Dr. T. D. Chugh,
MD, FRCPath, FAMS, FAAM
(15 May 1934–31 December 2020)

Dr Tulsidas Chugh Recognition of Academic Excellence Award

Prof. Shally Awasthi

M.D. (Ped), PhD, D.N.B. (Ped), MMSC(Clinical Epidemiology),FASc, FNASc, FNA, FRCPCH (Hony), FAMS, FIAP

Former Head of Department of Paediatrics & Medical Education
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Founder Editor In Chief: Clinical Epidemiology and Global Health (www.ceghonline.com)

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- Department of H & FW, UP & Bihar
- Public Health Staff
- Subjects and their families

Community Acquired Pneumonia in Children

- **Definition:** WHO CAP in children under 5 years : coughing or difficult breathing, fast breathing, with or without fever.
- **Severe Pneumonia Classification:** Cough/difficulty breathing *plus* any general danger sign: unable to drink/breastfeed, vomiting everything, convulsing, lethargy/unconsciousness, or stridor in a calm child.
- **Etiology:** Mainly bacterial (*Streptococcus pneumoniae*, *Haemophilus influenzae* type b) or viral (Respiratory Syncytial Virus - RSV).

Fast Breathing Criteria (WHO)

- **< 2 months:** 60 breaths/min or more.
- **2-11 months:** 50 breaths/min or more.
- **1-5 years:** 40 breaths/min or more.
- The diagnosis is primarily clinical, focusing on identifying those who need immediate antibiotic treatment

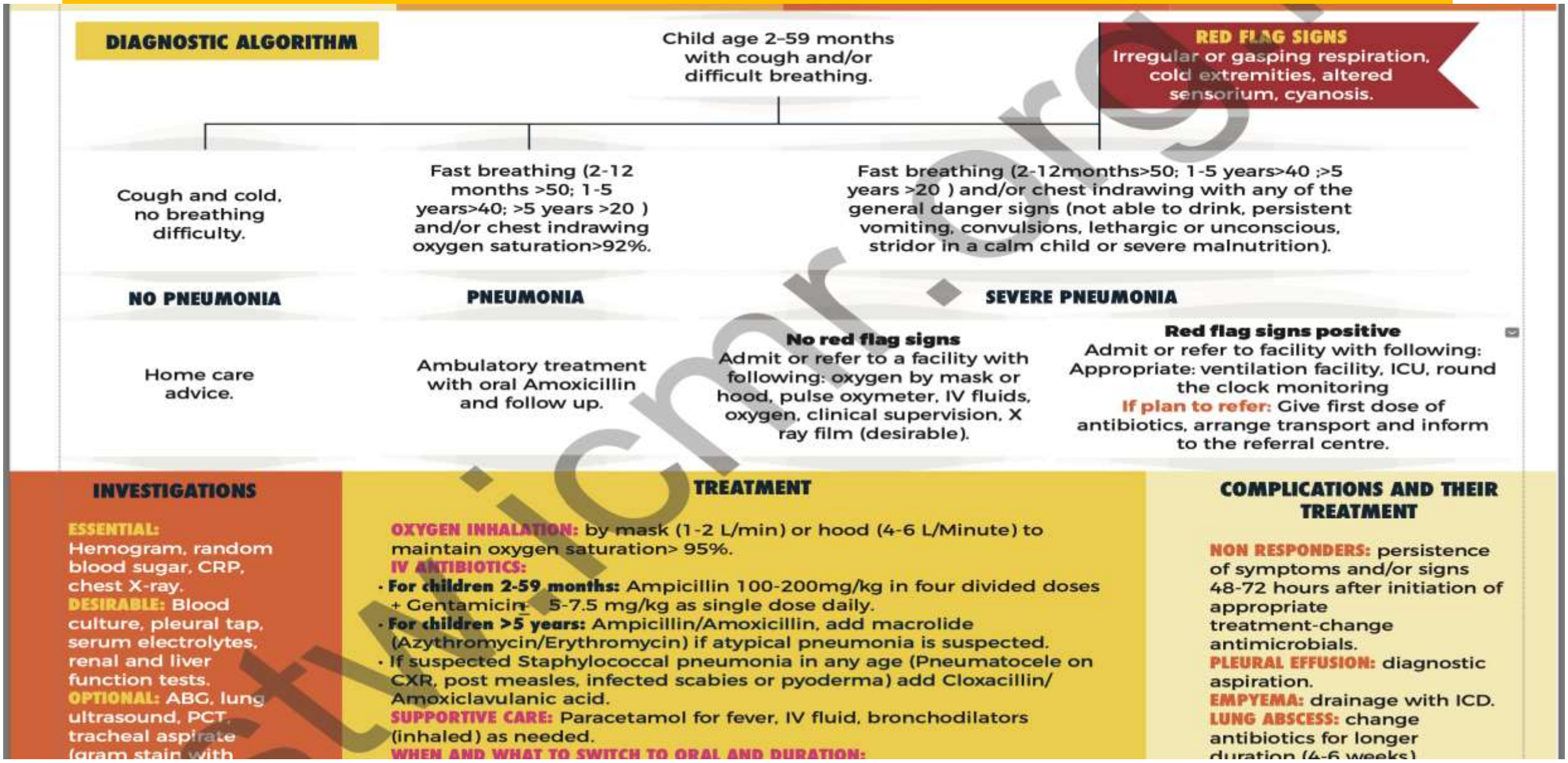
14 CAP deaths/Hr
Burden and Risk Factors

- **High Incidence and Mortality:** Pneumonia causes nearly 15%-17.57.5% of all under-five deaths in India – annually approx. 170,000 deaths- 17-20% global burden
- **Childhood Pneumonia Cases:** Approximately 3.6 to 4.0 million episodes of childhood pneumonia are reported annually.
- **Mortality Rate:** CFR in hospitalized, severe cases ranges from 14%–30%.
- **Key Risk Factors:** Increasing vulnerability include low birth weight, malnutrition, poor air quality (indoor smoke), inadequate immunization, lack of exclusive breastfeeding, and delayed care-seeking.

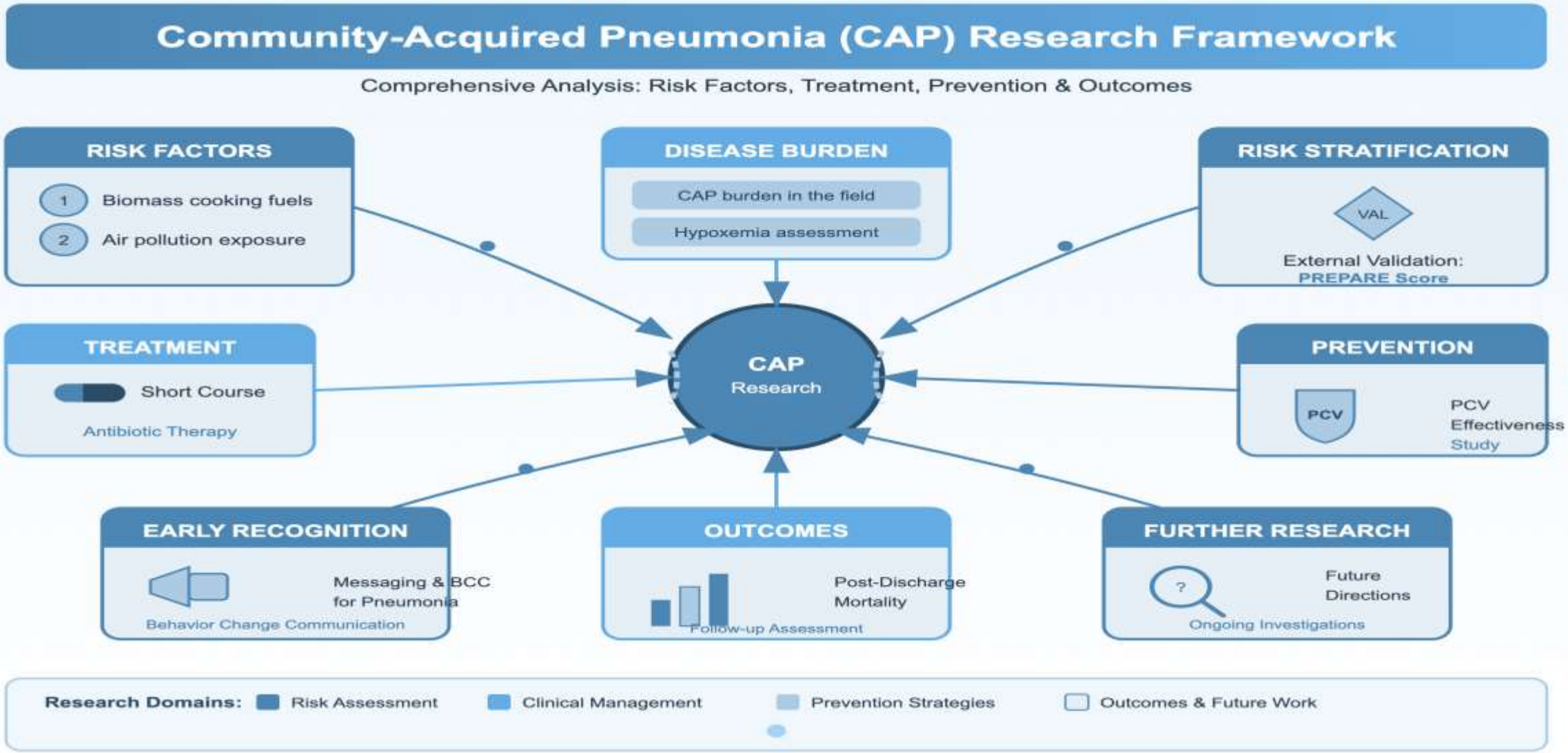
Reasons for Decline in CAP Burden

- Since Year 2000- 54% decline due to
  - introduction of pneumococcal conjugate (PCV) and Hib vaccines
  - improved nutritional status
  - early recognition of disease
  - increased access to early antibiotic treatment
  - reduced household air pollution through government initiatives

Treatment of CAP



My Areas of Work in CAP (From 1990s till date)



Awasthi S, *et al*. Effect of cooking fuels on respiratory diseases in preschool children in Lucknow, India. *Am J Trop Med Hyg*. 1996;55(1):48-51. doi:10.4269/ajtmh.1996.55.48

Cooking Fuels & Respiratory Disease Risk

Study of Preschool Children in Urban Poor Neighborhoods, Lucknow, India

n = 650 children < 5 years | 28 neighborhoods | Cross-sectional study

BACKGROUND & PROBLEM

- Indoor air pollution from cooking fuels affects health
- Urban poor communities rely on biomass fuels
- Limited data on specific fuel types & child health

Children <5 most vulnerable

METHODS & APPROACH

- **DESIGN**: Cross-sectional study; Mother interviews
- **ASSESS**: Respiratory disease by observation (5 symptoms)
- **STATS**: Multiple logistic regression (adj. ORs)

Symptoms: cough, runny nose, sore throat, breathlessness, noisy respiration

KEY RESULTS

14.5% prevalence — Point prevalence of respiratory disease

Cooking Fuels Used:

Dung = cow/buffalo dung + straw

SIGNIFICANT RISK FACTORS

1. **Dung Cake Fuel Use**
   Adjusted OR = 2.69
   95% CI: 1.37-5.31, P = 0.004
2. **Bedroom Overcrowding**
   Adjusted OR = 1.25 per person
   95% CI: 1.11-1.41, P = 0.001

IMPLICATIONS & RECOMMENDATIONS

Not Associated:

- Age
- Weight / Gender
- Family income
- Household structure

Modify Oven Design or Install Chimneys

Reduce indoor smoke exposure

Reduce Bedroom Overcrowding

Fewer people sleeping together where feasible

PUBLIC HEALTH IMPACT

Targeted interventions can reduce respiratory disease in children

ISCAP Study Group. 3- versus 5-day treatment with amoxicillin for non-severe pneumonia in young children: a multi-centre randomized trial. Shally Awasthi, ISCAP study group. *British Medical Journal*. 2004; 328(7443):791

(*Shally Awasthi* is the coordinator and guarantor)

Background in 2000

- Acute respiratory infections accounted for about 2.1 million deaths annually in children younger than 5 years (1999-2001).
- Since most cases of community acquired pneumonia are due to *Haemophilus influenzae* and *Streptococcus pneumoniae*, co-trimoxazole, penicillin, ampicillin, and amoxicillin have been recommended for control programmes

✓ A trial of oral co-trimoxazole in Bangladeshi children reported that three days of treatment cured 75% of cases of nonsevere pneumonia with no subsequent treatment.

3-Day vs 5-Day Amoxicillin for Pediatric Pneumonia

Randomised, Double-Blind, Placebo-Controlled Multicentre Trial | 7 Referral Hospitals in India

BACKGROUND & PROBLEM

Non-severe pneumonia in children 2-59 months

Standard 5-day treatment: Is shorter duration equally effective?

Objective: Compare 3-day vs 5-day oral amoxicillin

METHODS & APPROACH

Study Population
2,188 Children
Age: 2-59 months

3-Day Group	5-Day Group
n = 1,095	n = 1,093

Amoxicillin 31-54 mg/kg/day

KEY RESULTS

3-Day Cure	≈	5-Day Cure
89.5%		89.9%

Difference: 0.4% (95% CI: -2.1 to 3.0)

Treatment Adherence
3-Day: 94% | 5-Day: 85%

SAFETY & RISK FACTORS

Deaths	Hospital	Adverse Rx
0	41	36

Risk Factors
RSV: OR 1.95
High RR: OR 2.89
Non-adhere: OR 11.57

CONCLUSIONS & IMPLICATIONS

Key Finding:
3-day treatment is equally effective as 5-day treatment

Clinical Impact
- Reduced antibiotic use
- Better adherence (94%)
- Lower resistance risk

Outcome Rates

Clinical Failure: 10.3%

Relapse: 5.3%

Loss to Follow-up: 5.4%

MAIN TAKEAWAY

Shorter 3-day amoxicillin treatment is non-inferior to standard 5-day course for non-severe pediatric pneumonia

Awasthi S, Nichter M, Verma T, *et al*. Revisiting community case management of childhood pneumonia: perceptions of caregivers and grass root health providers in Uttar Pradesh and Bihar, northern India. *PLoS One*. 2015;10(4):e0123135. Published 2015 Apr 21. doi:10.1371/journal.pone.0123135

Treatment Delay for Community-Acquired Pneumonia

Qualitative Study in Rural India | Under-Five Children

CAP: Leading cause of under-5 mortality globally

BACKGROUND & PROBLEM

- ~25% of global CAP deaths occur in India
- Treatment delays in rural communities
- Care-seeking barriers poorly understood

METHODS & APPROACH

Sept 2013 - Jan 2014 | Two States

30	43	42	42
Case Studies	Key Informant	Semi-Struct.	FGDs

Participants:

Parents | CHWs | Rural Medical Practitioners

Video presentations + Case scenarios

KEY FINDINGS

- Poor recognition of danger signs
  Fast breathing not commonly recognized
- Chest in-drawing recognized but not monitored by removing clothing
- Mild/moderate CAP → RMP first
  Severe cases → Private clinics in towns
- ~1 week delay to public hospital
  2-3 providers seen before arrival
  Gov't facilities deemed poor quality

CARE-SEEKING PATHWAY & DECISION MAKING

Symptom Onset → **Mother Consults RMP** → **Family Decision** Husband/ Mother-in-law → **Private Clinic** → **Public Hospital**

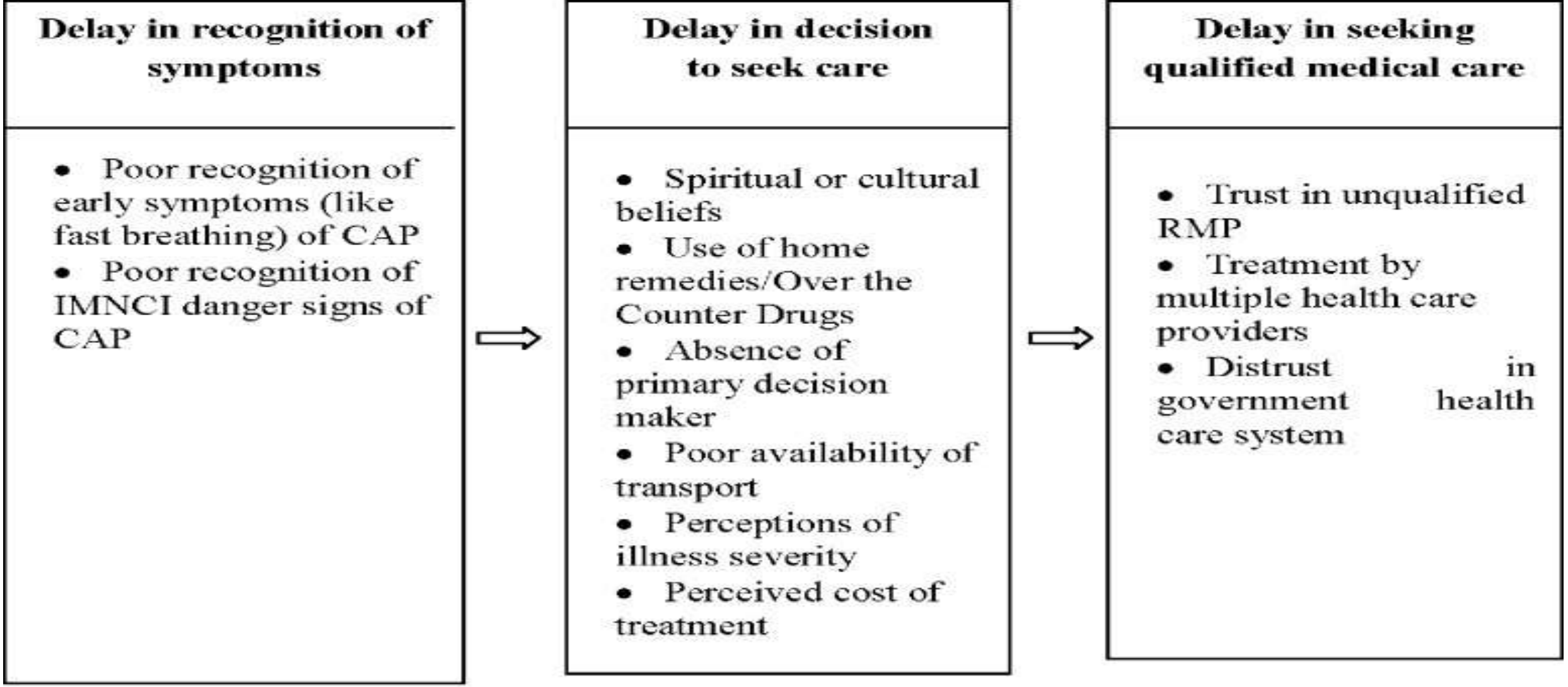
~1 WEEK DELAY

DECISION-MAKING BARRIERS

- Mothers: Direct RMP access only
- Outside village: Family approval

CONCLUSIONS & RECOMMENDATIONS

1. **Improve Danger Sign Recognition**
   Educate caregivers on fast breathing & consequences of treatment delay
2. **Strengthen Gov't Facilities**
   Increase caregiver confidence in public healthcare quality
3. **Engage Rural Practitioners**
   Investigate RMP involvement in community-based CAP programs



Abbreviations: CAP=Community-acquired pneumonia; IMNCI=Integrated Management of Neonatal & Childhood Illnesses (IMNCI); RMP= Rural Medical Practitioner

Source: Adapted from Thaddeus S, Maine D (1994) Too far to walk: maternal mortality in context. Soc Sci Med. 38(8):1091-110.

Awasthi S *et al*. Effectiveness of various communication strategies for improving childhood pneumonia case management: a community based behavioral open labeled trial in rural Lucknow, Uttar Pradesh, India. BMC Public Health. 2019 Dec;19(1):1721.

Community Pneumonia Awareness Intervention Study

Behavior Change Communication for Under-5 Pneumonia Care Seeking

Rural Lucknow, India | October 2015 - September 2018 | 2×2 Factorial Design

BACKGROUND & PROBLEM

- 16% Under-5 mortality from pneumonia in India
- Delayed recognition of symptoms by caregivers
- Low qualified care seeking from government system

GOAL: Improve care seeking through

METHODS & APPROACH

Study Design
2×2 Factorial Trial
8 Rural Blocks
Community-based

Interventions
Village-based Sessions
Facility-based Sessions
Monthly by CHWs

Validated IEC Materials + Drug Kits
Amoxicillin + Paracetamol + Instructions + Danger Signs

Infrastructure Strengthening
Public health facilities equipped for optimal care

RESULTS & FINDINGS

Intervention Adherence

Facility-based	Village-based
93.0% (279/300)	73.4% (7638/10410)

Care Seeking Improvement

- Village-based: +79.3% from 3.3% p<0.0001
  Baseline: 14/420 cases at govt facilities
- Facility-based: +68.9% from 5.35% p=0.02
  Baseline: 21/392 cases at govt facilities

IMPLICATIONS & CONCLUSIONS

Key Finding
Structured pneumonia awareness sessions using validated IEC materials at village level + infrastructure
→ Improved qualified care seeking from govt facilities

Public Health Impact
Potential to reduce under-5 pneumonia deaths

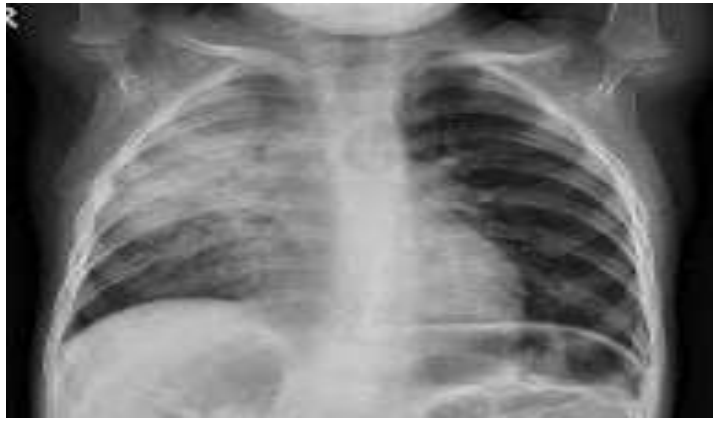
Future Directions
Scale-up to other rural districts in India

STUDY TIMELINE: October 2015 - September 2018 (3 Years)

Start — Intervention — End

Rural Lucknow	Community-Based	Target: Under-5 Children	Trained CHWs	Significant
Northern India	Open-Label Behavioral Trial	Caregivers & CHWs	Monthly Sessions	p<0.05

Awasthi S *et al*. Effectiveness of 13-valent pneumococcal conjugate vaccine on radiological primary end-point pneumonia among cases of severe community acquired pneumonia in children: A prospective multi-site hospital-based test-negative study in Northern India. PLoS One. 2022 Dec 15;17(12):e0276911. doi: 10.1371/journal.pone.0276911. PMID: 36520841; PMCID: PMC9754232.



PCV13 Vaccine Effectiveness Against Pneumonia

Hospital-based Surveillance Study in Northern India (2017-2020)

Children aged 2-23 months with Severe Community Acquired Pneumonia

BACKGROUND & PROBLEM

- S. pneumoniae: Leading bacterial cause of CAP
- PEP±I on chest X-ray indicates pneumococcal CAP
- PCV13 introduced in India national program since 2017
- **Research Question:** Does PCV13 reduce PEP±I?

METHODS & APPROACH

Study Design
Prospective surveillance
3 districts, N. India
May 2017 - March 2020

Population
Age: 2-23 months
Severe CAP (WHO)
n = 2,658 subjects

Exposure
≥2 doses PCV13
From immunization card

Outcome
PEP±I on CXR
3 blinded radiologists

Analysis: Conditional Logistic Regression

KEY RESULTS

Total Enrolled
2,658
subjects

PCV13 Exposed
22.0%
(586/2658)

Vaccine Effectiveness
33.0%
(95% CI: 15.0 - 48.0)

Adjusted OR
0.74
(CI: 0.58-0.95)

Mortality OR
3.86
PEP±I vs no (p<0.001)

IMPLICATIONS & CONCLUSIONS

1. **Significant Protection**
≥2 doses PCV13 significantly reduced odds of PEP±I in severe CAP cases

2. **Mortality Impact**
PEP±I associated with 3.86x higher odds of hospital mortality (p<0.001)

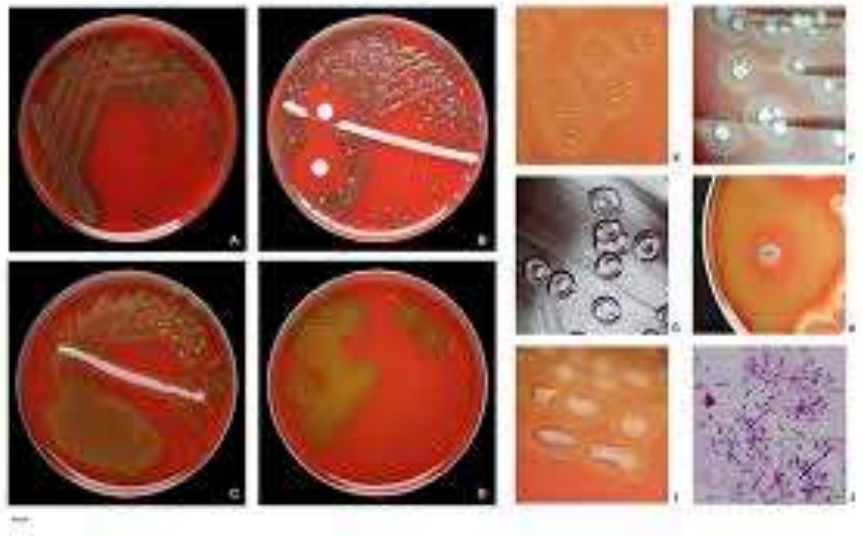
! **Policy Recommendation**
Country-wide PCV13 coverage is essential on priority to reduce pneumonia mortality

STUDY FLOW SUMMARY

Severe CAP
n=2,658
→
PCV13 Exposed
586 (22%)
≥2 doses
→
PEP±I Cases
555 (20.9%)
total with PEP±I
→
Exposed with PEP±I
94 (16.9%)
of exposed group
→
Vaccine Effectiveness
33% (aOR 0.74)
p<0.05

Funded by BMGF Grant No: OPP1189869/INV-006521 KGMU | Study Sites: Lucknow, Patna, Darbhanga

Verma N, Gupta P, Pandey AK, **Awasthi S**. Nasopharyngeal carriage of *Streptococcus pneumoniae* serotypes among sick and healthy children in northern India: A case-control study. Vaccine. 2023 Oct 20;41(44):6619-6624. doi: 10.1016/j.vaccine.2023.09.029. Epub 2023 Sep 26. PMID: 37758571; PMCID: PMC10663590



S. pneumoniae in Pediatric Community Acquired Pneumonia

Case-Control Study in Children 2-59 Months | Northern India | 2017-2022

N = 2,693 Children (1,910 Cases, 783 Controls)

BACKGROUND & PROBLEM

- S. pneumoniae: Leading bacterial cause of CAP
- WHO: 14% child deaths globally attributed
- Effective vaccine exists
  Coverage needs assessment

Objective: Isolate & serotype S. pneumoniae

METHODS & APPROACH

CASE CONTROL — Case-Control Study
Tertiary Teaching Institutes

Nasopharyngeal Swabs
WHO-defined CAP criteria

LAB — 5% Sheep Blood Agar
Quellung Reaction Serotyping

March 2017 — December 2022 (5+ years)

KEY RESULTS

CASES
n = 1,910
8.1%
S. pneumoniae +
56.8% vaccine types

CONTROLS
n = 783
23.6%
S. pneumoniae +
37.8% vaccine types

KEY STATISTICAL FINDING
Adjusted OR: 1.77
(95% CI: 1.09 - 2.88)
Vaccine serotypes in cases vs controls

CONCLUSIONS & IMPLICATIONS

1. **Paradoxical Finding**
   Lower S. pneumoniae isolation in cases vs controls (8.1% vs 23.6%) - prior antibiotics effect

2. **Vaccine Serotype Association**
   Higher vaccine serotype colonization in CAP cases (56.8%) compared to healthy controls (37.8%)

3. **Policy Recommendation**
   Pneumococcal vaccine coverage must be increased to prevent community acquired pneumonia

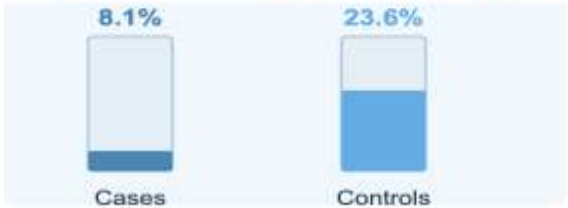
STUDY POPULATION

Cases: 1,910
Median: 7 months

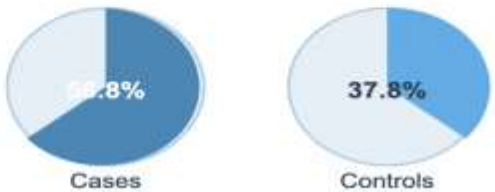
Controls: 783
Median: 10 months

*Almost all cases received antibiotics prior to hospitalization

S. PNEUMONIAE POSITIVITY

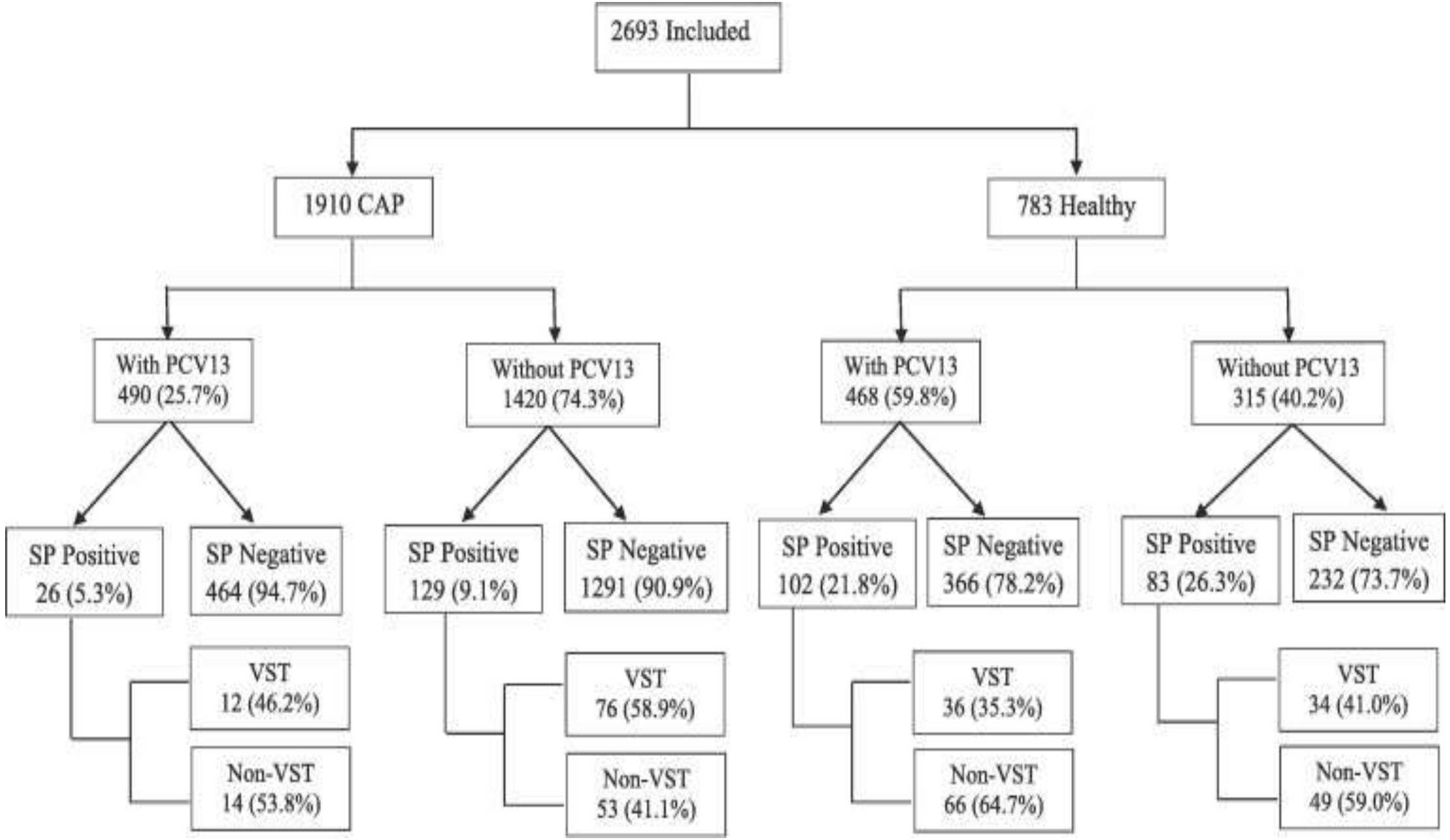


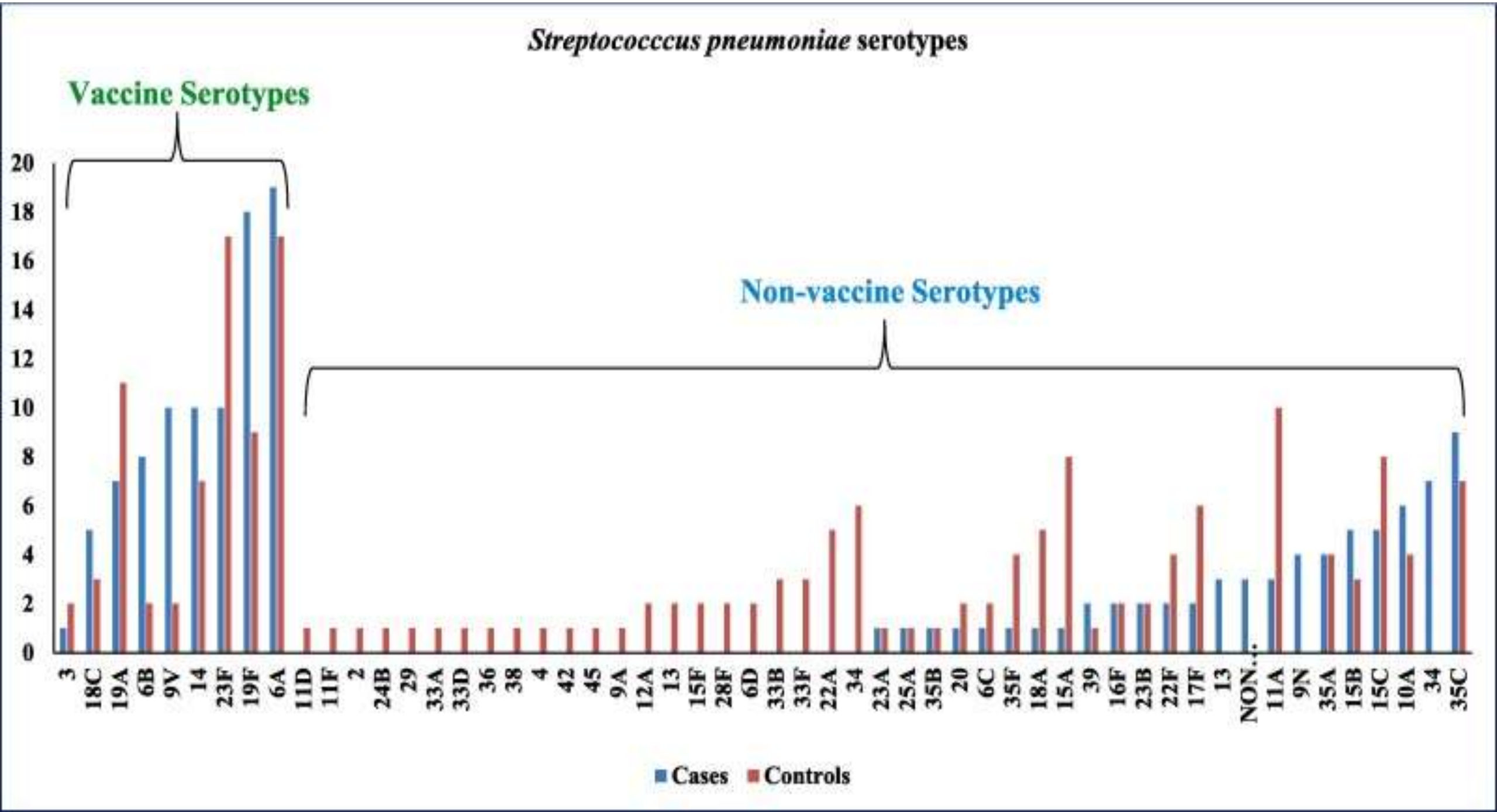
VACCINE SEROTYPES



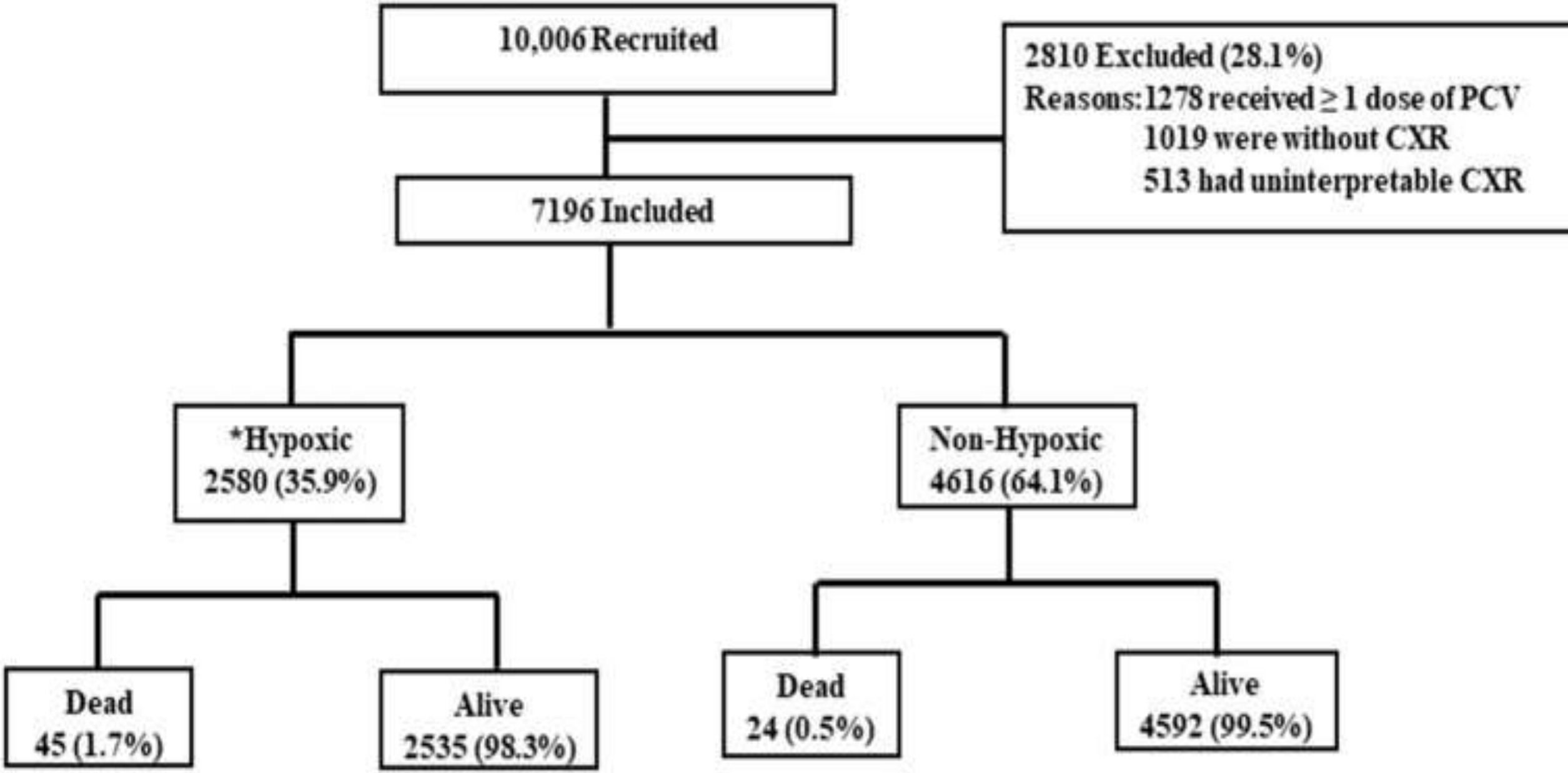
KEY MESSAGE

Increase pneumococcal vaccine coverage to prevent CAP in children


2693 Included
1910 CAP
783 Healthy
With PCV13
490 (25.7%)
Without PCV13
1420 (74.3%)
With PCV13
468 (59.8%)
Without PCV13
315 (40.2%)
SP Positive
26 (5.3%)
SP Negative
464 (94.7%)
SP Positive
129 (9.1%)
SP Negative
1291 (90.9%)
SP Positive
102 (21.8%)
SP Negative
366 (78.2%)
SP Positive
83 (26.3%)
SP Negative
232 (73.7%)
VST
12 (46.2%)
Non-VST
14 (53.8%)
VST
76 (58.9%)
Non-VST
53 (41.1%)
VST
36 (35.3%)
Non-VST
66 (64.7%)
VST
34 (41.0%)
Non-VST
49 (59.0%)


Streptococccus pneumoniae serotypes
Vaccine Serotypes
Non-vaccine Serotypes
20
18
16
14
12
10
8
6
4
2
0
3
18C
19A
6B
9V
14
23F
19F
6A
11D
11F
2
24B
29
33A
33D
36
38
4
42
45
9A
12A
13
15F
28F
6D
33B
33F
22A
34
23A
25A
35B
20
6C
35F
18A
15A
39
16F
23B
22F
17F
13
NON...
11A
9N
35A
15B
15C
10A
34
35C
Cases
Controls

Awasthi S *et al*. Epidemiology of Hypoxic Community-Acquired Pneumonia in Children Under 5 Years of Age: An Observational Study in Northern India. Front Pediatr. 2022 Feb 9;9:790109. doi: 10.3389/fped.2021.790109.


10,006 Recruited
2810 Excluded (28.1%)
Reasons: 1278 received ≥ 1 dose of PCV
1019 were without CXR
513 had uninterpretable CXR
7196 Included
*Hypoxic
2580 (35.9%)
Non-Hypoxic
4616 (64.1%)
Dead
45 (1.7%)
Alive
2535 (98.3%)
Dead
24 (0.5%)
Alive
4592 (99.5%)

Hypoxic Community-Acquired Pneumonia

in Children Aged 2-59 Months in Northern India

Prospective Observational Study | Jan 2015 - Apr 2021 | Four Districts

BACKGROUND & PROBLEM

- CAP: Leading cause of under-5 mortality in India
- Hypoxic pneumonia linked to increased mortality risk
- Need to identify risk factors & clinical signs

STUDY POPULATION
10,006 Children Screened

METHODS & APPROACH

Inclusion Criteria
Age 2-59 mo, WHO CAP
Illness <14 days

Exclusion Criteria
CXR unavailable
PCV-13 vaccinated

HYPOXIA DEFINITION
SpO_2 <90% or O_2 supplementation needed

ANALYSIS
Conditional Logistic Regression Model

KEY RESULTS

35.9%
of severe CAP had hypoxia
(2,580 / 7,196 eligible)

Risk Factors Identified:

- Female gender
- Biomass fuel use
- Wheezing
- Pallor
- Tachypnea
- Malnutrition
- PEP±OI on CXR
- Low pulse volume
- Danger signs

MORTALITY RISK

Adjusted Odds Ratio
2.36

95% Confidence Interval
1.42 - 3.92
Statistically Significant

CONCLUSIONS & IMPLICATIONS

1. ~1/3 of severe CAP cases have hy
2. Hypoxia significantly increases mo
3. Pallor & wheezing: novel clinical m

KEY RECOMMENDATION
Pulse oximetry for ALL
CAP cases at diagnosis

STUDY FLOW SUMMARY

10,006
Severe Pneumonia
→
7,196 (71.9%)
Eligible for Study
→
2,580 (35.9%)
Hypoxic Pneumonia
→
AOR: 2.36
Mortality Risk
→
ACTION
Pulse Oximetry

Awasthi S, Pandey AK; CAP Study Group. High post discharge mortality in children of severe pneumonia in two states of Northern India. Lancet Reg Health Southeast Asia. 2023 Dec 1;25:100334. doi: 10.1016/j.lansea.2023.100334. PMID: 39021477; PMCID: PMC467068.

Post-Discharge Mortality in Children with Community Acquired Pneumonia (CAP) in Northern India

BACKGROUND & PROBLEM

CAP causes 14% of deaths in children <5 years globally

SDG Target: Reduce U5 mortality to 23/1000 by 2030

Current: 41.9/1000 (2021)

Gap: Post-discharge outcomes unknown

METHODS & APPROACH

CAP Surveillance Network (2015) → Telephonic Follow-up (2023)

Inclusion Criteria:

- Age: 2-59 months
- WHO-defined severe CAP
- Illness <14 days
- District resident
- Parental consent
- No prior CAP admission

Mean Follow-up: 9.91 (±3.56) months

KEY FINDINGS

Hospitalized n=1,295 → Analyzed n=934

Hospital Mortality **1.9%**

Post-Discharge **3.5%**

Re-hospitalized: 10.0% (93/934)

72.7% deaths within 3 months

RISK FACTORS FOR POST-DISCHARGE MORTALITY

- Infants
- Congenital Heart
- Severe Malnutrition
- Rural Residence
- Radiological Pneumonia

IMPLICATIONS & RECOMMENDATIONS

Active Follow-up
Minimum 3 months post-discharge monitoring

Health Interventions
Child, maternal & household level support

Critical for achieving SDG targets

Study Limitation: 26.5% loss to follow-up (n=336)

PDM (3.5%) exceeds hospital mortality (1.9%)
Highlighting need for post-discharge care protocols

STUDY SITES

Lucknow	Etawah	Patna	Darbhanga
Uttar Pradesh	Uttar Pradesh	Bihar	Bihar

Awasthi S, Pandey AK, Mishra S; CAP Study Group. Identifying risk of death in children hospitalized with community-acquired pneumonia. Bull World Health Organ. 2023 Apr 1;101(4):281-289. doi: 10.2471/BLT.22.289000. Epub 2023 Feb 21. PMID: 37008263; PMCID: PMC10042094.

External Validation of PREPARE Tool

Risk Assessment for Pediatric Pneumonia Mortality

Northern India Hospital Surveillance Study (2015-2022)

BACKGROUND & PROBLEM

- Community-acquired pneumonia is a leading cause of child death
- PREPARE tool developed by WHO Pneumonia Research Partnership
- Need for external validation in different populations

Target: Children 2-59 months
with pulse oximetry assessment

METHODS & APPROACH

Hospital Surveillance
Jan 2015 - Feb 2022

Secondary Analysis
Northern India Data

Statistical Analysis
Multivariable backward stepwise logistic regression

PREPARE Variables Assessed:
Age, Sex, Weight-for-age, Respiratory rate, Lethargy, Convulsions, Cyanosis, SpO_2

Cut-off scores tested: ≥3, ≥4, ≥5

RESULTS & FINDINGS

6,745
Children Analyzed
(61.6% of screened)

93
Deaths (1.4%)
Mortality Rate

Optimal Cut-off Score: ≥5

79.6%	72.5%	0.82
Sensitivity	Specificity	AUC

95% CI: 0.77-0.86

RISK FACTORS ASSOCIATED WITH DEATH

- Age < 1 year
- Female sex
- Weight-for-age < -3 SD
- High respiratory rate
- Lethargy
- Convulsions
- Cyanosis
- SpO_2 < 90%

CONCLUSIONS

- ✓ Good discriminatory ability
- ✓ Validated in Northern India
- ✓ Supports early referral decisions
- ✓ Applicable to children 2-59 months
- ✓ Requires pulse oximetry

CLINICAL IMPLICATIONS & IMPACT

Risk Stratification
Identify high-risk children for prioritized care and monitoring

Early Referral
Support timely transfer to higher-level healthcare facilities

Resource Allocation
Optimize healthcare resources in low-resource settings

Awasthi S, Kumar D, Pandey A et al.
Prevalence of hypoxemia among sick children, aged under-five years, seeking healthcare at primary health facilities in Uttar Pradesh, India: an observational-cohort study
The Lancet Regional Health - Southeast Asia, 2025; 43

Hypoxemia in Sick Children at Rural Primary Health Facilities in Uttar Pradesh, India

Secondary Analysis from Cluster Randomized Trial | CTRI/2022/03/041325 | June 2022 - April 2023

n=23,560

BACKGROUND & PROBLEM

- Hypoxemia (low SpO2) increases mortality risk
- IMNCI Guidelines: Refer at SpO2 <90%
- Gap: Unknown prevalence & referral completion rates

Hypoxemia: SpO2 <94% | Severe: <90%

METHODS & APPROACH

Day 0
Pulse Oximetry Assessment

Day 7 (+2)
Telephonic Follow-up

Study Design

- Secondary analysis of RCT
- Rural primary health facilities
- Under-5 children
- Uttar Pradesh

KEY RESULTS

Hypoxemia
1.3%
308/23,560

Severe
29.2%
90/308 of hypoxemic

Referral Outcomes

Referred	Completed
27.9%	20.3%

CRITICAL FINDINGS & MORTALITY IMPACT

Mortality Comparison

3.9% vs 0.05%

Hypoxemic (11/279)

0.05% Non-hypoxemic

Referral Cascade - Hypoxemic Children

308 Hypoxemic Children (100%)

86 Referred (27.9%)

16 Completed (20.3%)

Severe Hypoxemia

Referred: 46.7%

Completed: 23.8%

Follow-up Status

SpO2 Available: **94.4%**

Lost: 9.4% (29/308)

IMPLICATIONS & CONCLUSIONS

1. **Low Prevalence**
   Hypoxemia prevalence is low (1.3%) in rural primary care settings
2. **Referral Gap**
   <1/3 hypoxemic referred; only 1 in 5 completed referral
3. **Action Needed**
   Strengthen POx integration in primary healthcare facilities

Study Period: June 2022 - April 2023 | Location: Rural Uttar Pradesh, India | Population: Under-5 Children | n = 24,966 enrolled

Gaps in Management of CAP

- **Antibiotic Overuse:** Etiology mostly viral, yet > 90% of hospitalized children receive antibiotics; 1/4th antibiotics at home inappropriately.
- **Lack of Diagnostic Precision:** No single test can definitively differentiate bacterial from viral pneumonia, leading to empirical over-treatment. Relying on imaging (chest X-rays) for diagnosis can result in variability, with low utility for uncomplicated cases.
- **Guideline Inconsistency & Non-adherence:** High rates of variation exist in adherence to guidelines regarding the necessity of inpatient care, diagnostic tests, and treatment durations.
- **Unclear Management Protocols for Complications:** Evidence is lacking on optimal treatment durations for complex cases such as empyema or pleural effusion, often leading to prolonged, unnecessary intravenous antibiotic courses.
- **Vaccine Coverage & Risk Factors:** Inadequate coverage of effective vaccines and failure to address underlying risk factors like malnutrition, lack of breastfeeding, and indoor pollution contribute to the disease burden

Immediate Research Priorities

- **Procalcitonin (PCT) Usage:** Further study is needed to firmly implement PCT as a tool to guide antibiotic de-escalation.
- **Rapid Molecular Diagnostics:** More rapid, reliable diagnostics are required to differentiate pathogen types, reducing empirical treatment.
- **Outpatient Management:** Shifting toward "watchful waiting" for mild cases to decrease antibiotic exposure.
- **Standardized Protocols:** Developing and adhering to simple, evidence-based, local management algorithms

Thank you