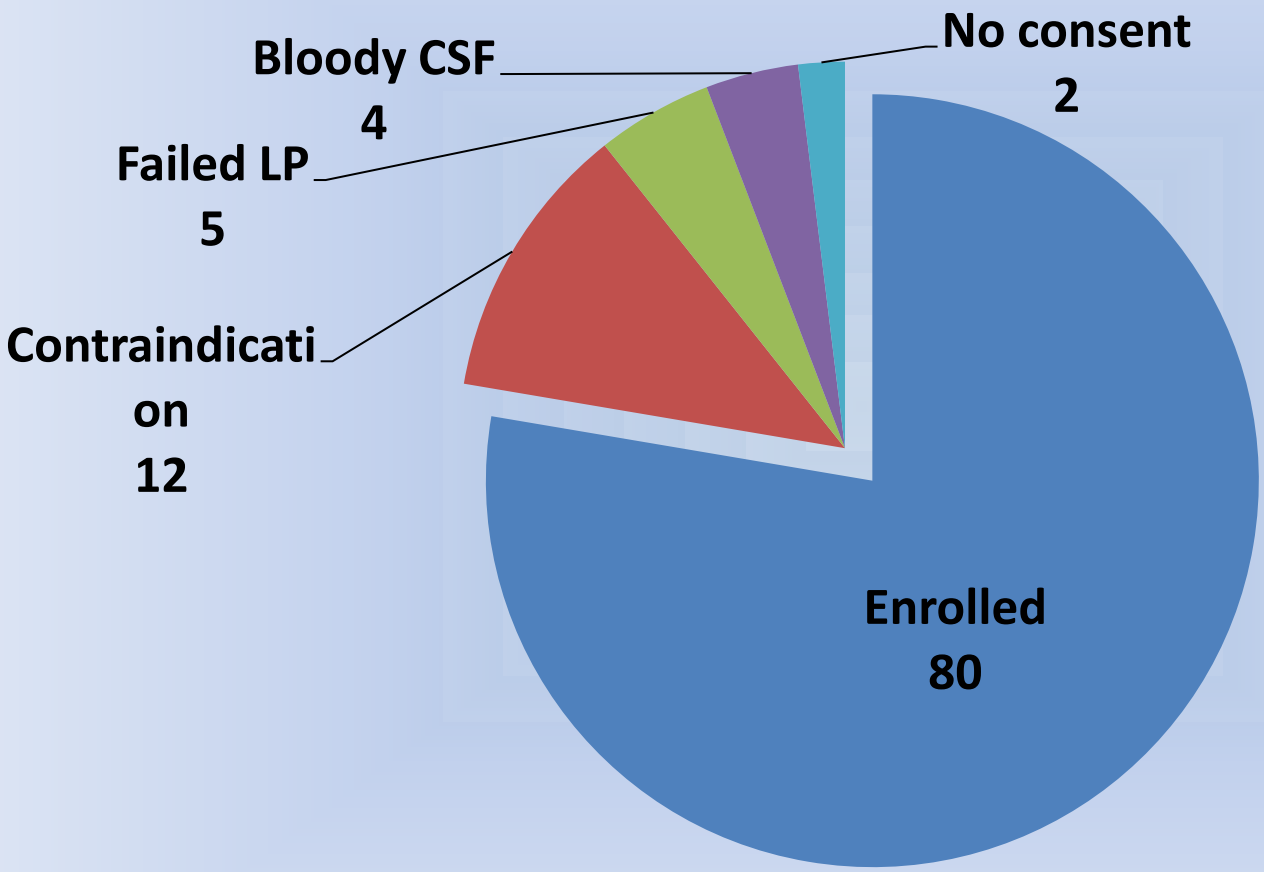
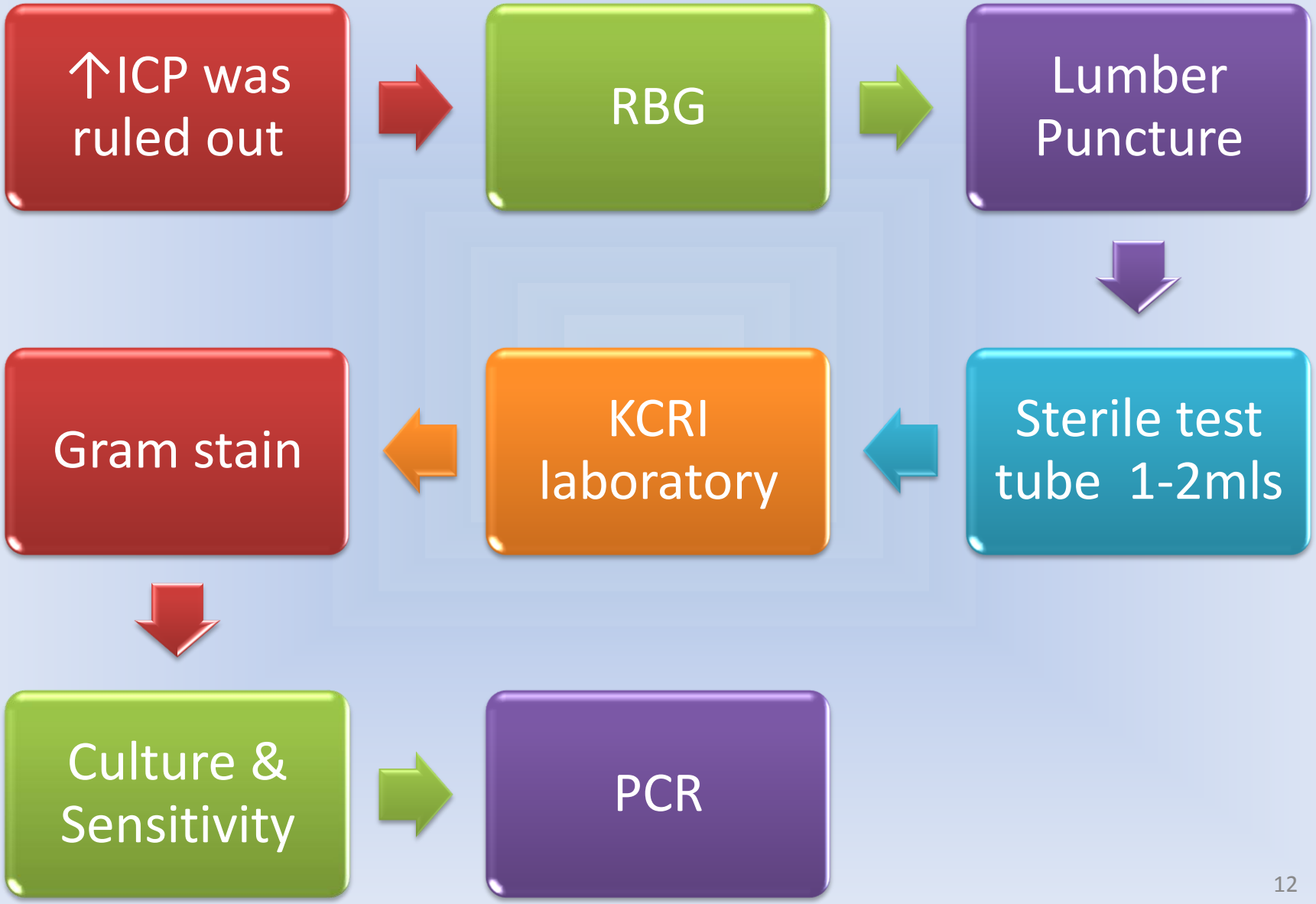


Figure 1: Number of patients suspected to have meningitis during study period (n=103).

Data collection technique



Results

Baseline characteristics of the participants

Table 1: Baseline characteristics of the participants (n=80).

Baseline characteristics	n	%
Age group (months):		
<1	31	**38.8**
1-12	22	27.4
>12	27	33.8
Median (Range); months	5.5 (1-153)	
Sex:		
Female	29	36.3
Male	51	**63.7**
Antimicrobial use:		
No	41	51.2
Yes	39	**48.8**

Table 2: Presenting symptoms among children suspected to have meningitis (n=80).

Symptoms	n	%
Fever < 3 days:		
No	23	28.7
Yes	57	**71.3**
Fever > 3 days:		
No	60	75.0
Yes	20	25.0
Headache:		
No	74	92.5
Yes	6	7.5
Convulsion:		
No	23	28.7
Yes	57	**71.3**
Reduce/poor feeding:		
No	38	47.5
Yes	42	52.5
Vomiting:		
No	66	82.5
Yes	14	17.5
Irritability:		
No	53	66.2
Yes	27	33.8

Table 3: Presenting signs among children suspected to have meningitis (n=80)

Signs	n	%
Neck stiffness:		
No	53	66.3
Yes	27	33.8
Brudzinski sign:		
No	76	95.0
Yes	4	5.0
Kerning sign:		
No	75	93.8
Yes	5	6.3
Bulging fontanel:		
No	75	93.8
Yes	5	6.3
Fever temperature (>37.5C):		
No	8	10.0
Yes	72	**90.0**
Lethargic/drowsy:		
No	53	66.3
Yes	27	33.8

Distribution of participants by laboratory methods

Table 4: Distribution of study participants according methods used to identify the aetiological agents of meningitis.

Method	Results N (%)		Total n
	Positive	Negative	
Gram stain	2 (2.5)	78 (97.5)	**80**
Culture	2 (2.5)	78 (97.5)	**80**
PCR	18 (**37.5**)	30 (62.5)	**48**

Antimicrobial Susceptibility pattern

Table 5: Antimicrobial sensitivity patterns of the isolated organism (n=2)

Isolates	E. Coli			Streptococcus pneumoniae		
	Sensitive	Intermediate	Resistant	Sensitive	Intermediate	Resistant
Ampicillin	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)
Cloxacillin	0 (0.0)	0 (0.0)	**1 (100.0)**	0 (0.0)	**1 (100.0)**	0 (0.0)
Ceftriaxone	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)
Gentamycin	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)
Chloramphenical	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)
Amoxiclav	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)
CTX	0 (0.0)	0 (0.0)	**1 (100.0)**	0 (0.0)	0 (0.0)	**1 (100.0)**
Erythromycin	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)

Table 5: Clinical features associated with PCR test results among neonates (n=19).

Clinical features	PCR results n (%)		χ^2	P-value
	Positive	Negative		
Fever				
No	1 (100.0)	0 (0.0)		
Yes	15 (83.3)	3 (16.7)	0.198	0.656
Convulsion				
No	8 (88.9)	1 (11.1)		
Yes	8 (80.0)	2 (20.0)	0.282	0.596
Reduce/poor feeding				
No	2 (100.0)	0 (0.0)		
Yes	14 (82.4)	3 (17.6)	0.419	0.517
Irritability				
No	12 (92.3)	1 (7.7)		
Yes	4 (66.7)	2 (33.3)	2.029	0.154
Lethargic drowsy				
No	14 (82.4)	3 (17.6)		
Yes	2 (100.0)	0 (0.0)	0.142	0.517
Abnormal cry				
No	5 (62.5)	3 (37.5)		
Yes	11 (100.0)	0 (0.0)	4.898	0.027
Tone up				
No	15 (83.3)	3 (16.7)		
Yes	1 (100.0)	0 (0.0)	0.198	0.656

Table 6: Clinical features associated with PCR test results among Infants (n=13).

Clinical features	PCR results n (%)		χ^2	*P-value
	Positive	Negative		
Fever				
No	0 (0.0)	0 (0.0)		
Yes	1 (7.7)	12 (92.3)	NC	NC
Reduce/poor feeding				
No	0 (0.0)	7 (100.0)		
Yes	1 (16.7)	5 (83.3)	1.264	0.261
Irritability				
No	0 (0.0)	7 (100.0)		
Yes	1 (16.7)	5 (83.3)	1.264	0.261
Neck stiffness				
No	0 (0.0)	8 (100.0)		
Yes	1 (20.0)	4 (80.0)	1.733	0.188
Lethargic drowsy				
No	1 (14.3)	6 (85.7)		
Yes	0 (0.0)	6 (100.0)	0.928	0.335
Tone up				
No	0 (0.0)	11 (100.0)		
Yes	1 (50.0)	1 (50.0)	5.958	0.015

Discussion

Prevalence

This study	Other studies	Remarks
2/80 **(2.5%)** **conventional methods**	Ogunlesi et al 2005 in Ilesa, Nigeria 1.6% Colnaz et al 2012 in Tehran, Iran 2.9% Michael et al 2012, Ghana 3.3%	excluding patients who had received antibiotics before admission
	Laving et al, 2003 in Nairobi, Kenya, 17.9% Ojide et al, 2012 in Benin city, Nigeria, 15.3% Nahid et al, 2008 in Bangladesh 14.4%, Jean et al, 2011 in France 15%	Use of more than Conventional methods
18/48 **(37.5%)** **PCR**	Mehmet et al, 2008 in Turkey Boubacar et al, 2008 in Burkina Faso	PCR is a reliable, and more sensitive

Aetiology agents

This study	Other studies	Remarks
Escherichia Coli (n=18)	**Kenya** (Laving et al, 2003) **Nigeria** Nwadioha et al, 2011)	FTD PCR detects only the commonest aetiologies.
	France (Jean et al, 2011) **Taiwan** (Meng-Chin, 2013) **Niger** (Odedina, 2008)	
Streptococcus pneumoniae (n=1)	**Nigeria** (Nwadioha et al, 2011) **Ghana** (Michael et al, 2012) **Tanzania** (Matee & R. Matre, 2001)	12 year old, No PCV
Hemophilus influenzae	**Kenya** (Karen et al, 2006) **Uganda** (Ellen et al, 2008)	Immunization against *Hi*b
Neiseria meningitidis	**Kenya** (Laving et al, 2003) **Tanzania** (Kalokola et al, 2007)	Not a frequent cause in East Africa.

Conclusion

Prevalence of 37.5% amongst 48 cases

- Bacterial meningitis is an important clinical problem

Clinical signs and symptoms

- Limited value in establishing the diagnosis of meningitis in children
- Should not be the solitary determinants for L.P

Diagnostics

- Missed cases by conventional methods

Antibiotic sensitivity

- Difficult to draw conclusions

Recommendation

Given the gravity of the illness and the need for treatment; a more sensitive test is needed

Acknowledgement

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KCRI-Biotech lab

Parents /guardians of participants

THANK YOU

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