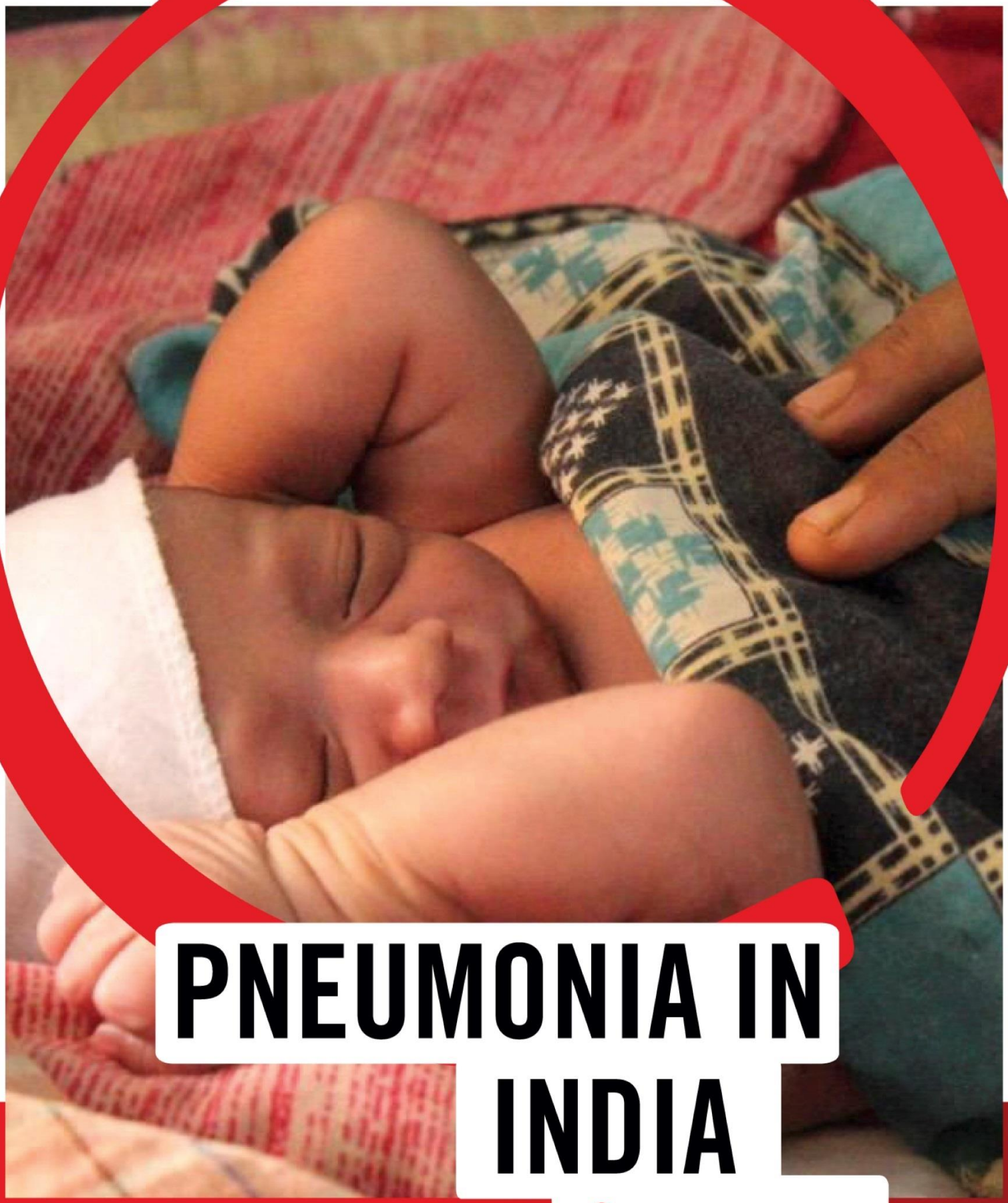

PNEUMONIA IN INDIA

Save the Children

Mapping the Challenges & Calling for Action

A situational analysis

India

This Edition

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Pneumonia in India: Mapping the Challenges & Calling for Action

Save the Children, India (SC India/ Bal Raksha Bharat)

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Acronyms

AIDS	Acquired Immunodeficiency Syndrome
ALRI	Acute Lower Respiratory Tract Infection
ANM	Auxiliary Nurse Midwife
ARI	Acute Respiratory Infection
ASHA	Accredited Social Health Activists
ATC	Anatomical Therapeutic Chemical
AWC	Anganwadi Centre
AWW	Anganwadi Worker
AYUSH	Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy
BRB	Bal Raksha Bharat
BCC	Behavior Change Communication
BCG	Bacillus Calmette-Guerin
PPD	Poor Performing District
CAGR	Compound Annual Growth Rate
CAPI	Computer Assisted Personal Interviewing
CDR	Child Death Review
CF	Complementary Feeding
CHC	Community Health Centre
CHW	Community Health Worker
CMHO	Chief Medical Health Officer
DH	District Hospital
DPM	District Program Manager
DPT	Diphtheria, Pertussis and Tetanus
FGD	Focused Group Discussion
FLHW	Frontline Health Worker
FIMNCI	Facility-Based Integrated Management of Neonatal and Childhood Illness
GAPPD	Global Action Plan for Pneumonia and Diarrhea
GoI	Government of India
GPD	Good Performing District
HBNC	Home-Based Newborn Care
HH	Household
HiB	Hemophilus influenzae Type B vaccine
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HWC	Health and Wellness Centre
IAP	Indian Association of Pediatrics
IAPPD	Integrated Action Plan for Prevention and Control of Pneumonia and Diarrhea
IEC	Information, Education and Communication
IDCF	Intensified Diarrhea Control Fortnight
IDI	In-depth Interview
IHIP	Integrated Health Information Platform
IPD	In-patient Department
IMA	Indian Medical Association
IMNCI	Integrated Management of newborn and Childhood Illness
IMR	Infant Mortality Rate
IRB	Institutional Review Board
IYCF	Infant and Young Child Feeding
KII	Key Informant Interview
LHV	Lady Health Visitor
LPG	Liquified Petroleum Gas
MAA	Mother's Absolute Affection

MC	Medical College
MDR	Maternal Death Review
MoHFW	Ministry of Health and Family Welfare
MMR	Maternal Mortality Rate
MO	Medical Officer
MP	Madhya Pradesh
MPW	Multi-Purpose Worker
NBSU	Newborn Stabilization Unit
NFHS	National Family Health Survey
NGO	Non-Governmental Organization
NRC	Nutrition Rehabilitation Centre
OPD	Out-patient Department
PCTS	Pregnancy, Child Tracking System
PCV	Pneumococcal Vaccine
PHC	Primary Health Centre
PSBI	Possible Severe Bacterial Infection
RCHO	Reproductive Child Health Officer
RMP	Registered Medical Practitioner
SC	Sub-Centre
SNCU	Special Newborn Care Unit
TB	Tuberculosis
TIBF	Time of Initiation of Breastfeeding
TSA	Technical Support Group
UNICEF	United Nations Children's Fund
UP	Uttar Pradesh
VHND	Village Health and Nutrition Day
VPD	Vaccine Preventable Diseases
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

Current conversion rate	US$1 = INR 69.42

Foreword

Pneumonia is the deadliest infection: responsible for more deaths of children under 5 than any other infectious disease. With a population of 1.2 billion people, India takes a lead in the case of childhood pneumonia. With 30 million new cases of childhood pneumonia reported every year, India tops the list of 15 countries with a high disease burden.
Pneumonia deaths are falling more slowly than other major causes of child mortality. Every pneumonia death is one too many. The disease is eminently preventable and treatable. Reducing pneumonia deaths to a level of less than 3/1,000 live births, as envisaged by UNICEF and the World Health Organization (WHO) in their Global Action Plan for Pneumonia and Diarrhoea (GAPPD), would put the world on track for the SDG target. If the 2030 SDG targets are to be achieved, pneumonia must be put at the centre of a renewed effort to eliminate preventable child deaths.

Children die from pneumonia because they are denied the benefits of prevention, accurate diagnosis and treatment. Pneumonia cannot be treated in isolation. Most fatalities occur because the parents of the children affected are excluded from health systems because of cost or distance, or because they see health providers as ineffective, unresponsive and unaccountable. Tackling pneumonia requires a properly financed health system that reaches the most disadvantaged children, delivering effective care through a trained and supported workforce. Multi-sectoral convergence is key to success.

Save the Children has launched a major global initiative to tackle pneumonia, the “forgotten killer”, by mobilizing the full power of the movement behind it. This involves sharing our learnings at national and global platforms, working closely with national governments and forging partnerships with key national and global stakeholders.

This report not only affirms the high prevalence of ARI cases in the country but also identifies key enablers and barriers to appropriate care and distinctly provides a direction to policy makers. I hope the learnings of the study will help and guide what needs to be done to tackle pneumonia in children.

Bidisha Pillai

CEO, Save the Children, India (SC India/ Bal Raksha Bharat)

Acknowledgements

This report benefited from the perspectives, advice and expertise of many people. We are grateful to the Ministry of Health and Family Welfare, Government of India, for granting permission to conduct the study. We also acknowledge the contribution of the Indian Academy of Paediatrics (IAP), UNICEF, officials from the World Health Organisation (WHO), officials and the Departments of Health and Family Welfare in the states of Bihar, Jharkhand, Madhya Pradesh, Rajasthan and Uttar Pradesh for their overall strategic guidance during the study and for facilitating the necessary approvals and training activities for the study.

We are grateful to the officers in-charge, those in charge of the Sick New-born Care Units and New Born Stabilisation Units, paediatricians and staff nurses at the Medical Colleges, District Hospitals (DH) and Community Health Centres (CHCs) from all the districts across the selected states who took time out of their busy schedules to share valuable feedback with the field teams. State-level officers, District Programme Officers and Medical Officers In-Charge in the selected study states facilitated the participation of officials from their departments as respondents in the study. We express our appreciation for the support and participation.

A special thanks also goes to the Auxiliary Nurse Midwives/staff nurses at the Primary Health Centres (PHCs), and Sub Centres (SCs) for sharing valuable information, opinions, and perspectives that have been significant for the assessment, and for showing us around their facilities.

Much appreciation is extended to the Save the Children's Pneumonia Centenary Commitment Group for their continuous guidance and support.

We would like to thank the Project Managers, Assistant Managers, State Programme Officers and District Project Officers of Save the Children, India (SC India/ Bal Raksha Bharat) for providing the support and information required for the assessment to be conducted in their respective states as mentioned above.

This study would not have been possible without the abundant support and guidance of the core team of Pneumonia Centenary Commitment (PCC) for India which was led by Dr. Rajesh Khanna and Dr. Vinod Kumar Anand. We appreciate the efforts of Dr. Shahab Ali Siddiqui, Dr OP Singh, Dr Antaryami Dash, Dr. Sonali Mukherjee and Mr. Farrukh Shah from the SCI team in completing the study. We also appreciate the continued support extended to us by the senior management team members from SCI.

*Several organisations and stakeholders at the national level and in the states of focus are making tremendous efforts to improve and accelerate interventions to control childhood pneumonia. In acknowledging these, we also hope that this report "**Pneumonia in India: Mapping the Challenges & Calling for Action"** will be a vital contribution to all such ongoing initiatives.*

We acknowledge the sincere efforts of IQVIA team in research design, stakeholder consultation, data analysis and situational analysis of Pneumonia in India.

EXECUTIVE SUMMARY

What is four minutes in the course of a day? Trivial one would think. But that is the tiny sliver of time it takes for India to lose one child to pneumonia. The country is on top of the list of nations across the world, both in terms of disease burden and the largest number of pneumonia deaths. This is a public health emergency in every respect, an unacceptable fact in today's highly developed world and society. What is baffling and even more unacceptable is the low priority that is given to the infection – for pneumonia is the single largest killer of children worldwide. Not surprisingly, pneumonia is the 'forgotten killer' of children according to the World Health Organisation (WHO).

This is ironical, because there is enough and more knowledge about protection from and treatment of pneumonia across the world – whether it is proven cost-effective interventions, policy and programme responses, ways to convince communities to keep themselves protected from the infection and many other important aspects of managing the illness. Despite all that, in India, 30 million episodes of Acute Respiratory Infections (ARI)/pneumonia are reported every year, and pneumonia is the leading infectious cause of death among children. Doubtless, it is vital to foster and catalyse, or even build, the drive and leadership among Government, policy makers, international agencies and all other relevant stakeholders so that the overall response to tackling pneumonia can be accelerated on all fronts, both in India and across the world. This approach would be critical if the Sustainable Development Goal 3, of ending all preventable child deaths by 2030, is to be achieved.

With a vision to end preventable under-five deaths due to pneumonia in India by 2030, Save the Children, India (SC India/ Bal Raksha Bharat) is committed to working in alignment with the Indian government, key stakeholders and donors to address all aspects of pneumonia morbidity and mortality in children. Through the publication of a major report titled *Fighting for Breath: A Call to Action on Childhood Pneumonia* in 2017, SCI has declared a massive global effort against pneumonia, aiming to save a million lives in the next five years. In order to effectively mount such efforts in India, there was a felt need to generate current and up-to-date evidence on the enablers and barriers in the response that is underway and required to prevent childhood pneumonia deaths in India. This report encapsulates results from a comprehensive situational analysis, including an in-depth assessment of high burden states (Uttar Pradesh, Bihar, Madhya Pradesh, Jharkhand, Rajasthan), that was carried out in order to systematically generate essential and current evidence related to burden of morbidity and mortality in study states and; enablers and barriers for reducing preventable pneumonia deaths in India through primary and secondary research. The Global Action Plan for the Prevention and Control of Pneumonia and Diarrhoea (GAPPD) framework developed for pneumonia management sets out various indicators that are considered to have impact on pneumonia care under three heads: Prevent, Protect and Treat. This study also tried to assess the impact of various indicators under these heads. Based on the evidences, the study suggests policy recommendations and operational researches vital for tacking pneumonia in the country.

KEY FINDINGS

The study reveals that the overall prevalence of ARI among children under five years of age was 13.4%. Among the five states selected for the study, Bihar recorded the highest prevalence of ARI (18.2%), followed by Uttar Pradesh (15.9%), Jharkhand (12.8%), Madhya Pradesh (11.6%), and Rajasthan recording the lowest prevalence (8.4%).

An analysis of the prevalence of ARI/ pneumonia on 6930 children in the age group of 0-5 years revealed the following:

- **Gender:** The prevalence was higher among boys (14.1%) compared to girls (12.6%)
- **Age:** ARI occurrence was highest among children who were 3-8 months old (16.7%)
- **Birth Order:** ARI occurrence was higher among children with birth order greater than 3 (14.5%) compared to other birth orders
- **Cooking Area:** ARI prevalence was higher in households without a separate kitchen for cooking (13.5%) compared to those without a separate kitchen (13.3%)

- **Caste:** ARI prevalence was higher among children of the Other Backward Classes (OBC) (15.5%) as compared to other categories.
- **Weight:** Underweight children were found to be having higher chances of occurrence of ARI (19.6%) compared to children with normal weight (10.9%)

Protect

- **Breastfeeding:** ARI occurrence was significantly lower among children who were breastfed within one hour after birth than those breastfed after one hour (OR 0.73; 95% CI 0.57, 0.92); It was significantly lower among children exclusively breastfed for six months (OR 0.78; 95% CI 0.61, 0.99).
- **Complementary Feeding:** ARI was lower among children who had been initiated on complementary feeding (CF) within six to eight months than those initiated on to CF later (OR 0.943 ; 95% CI 0.709,1.254).
- **Vitamin A:** Vitamin A did not seem to have a significant impact on protecting children from ARI (OR 1.229; 95% CI 1.038,1.455)
- **Mother's knowledge on weight of child:** ARI was significantly higher in children whose mothers were not aware about weight of their offspring. (OR 1.99; 95% CI 1.42,2.78)

Prevent

- **Immunization:** We could not demonstrate any significant difference in ARI between those who were immunized compared to those who were not immunized.
- **Availability of Toilets:** ARI cases were more in households lacking a toilet facility (OR 0.82; 95% CI 0.697, 0.957).
- **Hand-washing**: The percentage of ARI cases was significantly lower in children whose respondents practiced hand washing with soap (OR 0.537; 0.44-0.65)
- **Household Fuel:** ARI was significantly higher in households using non-improved fuels (OR 0.857; 95% CI 0.75, 0.96)

Treat

- **Perception about Danger Signs:** Fever and Cough were the most perceived danger signs for care seeking by community
- **Care-Seeking** : More than 90% of the respondents shared that they sought medical treatment for Pneumonia, followed by 5% opting for home remedies for pneumonia management. Very few did not seek any treatment at all
- **Family-level Decision-Making:** In both urban and rural areas, the mother was found to be the key decision-maker for seeking medical treatment, followed by the father
- **Facility Preference**: Majority of the respondents in both urban and rural areas prefer visiting the private facility as compared to the government facility. Within the private sector, nearly 20% seek treatment from unqualified medical practitioners
- **Outpatient Vs Inpatient:** Among those seeking medical treatment, majority of the cases are managed in the OPD (95%), while the remaining were hospitalized
- **Duration of Stay in the Facility**: The average length of stay in government hospitals was found to be higher (9 days in urban, 6 days in rural area) than those who received treatment in private facilities (5 days in urban, 2 days in rural area).
- **Most prescribed medicines:** Cough syrups were the most commonly prescribed medicine both in the OPD (96.5%) and IPD (79.5%). Almost one third of ARI cases were prescribed with antibiotics in OPD (34.7%) while the use of antibiotics was higher in IPD (46.2%).

- **Cost of Treatment:** Respondents seeking treatment from private facilities incurred higher cost (Rs. 5025 in Urban, Rs. 5353 in Rural) compared to those seeking treatment from government facilities (Rs. 3250 in Urban, Rs. 839 in Rural). In rural areas particularly, the cost of hospitalization for pneumonia was found to be six times higher in private facilities (Rs. 5353) compared to government facilities (Rs. 839)
- **Assessment of Health care facilities for management of ARI/ pneumonia :**
  - Medical Colleges seemed to be prepared in terms of facilities for pneumonia care. However, the system preparedness for providing inpatient care for pneumonia cases was found to be compromised at district and sub-district level.
  - While observing the facilities at district and sub-district level, a huge gap was found in the services at district level compared to sub-district level. At least 70% DHs had adequate infrastructure, special care units, human resources, equipment and supplies while training remains an issue at district level public facilities as well. However, sub-district facilities presented a different picture. Though majority CHCs had adequate equipment and supplies, not even half had adequate infrastructure and human resource. The major concern area at PHC and SC was human resources crunch rather infrastructure and supplies.
  - Trained staff and reporting remained an area of concern across health facilities.

KEY RECOMMENDATIONS

1. Advocacy to Address the Silent Killer

Partners and organizations involved in the fight against pneumonia, need to come together to mainstream the discourse around pneumonia. Their joint efforts in collaboration with Government of India (GoI) will ensure clear commitments and resources from global and national stakeholders to address this silent killer. Subsequently, state and district operational plans be prepared, and resources be allocated in the annual Program Implementation Plans (PIPs).

2. Knowledge and Information for the Community: Pushing for Effective Behavior Change

It is recommended to devise social behavioral change communication strategy specific to pneumonia symptoms and prevention. Based on the strategy, national and state level campaigns be rolled out to improve community knowledge and practices.

3. Improving access to quality healthcare through public health systems

Distance between the community and the public health facilities presented as a key barrier to easy access to health services. While shortage of skilled staff, medicines and equipment were found to be additional hindrances in care seeking. To overcome these barriers, it is recommended to:

- Bring the primary health care closer to households, through establishment of Health and Wellness centres & mobile medical Units
- Strengthen facility based pediatric care at health facilities as per national guidelines
- Ensure skilled and empathetic staff, uninterrupted supplies of medicines & availability of diagnostic services.
- Strengthen referral mechanisms

4. Capacity building of human resources

Pre and in-service capacity building of service providers on appropriate pneumonia management at facility level should be part of state and district operational. Capacity building of FLHWs on identification of cases, classification and providing appropriate first line antibiotic (Amoxicillin) is critical. Innovative approaches like use of skill labs, telemedicine and online self-learning platforms can be explored.

5. Data driven decision making – strengthening pneumonia reporting in HMIS

Though the indicators on pneumonia have recently been included in HMIS, however, reporting on the same still lacks correctness and completeness. Decision makers and program managers should regularly use this HMIS data during monthly and quarterly child health reviews for informed decision making. This will inherently improve data quality in due course.

6. Routine Immunization - reaching the unreached and marginalized groups

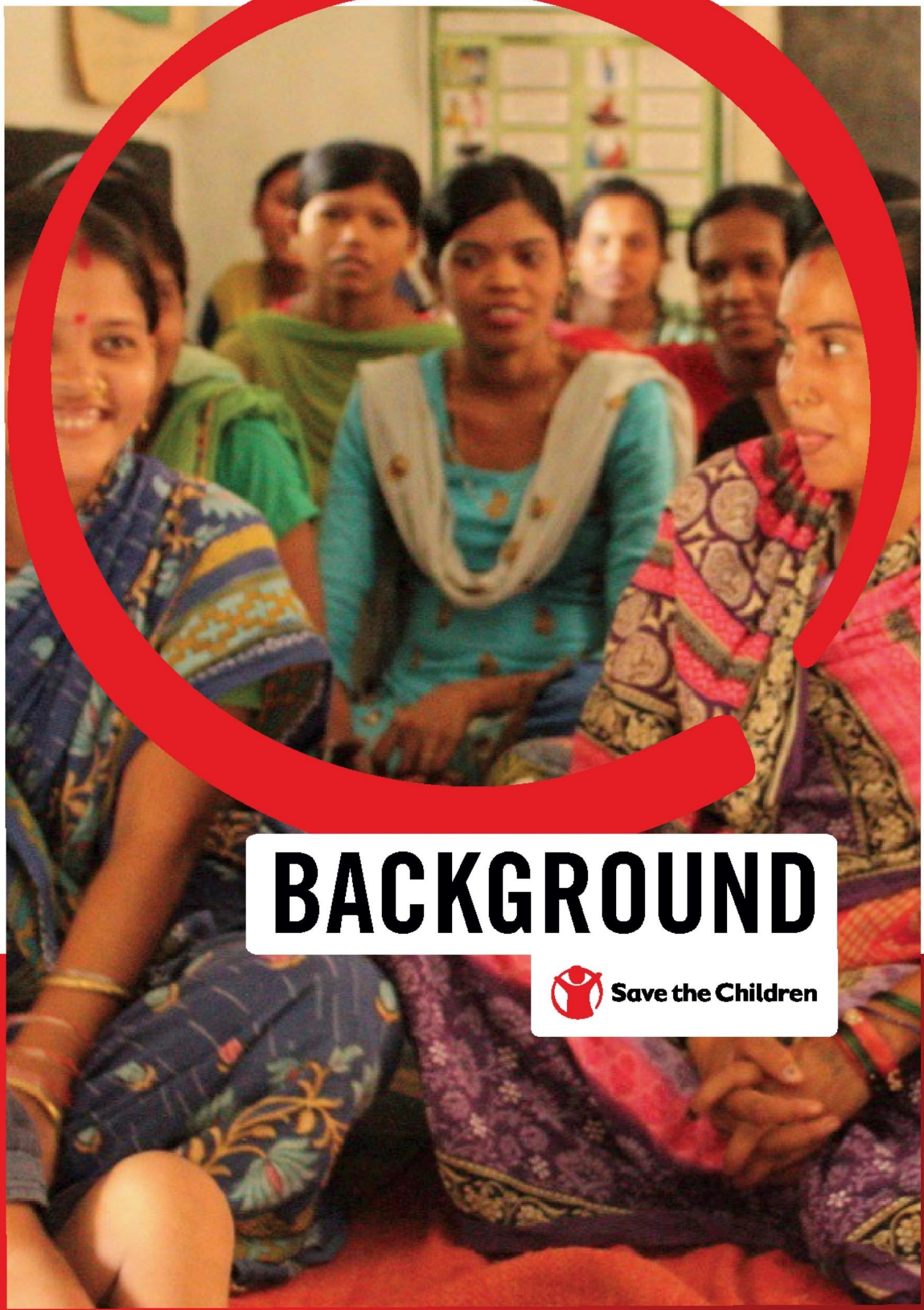
Attaining a full immunization coverage should be a non-negotiable target in order to reach the most underserved and marginalized groups as mandated under Mission Indra Dhanush.

7. Convergence between various government department programs and the efforts of other stakeholders including international partners

To effectively tackle pneumonia, there is a need for concerted efforts from multiple stakeholders including various departments/ ministries. To achieve this, committees comprising of representatives from concerned departments should be constituted for convergent action at all levels.

8. Private Sector Engagement

There is vibrant and flourishing private healthcare sector in the country which can be leveraged to expand the coverage and quality of services. Engagement of private health sector with public health system should be explored keeping in mind the local context.



BACKGROUND

Save the Children

1. BACKGROUND

Saving lives is a natural priority for human society. Ground realities however, often cast doubt over this noble idea. Childhood pneumonia is a killer illness that challenges the doctrine of life being precious. For a completely preventable and treatable infection to be a leading cause of death among children is deplorable and that is why, when a child dies of pneumonia, the humane intention to always save lives is very seriously in question.

Pneumonia and Acute Respiratory Infections (ARI) being such a major cause of morbidity and mortality is a public health paradox, because preventing these deaths and protecting children from succumbing to pneumonia is very much an achievable goal. But something is amiss. There are critical gaps, fuelled by ineptitude, inefficiency and a grave lack of concern, that are keeping the world from being able to stop the loss of such young lives. Data suggest that in the year 2017, India has lost 20 children to pneumonia every hour – this is an appalling and disturbing statistic.

About Pneumonia

Pneumonia is closely related to the most severe forms of acute respiratory infections, or ARIs. Most of these infections are limited to the nose and throat (the upper-respiratory tract). Acute lower respiratory tract infections, the most widely used classification in health surveys, refer to all infections extending into the chest, including bronchiolitis and pneumonia cases, where infection extends into the lung tissue. Pneumonia is a form of acute lower respiratory tract infection that occurs when viruses, bacteria or other micro-organisms cause inflammation of the lungs. Most severe or fatal pneumonia is caused by bacteria.

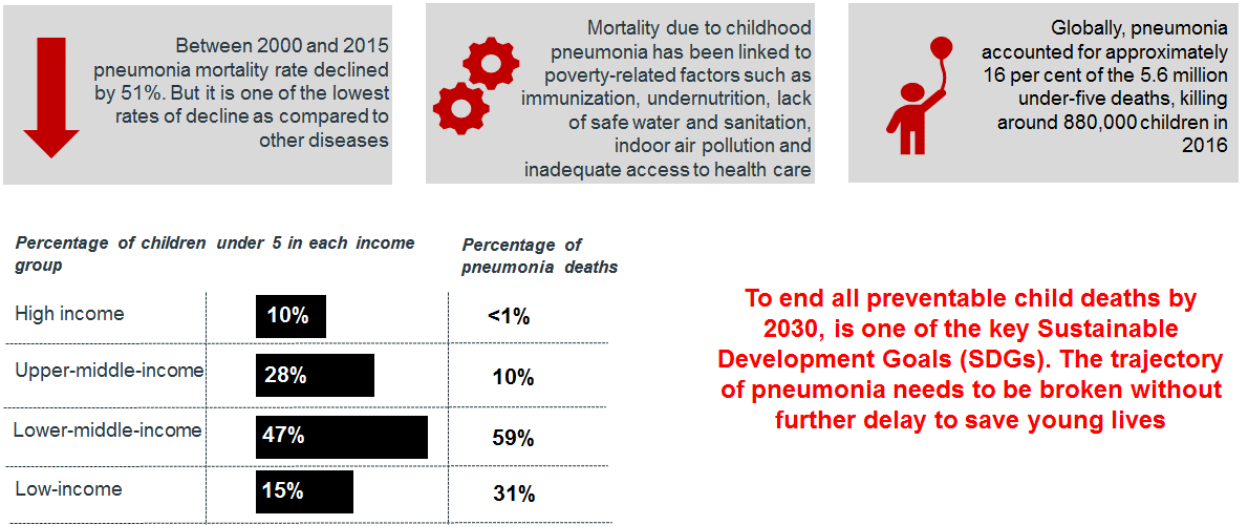
When an individual has pneumonia, the alveoli are filled with pus and fluid, which makes breathing difficult and limits oxygen intake[1]. To ensure diagnosis of pneumonia by Front Line Health Workers (FLHW), two signs, i.e. cough and fast breathing or difficulty in breathing due to chest related issues (signs of ARI) have been recommended in Integrated Management of New-born and Childhood Illness (IMNCI) strategy. In this study, the two terms Pneumonia and ARI have been used inter-changeably.

1.1 THE GLOBAL SCENARIO

Burden of Pneumonia

Globally, 5.6 million children under age five lost their lives in 2016. Pneumonia is the single largest infectious cause of death in children. It accounted for 16% of all deaths of children under five years of age in 2015[2] and was the leading infectious disease killer of children in the world in 2016, responsible for more deaths than malaria, TB, measles, and AIDS combined[3].

[1] WHO – Pneumonia Fact Sheet 2016 - http://www.who.int/news-room/fact-sheets/detail/pneumonia
[2]WHO – Pneumonia Fact Sheet 2016 - http://www.who.int/news-room/fact-sheets/detail/pneumonia
[3] UNICEF – Health – Pneumonia - https://www.unicef.org/health/index_91917.html



Source: UNICEF (https://data.unicef.org/topic/child-health/pneumonia/), Population of children under age five: United Nations Population Division WPP 2015 Rev.; Cause of Death: WHO and Maternal and Child Epidemiology Estimation Group (MCEE) estimates 2015; Income levels: World Bank Income classification 2016

Figure 1: Global burden of pneumonia

Inequity in the level of pneumonia deaths by income classification of countries is evident from Figure 1. A higher proportion of deaths due to pneumonia among under 5 children is occurring in low income and lower-middle income countries.

It is clear that there has been progress in controlling pneumonia – the world has recorded a 51% decrease in pneumonia mortality over 15 years, from 2000 to 2015; however, sustained and concerted actions are required to bring further reduction in deaths due to pneumonia that are potentially preventable and treatable[4].

Global Strategies to Tackle Pneumonia

One of the most important strategies to reduce pneumonia-related morbidity and deaths is 'effective case management'. WHO developed a case-management strategy in the 1980s aiming to reduce pneumonia-related deaths. This was the cornerstone of the Acute Respiratory Infections (ARI) program and was later incorporated into the Integrated Management of Childhood Illness (IMCI) guidelines in early 1990s. These include both preventive and curative elements to be implemented by families and communities as well as by health facilities.

The IMCI aimed to address the major causes of child mortality and morbidity in developing countries. It focused on both preventative and curative elements to improve health outcomes through three key components[5]:

1. Integrated Management of sick children in facilities and health centres
2. Health system strengthening, particularly drugs and logistics support
3. Community IMCI, or promotion of key family and community practices

WHO also built on the IMCI guidelines and its pneumonia guidelines and updated recommendations for "preventing and managing pneumonia" in HIV-infected and -exposed infants and children in 2010 and in non-HIV affected infants and children in 2012.

Revised WHO classification and treatment of childhood pneumonia at health facilities (2014) simplified the classification of pneumonia from the earlier three categories – pneumonia, severe pneumonia, and very

[4] UNICEF Data Source - https://www.unicef.org/health/index_91917.html
[5] http://www.who.int/pmnch/media/publications/aonsectionIII_5.pdf

severe pneumonia to two – pneumonia and severe pneumonia. It also provided clear recommendations for paediatric pneumonia case management and management of pneumonia at the country level, and updated the first-line antibiotics, their dosage and duration. These changes aimed at improving access to care by equipping primary health care providers with requisite skills to manage pneumonia at all levels.

These mandates have certain policy implications, mainly with regards to (a) retraining healthcare providers on adoption of the new classifications for management (b) switching from oral cotrimoxazole to oral amoxicillin, and (c) monitoring to ensure adherence to the right dosage of antibiotics.

Further, the **Global Action Plan for Prevention and Control of Pneumonia (GAPP)** was developed in 2009[6], to increase awareness about pneumonia and for scaling up proven interventions. The approach categorizes the interventions for controlling pneumonia in children under five, along the lines of[7]:

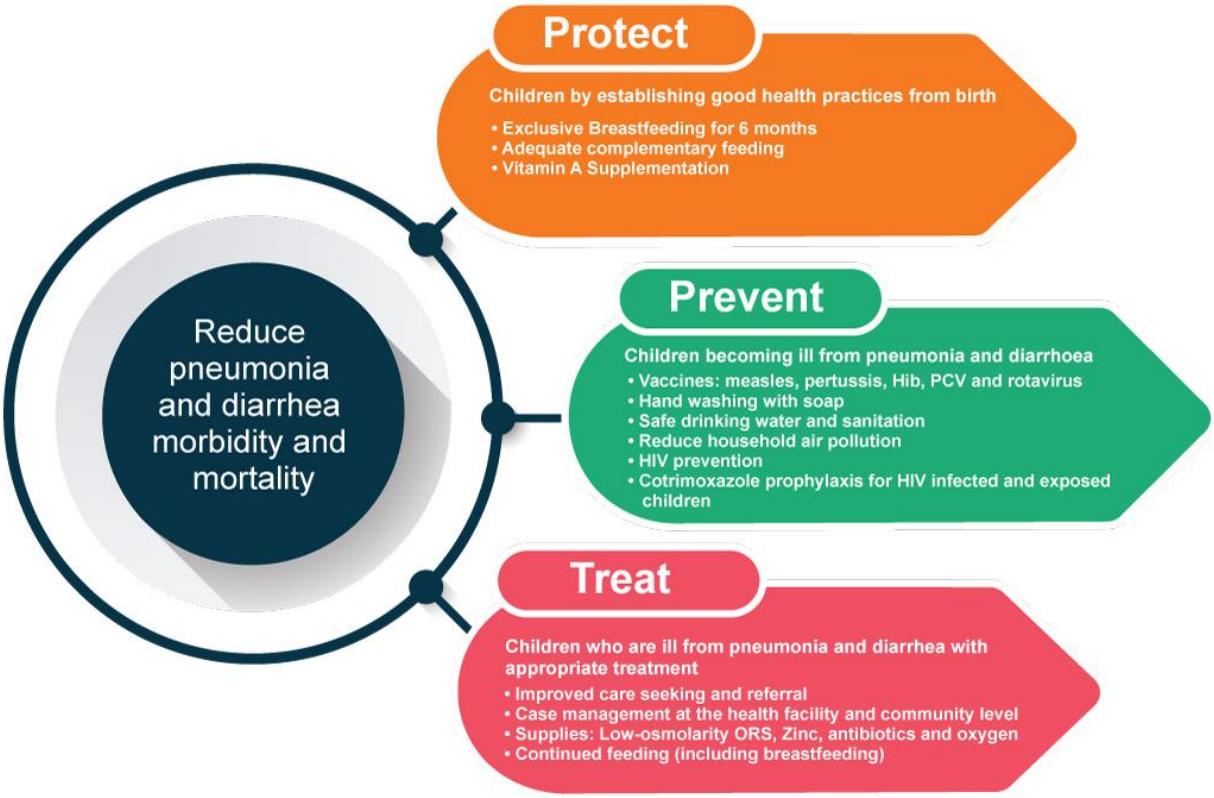


Figure 2: The Global Action Plan for Pneumonia and Diarrhea (GAPPD) framework

- **Protecting** children by establishing and promoting good health practices from birth;
- **Preventing** children becoming ill from pneumonia and diarrhea;
- **Treating** children who are ill from pneumonia and diarrhea with appropriate treatment

Furthermore, the GAPP approach advocates designation of a national action group for pneumonia control, generating political will, conducting a situational analysis for pneumonia, involving other programmes, identifying areas of harmonization and collaboration, increasing coverage for vaccination, and tracking progress.

[6]http://www.who.int/maternal_child_adolescent/documents/fch_cah_nch_09_04/en/
[7] Ending Preventable Child Deaths from Pneumonia and Diarrhea by 2025: The integrated Global Action Plan for Pneumonia and Diarrhea (GAPPD)

Several interventions for pneumonia and diarrhoea are inter-related, and hence these two diseases, which cause 29% of U5M, are often considered together[8]. As part of the **Integrated Global Action Plan for Pneumonia and Diarrhoea (GAPPD, 2013),** there are 26 indicators (including two on mortality indicators) that are being tracked for 136 low and middle-income countries, related to the protection, prevention and treatment of diarrhoea and pneumonia in children under five years of age. This monitoring framework includes input indicators from the Global Maternal, New-born, Child and Adolescent Health (MNCAH) Policy Indicators Survey. Of the total 26 indicators included under GAPPD, 15 have had targets assigned[9], of which following 11 relates to pneumonia. (Table 1). Also, a score is assigned to the indicators, to obtain the GAPPD score for each country being tracked.

Table 1: GAPPD global indicators and targets

S. No.	GAPPD Indicators	Target	Target Year
1.	Pneumonia mortality among children less than 5 years of age	3 deaths per 1000 live births	2025
2.	Hib immunization coverage	90%	2025
3.	Measles immunization coverage	90%	2025
4.	DTP3 immunization coverage	90%	2025
5.	PCV3 immunization coverage	90%	2025
6.	Exclusive breastfeeding of children aged 0-6 months	50%	2025
7.	Care seeking for pneumonia	90%	2025
8.	Antibiotic treatment for suspected pneumonia	90%	2025
9.	Access to hygienic sanitation facility at household	90%	2040
10.	Access to hand washing facilities at household	90%	2030
11.	Access to clean and safe fuel used for cooking in the household	90%	2030

Source: WHO, GAPPD Monitoring

Globally, the top three countries with over 40% of the global under five deaths due to ARIs include India, Nigeria and Pakistan[10] (Figure 3)

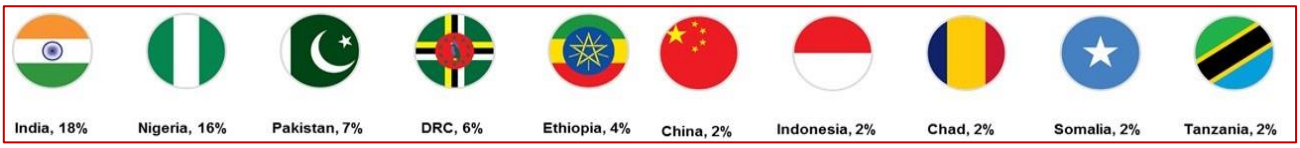


Figure 3: Highest burden of under-five ARI deaths in ten countries

The world has witnessed an array of activities to address the problem of U5 deaths and especially ARI. This is evident from the global milestones laid down in the past couple of decades. This has led to an appreciable reduction in U5MR, from 77.1 to 39.1 per 1000 live births between 2000 and 2017. The concomitant reduction in U5MR due to pneumonia was from 14 to 6 per 1000 live births (Figure 4)

A few of the key milestones in achieving the success were WHO's integrated management of childhood illness, announcement of Global Pneumonia day by WHO (November 12th), Global action plan for prevention and control of pneumonia and revised WHO classification and treatment of childhood pneumonia at health facilities.

[8] WHO Global Health Observatory (httt://www.who.int/gho/child_health/en/index.html)
[9] GAPPD Monitoring: http://www.who.int/maternal_child_adolescent/epidemiology/gappd-monitoring/en/
[10] UNICEF - Estimates of child cause of death, Acute Respiratory Infection 2018

This modest decline calls for a renewed commitment worldwide, with special focus on the high burden countries.

Global Milestones

1980s: WHO's Pneumonia classification and case guidelines

1990s: WHO's Integrated Management of Childhood Illness

2000: Millennium Development Goals
MDG Targets 4a: Reduce by two thirds the U5MR

2009: WHO's Global Pneumonia Day – November 12th

2009: WHO/UNICEF Global action plan for prevention and control of pneumonia (GAPP)

2010: WHO's Preventing and managing pneumonia in HIV-infected and -exposed infants and children guidelines

2010: UN's Every Woman Every Child (EWEC) movement

2012: Child Survival Call to Action forum: A Promise Renewed

2012: Global Vaccine Action Plan

2012: WHO's Managing pneumonia in non-HIV affected infants and children

2013: The integrated Global Action Plan for Pneumonia and Diarrhoea (GAPPD)

2014: Revised WHO classification and treatment of childhood pneumonia at health facilities

2014: WHO's Every Newborn Action Plan

2015: Sustainable Development Goals 2030
Goal 3: Good health and well-being

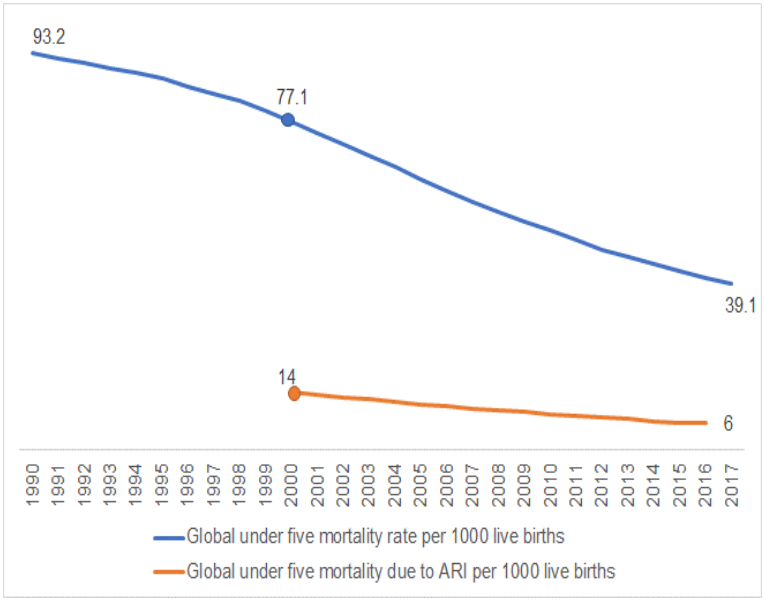


Figure 4: Current global policies and programs at a glance (left) and decline in under five mortality rate per 1000 live births (right)

1.2 THE INDIAN SCENARIO

Burden of Pneumonia

India has made encouraging progress in reducing Child Mortality Rates (Figure 5). "The average annual decline in mortality rates from 2000 to 2015 was 3·3% for neonates and 5·4% for children aged 1–59 months." Annual rates of decline between 2005 and 2015 (3·4% decline in neonatal mortality and 5·9% mortality decline in children aged 1–59-months) were higher than the rates of decline between 2000 and 2005 (3·2% decline for neonatal mortality and 4·5% decline in 1–59-month mortality)"[11].

There has been a considerable decline in the number of deaths resulting from ARI and particularly pneumonia in India (Figure 6). Majority of the deaths took place in the post-neonatal period and was 1.22 times higher in girls than in boys.[12] As per the estimates provided by Lancet, 1,40,649 children below the age of five died in India because of pneumonia in 2015 which accounted for death rate of 5.7 per 1000 live births. NFHS – 4 records a 2.7% prevalence of ARI (Urban: 2.3% Rural: 2.9%) in children under five years of age.[13]

GAPPD (with country specific adaptation: India Action Plan for Pneumonia and Diarrhoea (IAPPD)) specifies a target of less than three childhood pneumonia death per 1000 live births by 2025.[14] With the

[11] Million Death Study: "Changes in Cause-Specific Neonatal and 1–59-Month Child Mortality in India from 2000 to 2015: A Nationally Representative Survey." The Lancet, vol. 390, no. 10106, 2017, doi:10.1016/s0140-6736(17)32162-1.
[12] https://data.unicef.org/country/ind/
Estimates of global, regional and national morbidity, mortality, and aetiologies of LRI in 195 countries : a systematic analysis of Global Burden of Disease Study 2015. Lancet Vol 17, November 2017
[13] ARI is defined as cough + (1) short, rapid breathing that is chest related, and / or (2) difficult breathing that is chest related during preceding 2 week]
[14] WHO data source for India, Estimates of global, regional and national morbidity, mortality, and aetiologies of LRI in 195 countries : a systematic analysis of Global Burden of Disease Study 2015. Lancet Vol 17, November 2017

current death rate of nearly 6 per 1000 live births, it is evident that a more rigorous approach is required if India has to achieve its target. (Figure 7)

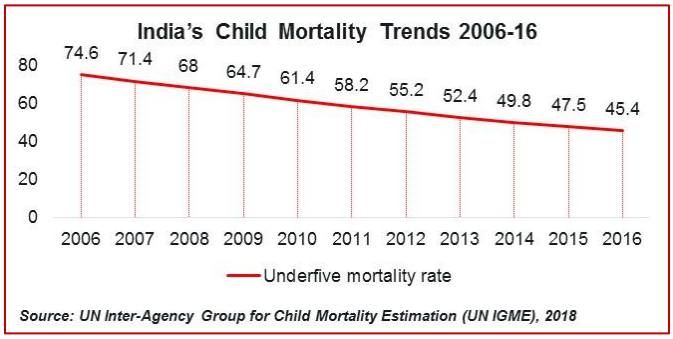
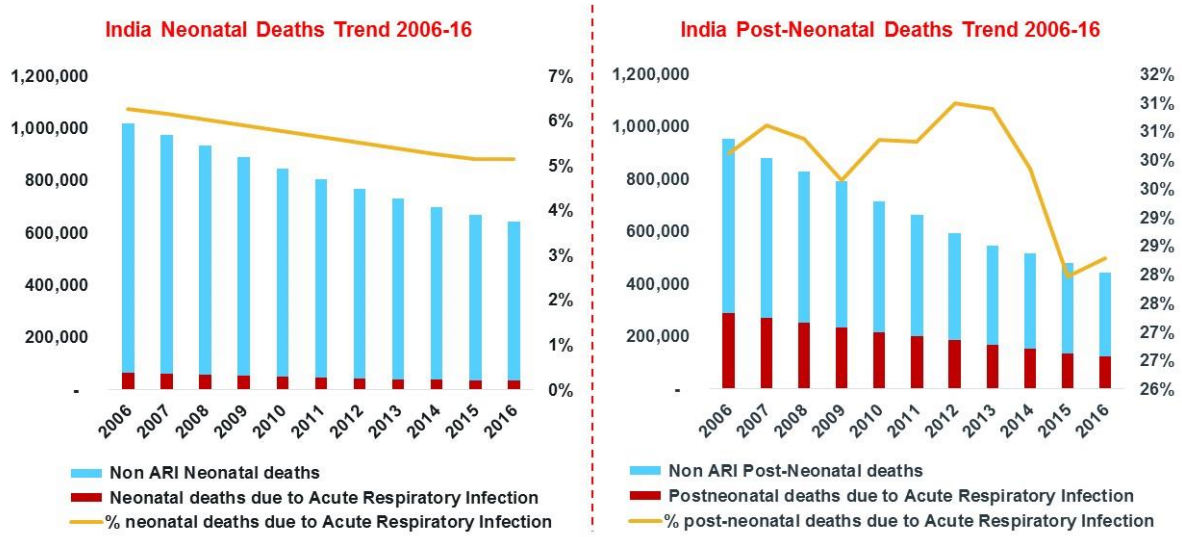


Figure 5: India child mortality trends



Source: UNICEF Data: Monitoring the situation of children and women

Figure 6: India neonatal death (left) and post - neonatal deaths trend (right)

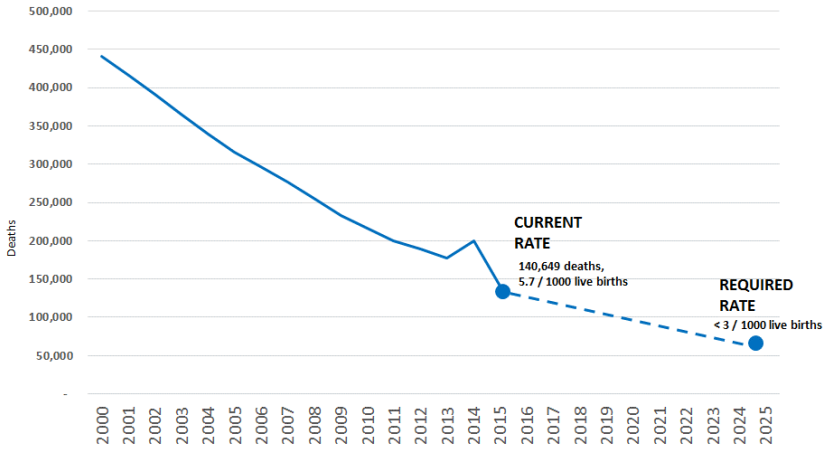


Figure 7: Current and estimated death rate

Source: WHO data source for India: Estimates of global, regional and national morbidity, mortality, and aetiologies of LRI in 195 countries: a systematic analysis of Global Burden of Disease Study 2015. Lancet Vol 17, November 2017

1.3 THE RATIONALE FOR THIS STUDY

There is enough evidence on the burden of pneumonia, on diagnostic parameters to identify cases in the community and facilities and on cost effective interventions- what works and what does not work. This is coupled with commitment, both at global as well as at national level. Despite all that, in India, '30 million new cases of childhood pneumonia are reported every year, and pneumonia is the leading infectious cause of death among children. It is therefore, vital to foster and catalyse, or even build, the drive and leadership among Government, policy makers, international agencies and all other relevant stakeholders so that the overall response to tackling pneumonia can be accelerated on all fronts, both in India and across the world.[15] This approach would be critical if of the goal of ending all preventable child deaths by 2030 (SDG3), is to be achieved.

With a vision to end preventable under-five deaths due to pneumonia in India by 2030, Save the Children, India (SC India/ Bal Raksha Bharat) is committed to working in alignment with the Indian government, key stakeholders, global partners and donors in order to address all aspects of pneumonia morbidity and mortality in children. Through the publication of a major report titled *Fighting for Breath: A Call to Action on Childhood Pneumonia*, Save the Children has declared a massive global effort against pneumonia as part of one of three 'Centenary Commitments'. In focusing these efforts on India, there was a felt need to generate robust evidence on the burden of pneumonia in high burden states, explore enablers and barriers at both facility and community level to prevent childhood pneumonia.

This report emanates from a situational analysis conducted across five states, reportedly having high burden of deaths from pneumonia.

1.4 OBJECTIVES OF THIS STUDY

This study was conducted as a **Situational Analysis of Pneumonia in India**, in line with the Global Action Plan for Pneumonia and Diarrhoea (GAPPD). The analysis is aligned to its Prevent, Protect and Treat Framework of indicators. It was designed to generate evidence related to:

a) **Burden of pneumonia** in five high burden states (Uttar Pradesh, Bihar, Madhya Pradesh, Jharkhand, Rajasthan)[16]

b) **Enablers and barriers** for reducing preventable pneumonia deaths through a comprehensive secondary data review at national level and an in-depth assessment of high burden states

1.5 SCOPE OF WORK

A combination of secondary desk review of available evidence and primary research were necessary to meet the objectives of the study.

Based on the evidence thus generated, the study put forth:

a) Policy recommendations

b) Suggestions for operational research

[15] https://data.unicef.org/country/ind/
Estimates of global, regional and national morbidity, mortality, and aetiologies of LRI in 195 countries : a systematic analysis of Global Burden of Disease Study 2015. Lancet Vol 17, November 2017

[16] States were selected by Save The Children in discussion with the Ministry of Health & Family Welfare, Government of India

METHODOLOGY

Save the Children

2. METHODOLOGY

2.1 STUDY DESIGN

The study used secondary and primary research to understand the situation of pneumonia in India. The evaluation framework of the study was based on:

i. Review of existing evidence on the situation of pneumonia -burden, policies, programmatic indicators (secondary research)

ii. In-depth assessment of five selected states (primary research)

For the primary research, a cross-sectional study with a mixed methodology approach involving quantitative and qualitative research was used. Quantitative research included facility assessment and a household survey. Qualitative research involved Focus Group Discussions (FGDs) with ANMs and mothers of children under five years of age and Key Informant Interviews (KIIs) with multi-disciplinary stakeholders at state, district, block and facility level.

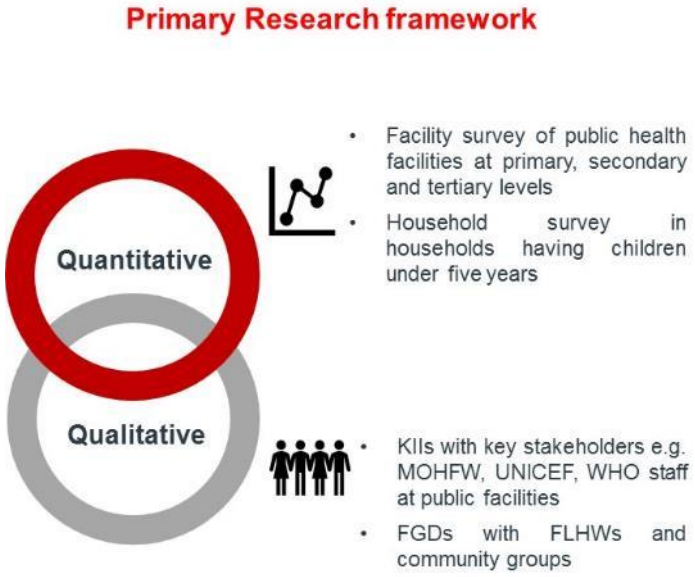


Figure 8: Primary research framework

Study duration:

September 2018 to June 2019 that includes data collection, analysis and report writing

Secondary review:

Objectives of secondary review:

- To document existing evidence on burden of pneumonia, and related programs and policies at the national level
- To explore evidence on enablers and barriers to pneumonia control and management:

Search strategy:

We reviewed literature for any evidence published from India between 2008 and 2018. The primary resources were electronic databases such as PubMed, publications from large surveys like NFHS (1,2,3,4), and ongoing Health Management Information system (HMIS). Besides we also searched for unpublished

reports, grey literature, private sector sales data to understand the use of medicines for management of pneumonia.

We use the following search words: “India”, “Pneumonia”, “Acute Respiratory Infection”, “Children”, “Infants” for mortality, burden, prevalence, risk factors, enablers and barriers for health seeking, contributing factors, burden, community perspective, and private sector involvement.

Primary Research:

Objectives of primary research:

- To document the burden of ARI/ pneumonia in select states
- To identify the determinants of ARI/ pneumonia that are amenable to prevention and control
- To assess the health facilities in terms of infrastructure, human resources, provision of services and supply and logistics for management of pneumonia
- To explore the perspectives of the stakeholders on pneumonia burden and management

A mixed methodology approach was utilized to address these objectives.

Quantitative Component

Study setting:

The study was conducted in ten districts across five states. The states selected were: Bihar, Jharkhand, Uttar Pradesh, Madhya Pradesh and Rajasthan. The states were selected based on burden of pneumonia and strategic geographical priorities of BRB. Due permission and approvals were obtained from the national and respective states Governments.

Selection of Districts

From each state, two districts were selected: one good performing and the other poor performing. The selection was based on a composite index score calculated using select indicators from NFHS 4. The indicators were suggestive of components of PPT framework of GAPP/ IAPPD.

The indicators used for calculation of index score were: (Source NFHS 4)

1. Immunization coverage (*Protect)*:
    - Children age 12-23 months fully immunized
    - Children age 9-59 months who received a vitamin A dose in the last six months
2. Practices for prevention of pneumonia*(Prevent*):
    - Households using improved sanitation facility
    - Households using clean fuel for cooking
3. Health seeking behaviour (Treat):
    - Children with fever or symptoms of ARI in the last two weeks preceding the survey taken to a health facility
4. Disease Burden:
    - Prevalence of symptoms of acute respiratory infection (ARI) in the last two weeks preceding the survey

Indices were computed for each of the above indicators for all the districts in the five selected states (Refer to annexure A). The composite index was the average of all the indices.

The composite indices of the districts of each state were then arranged in chronological order (best to worst). The district with the best index was considered as a good performing district and the worst a poor

performing district. In case of districts having similar indices, *Prevalence of symptoms of ARI in last 2 weeks preceding the survey* was considered as a criterion to rank them.

Thus, the ten districts selected are enumerated in Table 2

Table 2: Districts selected for the study

Performance	Bihar	Jharkhand	Madhya Pradesh	Rajasthan	Uttar Pradesh
Good	Patna	Khunti	Gwalior	Jaipur	Lucknow
Poor	East Champaran	Pakur	Sagar	Sawai Madhopur	Shrawasti

In every district, facility and community-based surveys were conducted.

FACILITY BASED SURVEY

The indicators selected for the facility - based survey were:

- Infrastructure: Availability of separate pediatric OPD, pediatric ward, NBSU/SNCU.
- Human Resource: Availability of pediatricians, MOs and staff nurses/ANM; Training of doctors and staff nurses/ANM on IMNCI and/or F-IMNCI
- Equipment and Supplies: Availability of equipment and drugs
- Display of protocols on pneumonia care

Selection of health facilities

Facilities from all levels of public health system were covered in each study districts.

- **One Medical College (MC)** from each state was selected after discussion with State nodal officers based on the criteria of maximum referrals *(except in Jharkhand, as the study district has no MC)*
- **Two District Hospitals (DHs)** from the districts
- **Four Community Health Centres (CHCs)** (two from each district) were selected purposively based on the distance from the DH (farthest and nearest blocks).
- **One Primary Health Centre (PHC)** was randomly selected under each CHC i.e. four PHCs in each State
- **Two Sub-Centres (SCs)** were randomly selected under each PHC, i.e. eight SCs in each State

Therefore, the total numbers of facilities were 94 (Table 3, Figure 10)

Table 3: Distribution of health facilities across five states

State	Number of Districts	Medical Colleges (MC)[17]	District Hospitals (DH)	Community Health Centres (CHCs)	Primary Health Centres (PHCs)[18]	Sub-Centres (SCs)	Total
Bihar	2	0	2	4	4	8	*20*
Jharkhand	2	0	2	4	3	8	*19*
Madhya Pradesh	2	1	2	4	4	8	*21*
Rajasthan	2	0	2	4	4	8	*20*
Uttar Pradesh	2	1	2	4	4	8	*21*
Total	*10*	*2*	*10*	*20*	*19*	*40*	*101*

[17] *This study depicts the findings of UP and MP Medical Colleges. The remaining two states, Bihar and Rajasthan, declined participation in the study*

[18] *Khunti district (Jharkhand) had only one functional PHC therefore a total of 3 PHCs were covered in the study*

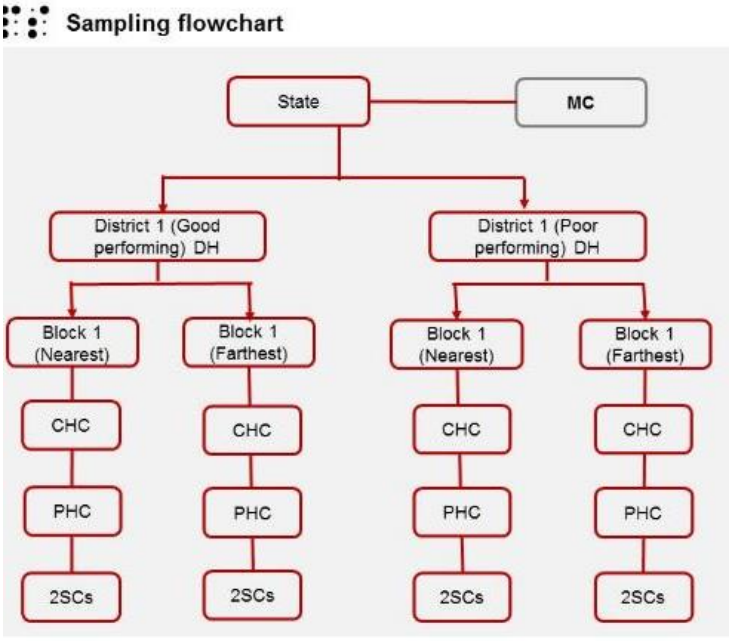


Figure 9: Sampling strategy for selection of health facilities

Tools for facility assessment

The checklists used for facility level assessment were developed by a senior research team in concordance with study objectives. Separate checklists were developed for district hospital, CHC, PHC and SC, translated and piloted before data collection.

Coding of tools

Android tablets running 2.0 and higher was used for data collection**.** An online and offline version of facility assessment checklists were developed using the latest cloud-based mobile data collection and communication application named Survey CTO enabled field team to quickly and easily collect data and cope mounting challenges of huge data volumes, time and resources to conduct this assignment.

> ***Survey CTO** is a field-tested technology platform that helps to collect data using mobile phones, tablets, or computers, online or offline, access data as soon as it is collected, keeps the data secure, and ensure data quality with our powerful quality-control features.*
>
> *Modern devices can record audio feedback from respondent, track GPS location and allow pictures to be taken of the interview, thus adding to the quality of the data*

For the purpose of data collection, these checklists were administered by field investigators at PHC and SC and by senior research associates at CHC, District hospital and Medical Colleges.

COMMUNITY BASED HOUSEHOLD SURVEY

The indicators selected for the community-based survey included the following:

Indicator	Relation to PPT framework
Association of timely initiation of breastfeeding with ARI prevalence among children under two years of age	Protect
Association of exclusive breastfeeding with ARI prevalence among children under two years of age	Protect
Association between time of initiation of complementary feeding and ARI prevalence among children 6-24 months	Protect

Indicator	Relation to PPT framework
Association of Vitamin A supplementation with ARI prevalence among children 9-59 months	Protect
Percentage of respondents having MCP card	Protect
Percentage of respondents knowing the weight of the child	Protect
Association between full and partial immunization and ARI prevalence among children 12-23 months	Prevent
Association between sanitation and hygiene practices and ARI prevalence among children 0-59 months	Prevent
Association between indoor air pollution and ARI prevalence among children 0-59 months	Prevent
Percentage of under five children who reported symptoms of pneumonia (cough or difficulty in breathing due to chest related problems) in previous two weeks	Treat
Percentage of mothers who were aware about severity of respiratory illness	Treat
Percentage of children who had ARI and were initiated medical (at public and private facilities) and home-based treatment	Treat
Percentage of children with ARI who received treatment with antibiotics	Treat

Sample size calculation:

Prevalence of symptoms of ARI (NFHS-4) was the basis for calculation of sample size for the community-based survey. The prevalence in the selected districts varied from 0.2 to 6.2%. (Table 4) The average prevalence was 3.5%.

Table 4: District-wise prevalence of symptoms of ARI for sample selection

State	District	Prevalence of symptoms of ARI in last two weeks preceding the survey under children 5 years of age at the district level (%)
Bihar	Patna	0.6
	East Champaran	4.0
Jharkhand	Khunti	0.2
	Pakur	6.0
Madhya Pradesh	Gwalior	0.5
	Sagar	6.2
Rajasthan	Jaipur	4.4
	Sawai Madhopur	4.8
Uttar Pradesh	Lucknow	2.0
	Shrawasti	7.0

The following formula was used to calculate the sample size:

$N=Z^2_{1-\frac{\alpha}{2}}$ (1-p) p / (ξ^2p) * Deff

P= combined average prevalence[19] of high focus districts

[19]Prevalence of symptoms of ARI in last two weeks preceding the survey under children 5 years of age at the district level" (Indicator source District Factsheets NFHS-4)

ξ=relative precision

(1-α/2) = Desired confidence level

Deff = Design effect, calculated as (1+(m-1) ρ), where m is the average cluster size and ρ is the intra-cluster correlation coefficient

With an assumption of 3.5% average prevalence, relative precision 15%, and design effect of 1.5, the sample size was **6,918** children under five years of age. Since we had 10 districts, the sample size for each district was approximately 692. The numbers included children from both urban and rural areas.

The distribution of study population in urban and rural areas was based on the rural urban distribution in the district as per 2011 census.

2.2 SAMPLING STRATEGY

Selection of households followed a three-stage cluster sampling:

First stage: Districts were selected based on the composite index (described in the previous section)

Second stage: From each selected block, clusters (villages/wards) were selected purposively, from the same two blocks selected earlier for the Facility Assessment Survey based on the criteria of the one nearest to (N) and farthest from (F) the District Hospital. For instance, if in district Patna of Bihar, N and F blocks were selected for conducting the Facility Assessment Survey at the CHC, PHC and SC, then the same blocks were considered to draw required number of clusters (villages/wards).The adjacent/link cluster was taken in the same block if enough children under five years of age were not available in a particular village/ward.

Third stage: Households were selected from each cluster. The selection of households varied between rural and urban areas. A total of 22 children in 0-5-years age group were selected from each cluster[20]. From each household, only one child was selected.

Based on all these parameters, the number of clusters covered in each district is described in Table 5

Table 5: Overall sample size calculation for the household survey

State	District	Rural Population[21]	Urban Population[20]	Sample size in each of 10 districts *=6918/10*	Sample size in rural area[22]	Sample size in Urban area[21]	Number of clusters to be covered in rural area	Number of clusters to be covered in urban area
Bihar	**Patna**	33,23,875 (56.9)	25,14,590 (43.1)	692	394	298	18	14
	East Champaran	46,98,028 (92.1)	4,01,343 (7.9)	692	637	54	29	2
Jharkhand	**Khunti**	4,86,903 (91.5)	44,982 (8.5)	692	633	59	29	3
	Pakur	8,32,910 (92.5)	67,512 (7.5)	692	640	52	29	2
Madhya Pradesh	**Gwalior**	7,58,244 (37.3)	12,73,792 (62.7)	692	258	434	12	20
	Sagar	16,69,662 (70.2)	7,08,796 (29.8)	692	486	206	22	9

[20]Twenty-two children under age 5 years per cluster (one per household as per the criteria mentioned) ref. NFHS-4
[21]Census 2011
[22]Proportions based on rural urban population proportions- Census 2011

State	District	Rural Population[21]	Urban Population[20]	Sample size in each of 10 districts =*6918/10*	Sample size in rural area[22]	Sample size in Urban area[21]	Number of clusters to be covered in rural area	Number of clusters to be covered in urban area
Rajasthan	Jaipur	31,54,331 (47.6)	34,71,847 (52.4)	692	329	362	15	16
	SM	10,69,084 (80.0)	2,66,467 (20.0)	692	554	138	25	6
Uttar Pradesh	Lucknow	15,50,842 (33.8)	30,38,996 (66.2)	692	234	458	11	21
	Shrawasti	10,78,712 (96.5)	38,649 (3.5)	692	668	24	30	1

Selection of households in rural and urban areas followed a different methodology.

Rural areas: In rural areas, the first household was selected by randomly selecting directions from the central point of the settlement /village by spinning a pencil. The number of households along the direction selected were counted and the first household to be interviewed selected at random. Successive households were visited in that direction to identify those with a child under five years of age.

Urban areas: Household numbers were enlisted, and the first household was selected randomly. Subsequent households were selected following the "nearest household from the last household to the right" criteria until the required sample size was obtained.

Terminologies and definitions as used in the study

"**Household**[23] is usually a group of persons who normally live together and take their meals from a common kitchen unless the exigencies of work prevent any of them from doing so. Persons in a household may be related or unrelated or a mix of both. However, if a group of unrelated persons live in a census house but do not take their meals from the common kitchen, then they are not constituent of a common household. Each such person should be treated as a separate household. The important link in finding out whether it is a household or not, is a common kitchen. There may be one-member households, two-member households or multi-member -If the two children in random sample belong to same household, then next random household will be selected to cover 22 different households.

ARI: Symptoms of ARI include cough accompanied by short, rapid breathing which is chest related and/or difficult breathing which is chest related (Reference: NFHS-4). The terms pneumonia and ARI are used interchangeably in the report.

Household having 0-5-year old child with ARI: If the household had a child of 0-5 years with ARI in the last two weeks preceding the survey, a complete history was recorded for the child. In case of two or more children under five years of age were suffering from ARI in one household, then one child was selected randomly.

Household having 0-5 year old child without ARI: If in a household, there were no children in the 0-5 years age group suffering from ARI in the last two weeks then along with background details information on health seeking behavior was sought. In case there were two or more children under five years of age in the same household, then one child was selected randomly.

For the purpose of the survey, the following steps were followed:

[23] http://censusindia.gov.in/Data_Products/Data_Highlights/Data_Highlights_link/concepts_def_hh.pdf

- Layout sketch map of clusters in which the streets and the structure/buildings of the streets were developed with the help of ASHAs in rural areas and Ward members in urban areas.
- Generally, layout sketch map indicated roads, streets, paths, important landmarks and all structures found in the villages/wards were located; and around each of landmarks 4-5 children were selected

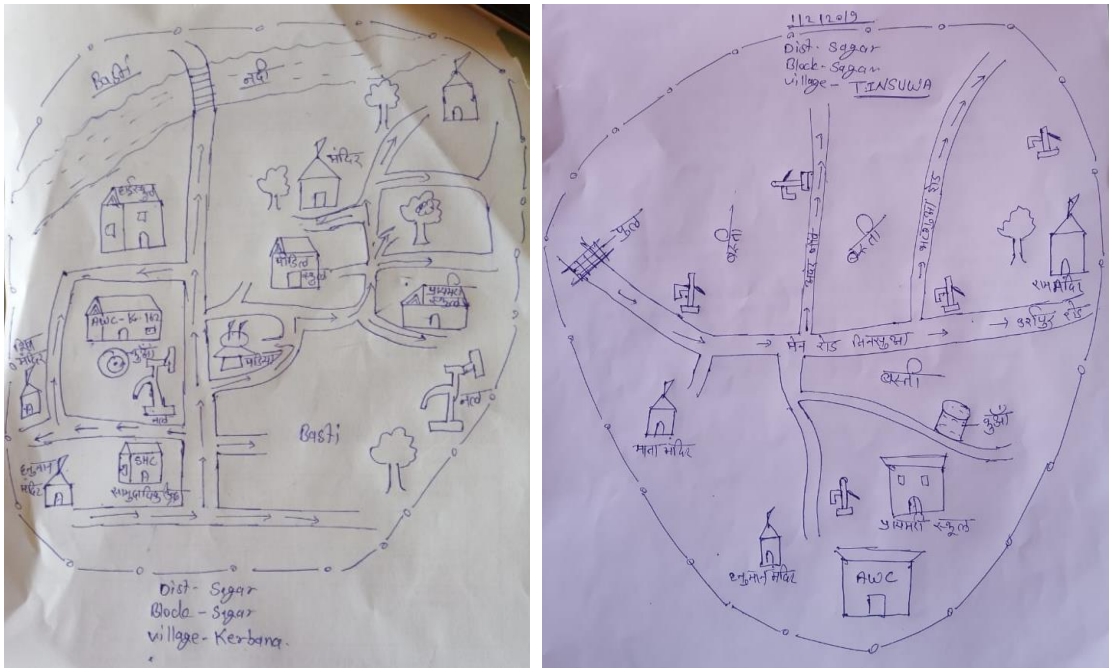


Figure 10: Illustrative layouts maps

2.3 STUDY TOOL FOR COMMUNITY-BASED SURVEY

Method of data collection

Android tablets running 2.0 and higher were used for data collection**.** Household survey tools were developed using cloud-based mobile data collection and communication application named Survey CTO. This was the same application that was used for the facility survey.

Data analysis

The data for both facility assessment and community survey were downloaded from Survey CTO server and imported to Microsoft Excel. The raw data were cleaned in Excel by applying basic sanity checks. The facility assessment data were analyzed using Microsoft Excel while the community survey data was imported to SPSS for analysis. The graphical presentation was done using Excel.

Exploratory (Qualitative) component :

Objectives:

The qualitative part of the study was a part of the larger mix-method approach with an objective of providing an in-depth understanding of childhood pneumonia from various stakeholders at different health system levels and settings across the selected states. It aimed to understand the perceptions and experiences of stakeholders in implementing programs related to pneumonia, explore barriers and enablers for pneumonia care in their respective geographies.

Methodology:

The stakeholders from every component of and level of health system were targeted. The participants included in the study were state and district level program officers; public and private healthcare providers; representatives of professional bodies, e.g. Indian Academy of Paediatrics (IAP); representatives of implementation partners e.g. WHO and UNICEF; and mothers of under five children. The participants were selected purposively to meet the study objectives. The distribution of composition of IDIs and FGDs are given in the table below:

Method of data collection	Stakeholder type	Designation	Number per State
IDI	State Government official	State Nodal Officer	1
	Implementation partner	UNICEF Official	1
		WHO Official	1
		Professional Body (IAP)	1
		NGO Official	1
	District Government official	District Nodal Officer	2
		District Program Manager	2
	Private Health Providers	Private Pediatrician	2
	Public Health Facility Staff	Medical Superintendent	7
		Pediatrician	7
		SNCU In charge	3
		NBSU In charge	4
		Staff Nurse	7
		MO - PHC	4
		ANM - SC	8
FGD	Public Health Facility Staff	ANM - SCs	4
	Mothers of under 5 children	Community	4

The IDIs and FGDs were conducted by adequately qualified and trained two-membered team of senior research associates. The number of participants for FGDs ranged from minimum eight to maximum twelve members. Interviews and FGDs were audio recorded with prior written consent and transcribed verbatim. Respondents' privacy was maintained by ensuring that no one except the interview team and respondent/s were present in the room. Confidentiality of the data was maintained.

Data Analysis: Various codes were developed by rereading the transcripts. The codes were made in line with the study objectives. Specific phrases on ideas/opinion/enablers/barriers etc. were identified and coded. Different types of codes were explored, and a code book was developed to define and list the codes identified from transcripts. Similar codes were grouped, and themes were generated. To address viewpoints and opinions collected from different stakeholders, responses were also analysed according to stakeholder type. Data management, organization and analysis was done using ATLAS.ti software.

2.4 ETHICAL CONSIDERATIONS:

a) **Informed Consent:** The consent form that was developed contained all the sections as per standard IRB format. Interviewers were instructed to read the consent form out to each participant and request for the signature/thumb print of the participant. One copy of the consent form was given to the participant if asked for

b) **Anonymity and confidentiality:** All the information obtained from the participants was kept strictly anonymous and confidential

c) **Beneficence (Do no harm):** The field investigators were trained to be sensitive about the feeling of the participants. The study was designed in such a way as to avoid any kind of harm to the participant.

d) **Justice:** It was ensured that participants were treated equally.

e) No investigator, under any circumstances, suggested any medicines, medical treatment or hospital if any sick children were found.

f) No photographs were taken during the survey revealing the identity of the participant.

g) Audio recording for IDI was done only after prior permission from the participant. In case, the participants did not allow for recording, notes were taken.

h) During analysis too, the names of participants or any other identifiers were not used to ensure confidentiality and anonymity.

This study posed minimal risk to the participants. Every possible effort was ensured to maintain anonymity and confidentiality of the participants.

The project was approved by Sigma IRB Committee. Due permissions were obtained from the state and district authorities for data collection.

2.5 QUALITY ASSURANCE:

Field Team for Data Collection

A strong multi-level field management network with senior field researchers and field investigators (with more than two years of experience) was deployed on field. Every state was handled by one Senior field researcher along with a team of 10-12 field investigators. Senior field researchers conducted KIIs at state, level; the facility assessment of MC, DH at district level; the facility assessment of CHCs and FGDs with ANMs and the community at block level. The field team conducted household surveys and facility assessments at PHCs and SCs. The selected team had experience in conducting facility assessments, KIIs, FGDs and household surveys and had a good understanding of the working of the health systems in states and districts, processes to run a survey/assessment smoothly in public health facilities and good network at the State level.

Training to Investigators

A team of 58 field investigators and field supervisors for five states was recruited for the study and a three-day training was conducted in Delhi from 7 January to 9 January 2019.

The training consisted of information regarding project background, research ethics, survey technique, discussions on the tools, role play, and hands-on practice on tablets for data entry. The field investigator team was taken to a learning site in Palam village to give them first-hand experience on the survey technique, selection of households and carrying out interviews in households and data entry using CAPI. (Annexure 2)

Quality Assurance Mechanism

A dedicated team for quality assurance was deployed. Data were checked on a daily basis and errors were rectified on the same day.

A robust quality control mechanism was devised and following were the key measures taken to ensure high quality of data being collected:

- Data collected digitally using tablets application. The tablet app had in-built validations and checks to ensure the quality of data
- Each form generated in the tablet application was scrutinized at the back-end. Only scrutinized data was made available on the production server.
- Supervisory visits and spot checks were performed but no back checks were performed.
- The Field Investigators (FIs) were accompanied by supervisors and other senior staff.

Various moderation and quality assurance reports were generated and resolved accordingly.

KEY FINDINGS

Save the Children

3. KEY FINDINGS

The findings of secondary and primary research are presented separately in the following pages

3.1 SECONDARY RESEARCH

The findings of the secondary research are described under the following sections:

- Burden of ARI/ pneumonia in India
- Practices for protect, prevent and treat in India
- Policy environment to address pneumonia in India
- Enablers, challenges and gaps to address pneumonia in India

Burden of ARI/ pneumonia in India

Pneumonia continues to remain a public health problem in India. According to NFHS, the state wise distribution of prevalence of symptoms of ARI among under children 5 years of age are depicted in Table 6.

Table 6: Prevalence of symptoms of ARI among under children 5 years of age(NFHS data)

State	NFHS 1@	NFHS 2#	NFHS 3#	NFHS 4^
India	6.5	19.3	5.8	2.7
Andaman and Nicobar Islands	NA	NA	NA	1.5
Andhra Pradesh	4.9	19.3	2	0.5
Arunachal Pradesh	8.7	25.4	6.7	2.1
Assam	11.3	17.8	7.3	1
Bihar	4.3	21.7	6.8	2.5
Chandigarh	NA	NA	NA	2.8
Chhattisgarh	NA	26	4.4	2.2
Dadar Nagar Haveli	NA	NA	NA	1.9
Daman and Diu	NA	NA	NA	0.6
Delhi	4.8	16.9	6.4	2.4
Goa	5.6	17.1	3.6	1.4
Gujarat	5.8	11	4.7	1.4
Haryana	5.4	11.8	2.7	3.2
Himachal Pradesh	6.4	10.8	1.4	1.6
Jammu and Kashmir	4.4	22.2	7.6	5.4
Jharkhand		22	5.2	3.2
Karnataka	3.4	7.9	1.7	1.2
Kerala	9.7	22.8	2.7	0.8
Lakshadweep	NA	NA	NA	0.9
Madhya Pradesh	4.7	29.2	3.7	2.1
Maharashtra	5.9	13.5	4.6	2.4
Manipur	14.5	26.9	4.7	1.7
Meghalaya	5.9	28.8	1.9	5.8
Mizoram	4.1	11.2	4.1	2.2
Nagaland	6.1	18.4	4.2	1.4
Odisha	10.3	22.5	2.8	2.4
Pondicherry	NA	NA	NA	2.7
Punjab	3.1	14.4	6.9	4.1
Rajasthan	4.9	22	6.9	2.1

State	NFHS 1@	NFHS 2#	NFHS 3#	NFHS 4^
Sikkim	NA	30	5	0.3
Tamil Nadu	8.6	10.3	3.7	2.8
Telangana	NA	NA	NA	2
Tripura	22.8	NA	14.2	2.6
Uttaranchal	NA	NA	4.3	4.6
Uttar Pradesh	7.2	21.1	7.1	4.7
West Bengal	10.2	24.8	13	3.3

@ Prevalence of symptoms of ARI in 24 hours preceding the survey under children 4 years of age

 # Prevalence of symptoms of ARI in last two weeks preceding the survey under children 3 years of age

^ Prevalence of symptoms of ARI in last two weeks preceding the survey under children 5 years of age

An analysis of the prevalence of ARI cases among children under 5 years of age reveals varying case definitions across the four NFHS surveys. (Table 6) While NFHS 1 assessed prevalence based on symptoms present in the preceding 24 hours among children under 4 years of age, NFHS 2 and 3 considered 2 weeks as the assessment period for under 3 children. NFHS 4 on the other hand considered 2 weeks for under 5 children. This variability makes comparison difficult between different time periods difficult. However, the states such as Bihar, Jharkhand, Madhya Pradesh, Odisha, Rajasthan consistently had a higher burden. A closer analysis between NFHS 2 and 3 (with similar case definitions) shows a drastic decline in the national average from 19.3 to 5.8%. The same was observed across all the states for reasons yet to be explored. Nevertheless, it was observed that in addition to the high burden states, Kerala and north eastern states reported rates higher than the national average that showed drastic decline in the subsequent survey. This requires further exploration.

In addition to these large-scale surveys, certain indicators are reported regularly through HMIS. However inadequate and incomplete it may be, it is the only source of nationally representative data source, with subcentre being the smallest unit and data being reported every month. HMIS captures only facility level data and private sector is largely underrepresented, which partly explains why it provides incomplete data. Nevertheless, some key pneumonia related indicators captured through HMIS include number of deaths due to sepsis and pneumonia. It is estimated that 15% of under five deaths are due to pneumonia. The proportion of deaths due to pneumonia is to the tune of more than 40% at the national level. However, this should be interpreted with caution because the total number of under 5 deaths are grossly under reported as compared to estimates. Secondly, more severe cases may eventually seek care from public health facilities that might falsely elevate the proportion. It could be because of variability in reporting by different facilities or due to varying case definitions used or lack of awareness among care providers. This is a critical gap that can requires focussed attention.

Table 7: An overview of the indicators related to pneumonia (from HMIS , 2018-19)

April'2018-March'2019	10.1 Childhood Diseases - Pneumonia	10.3 Childhood Diseases - Sepsis	10.13 Children admitted with upper respiratory infections	16.2.1 Infant Deaths up to 4 weeks due to Sepsis	16.3.1 Number of Infant Deaths (1 - 12 months) due to Pneumonia	16.4.1 Number of Child Deaths (1 -5 years) due to Pneumonia	Total under 5 deaths (2018-19)	Proportion of Deaths due to Pneumonia to total number of deaths*
All India	465875	79601	1488508	20323	11365	3584	34786	0.43
A & N Islands	26	8	1270	9	0	0	17	0.00
Andhra Pradesh	8807	5607	16322	1021	327	110	995	0.44
Arunachal Pradesh	254	81	2444	20	8	4	24	0.50
Assam	8930	1642	6241	934	692	101	1100	0.72
Bihar	9143	559	8573	457	448	96	1163	0.47
Chandigarh	5285	229	7156	136	28	23	304	0.17
Chhattisgarh	3526	542	10623	436	529	117	1315	0.49
Dadra & Nagar Haveli	14	3	1151	16	14	3	39	0.44
Daman & Diu	39	16	127	2	2	0	9	0.22
Delhi	30734	3629	14709	873	555	237	827	0.96
Goa	644	113	2841	2	5	2	11	0.64
Gujarat	6590	1778	32116	1614	827	339	2331	0.50
Haryana	4784	3469	20678	699	346	110	1606	0.28
Himachal Pradesh	4260	763	3742	113	46	22	211	0.32
Jammu & Kashmir	5231	1959	16643	300	85	29	150	0.76
Jharkhand	3018	937	5752	193	183	53	737	0.32
Karnataka	23009	4906	54475	1214	495	130	1303	0.48
Kerala	14756	273	78773	104	72	39	297	0.37
Lakshadweep	21	0	89	0	2	0	0	-
Madhya Pradesh	41524	5182	43903	2151	1494	483	5702	0.35
Maharashtra	17078	4027	25835	1915	721	294	2743	0.37
Manipur	1274	225	1286	9	8	1	34	0.26
Meghalaya	3556	802	23463	143	309	100	525	0.78
Mizoram	901	803	4380	29	49	18	67	1.00
Nagaland	537	240	900	30	21	8	45	0.64
Odisha	20251	4137	37579	1024	1040	222	2004	0.63
Puducherry	1340	88	9408	97	28	14	68	0.62
Punjab	9297	6072	6616	66	111	42	435	0.35
Rajasthan	76929	6316	34219	2221	865	333	4435	0.27
Sikkim	217	37	1853	6	10	1	8	1.38
Tamil Nadu	7704	3614	825375	850	221	46	1060	0.25
Telangana	5902	1240	11804	282	120	62	467	0.39
Tripura	1260	787	5880	37	42	15	87	0.66
Uttar Pradesh	121759	10172	77165	624	352	216	1703	0.33
Uttarakhand	3492	426	3974	57	31	18	155	0.32
West Bengal	23783	8919	91143	2639	1279	296	2809	0.56

** Proportion of deaths due to pneumonia to total number of deaths is calculated by dividing the sum of number of infant deaths (1 -12 months) due to pneumonia and number of child deaths (1 -5 years) due to pneumonia by total under 5 deaths (2018-19).*

Practices protecting children from ARI

Exclusive breastfeeding for the first six months of life (without additional foods or liquids, including water) protects infants from disease and guarantees them a food source that is safe, clean, accessible and perfectly tailored to their needs. Nearly a third of all respiratory infections could be prevented with increased breastfeeding.[24] The prevalence of exclusive breast feeding below 6 months of age is 54.9% (NFHS 4). Although the increase from 46.4% (NFHS 3) may look impressive, yet it raises several questions. The prevalence is fairly uniform across states with no apparent correlation with parameters such as literacy or per capita income. (Table 8)

Following this, the next critical stage in the infant's nutrition is timely and appropriate Complementary feeding (CF) from six months of age. Good nutrition supports strong immune systems and provides protection from disease. Providing children with adequate quantities of safe, nutritious and age appropriate foods alongside continued breastfeeding – can reduce child deaths, including those due to pneumonia and diarrhoea.[25] Only 8.7% breast feeding and 14.3% of non-breast feeding 6-23 months children receive adequate diet (NFHS 4). None of the states show satisfactory performance. States like Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Delhi, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra and UP fair poorly, in particular. (Table 8)

In India, Vitamin A supplementation is carried out through the existing network of PHCs and SCs and the Integrated Child Development Services (ICDS) network, under the Universal Immunization Programme (UIP)[26]. High-dose Vitamin A supplementation helps maintain strong immune systems and can reduce all-cause mortality by 24% and cases of diarrhoea by 15%. Children between the ages of 6-59 months should be protected with 2 high-dose supplements of vitamin A every year in countries with high under-five mortality.

Table 8: Performance of "protect interventions" related to ARI/ pneumonia in India (NFHS 4)

States	Exclusive breastfeeding	Breastfeeding feeding children 6-23 months receiving adequate diet	Non-breastfeeding children 6-23 months receiving adequate diet	Vitamin A Supplementation
India	54.9	8.7	14.3	60.2
Andaman and Nicobar Islands	66.8	13.5	17.6	69.3
Andhra Pradesh	70.2	6.5	11.9	72.1
Arunachal Pradesh	57	12.3	26.1	39.4
Assam	63.5	8.7	10.8	51.3
Bihar	53.4	7.3	9.2	62.3
Chandigarh	*	0	*	56.3
Chhattisgarh	77.2	11.1	8.5	70.2
Dadar and Nagar Haveli	72.7	0	*	59.3
Daman and Diu	52.3	6.2	7.4	68.4
Delhi	49.6	4.3	9.4	58.2
Goa	60.9	9.1	15.1	89.5
Gujarat	55.8	5.8	2.8	71.2
Haryana	50.3	7	10	66.7

[24] Victora, C.G.et al. Breastfeeding in the 21st century: epidemiology, mechanism, and lifelong effect
[25] Jones, G. et. al. How many deaths child deaths can we prevent this year? (2003)
[26] Kapil U, Sachdev HPS. Massive dose vitamin A programme in India - Need for a targeted approach. *The Indian Journal of Medical Research*. 2013;138(3):411-417.

States	Exclusive breastfeeding	Breastfeeding feeding children 6-23 months receiving adequate diet	Non-breastfeeding children 6-23 months receiving adequate diet	Vitamin A Supplementation
Himachal Pradesh	67.2	11.2	10	64.3
Jammu and Kashmir	65.4	21.8	32.1	64.6
Jharkhand	64.8	7.2	7.1	52.9
Karnataka	54.2	5.8	14.4	78.7
Kerala	53.3	21.3	22.3	74.4
Lakshadweep	54.8	16.8	*	52.1
Madya Pradesh	58.2	6.9	4.8	60.4
Maharashtra	56.6	5.3	12.2	70.5
Manipur	73.6	19.3	14	32.1
Meghalaya	35.8	24.2	19.5	54.4
Mizoram	61.1	14.6	13.3	68.6
Nagaland	44.3	17.5	21.9	27.2
Odisha	65.6	8.9	5	69.2
Pondicherry	47.6	21.4	54.4	74.2
Punjab	53	5.7	6.7	70.6
Rajasthan	58.2	3.4	3.7	39.6
Sikkim	54.6	23.1	*	84.3
Tamil Nadu	48.3	21.4	47.1	68.3
Telangana	67	9.9	11.2	76
Tripura	70.7	5.3	*	62.8
Uttaranchal	51.2	8.6	7.8	36.9
Uttar Pradesh	41.6	5.3	5.3	39.5
West Bengal	52.3	19.1	25.7	68.4

** Percentage not shown; based on fewer than 25 unweighted cases*

Table 9: The coverage of protect interventions at national level (NFHS 4)

Protect indicators	NFHS 1	NFHS 2	NFHS 3	NFHS 4
Exclusive breastfeeding	NA	NA	46.4	54.9
Breastfeeding feeding children 6-23 months receiving adequate diet	NA	NA	NA	8.7
Non-breastfeeding children 6-23 months receiving adequate diet	NA	NA	NA	14.3
Vitamin A Supplementation	NA	17.1^	16.5	60.2

^ Children age 12–35 months

Practices to prevent and treat ARI among children

According to WHO[27], children with compromised immune systems are at higher risk of developing pneumonia. Malnutrition or undernourishment, especially in infants who are not exclusively breastfed may weaken the immune system of the child. Pre-existing illnesses, such as symptomatic HIV infections and measles, also increase a child's risk of contracting pneumonia.

The following environmental factors also increase a child's susceptibility to pneumonia, indoor air pollution caused by cooking and heating with biomass fuels (such as wood or dung), living in crowded homes and parental smoking

Many of the studies conducted in the past show that Hib and Pneumococcal Conjugate Vaccines (PCV) are effective in preventing the two most common bacterial causes of childhood pneumonia. The use of vaccines against measles and pertussis in national immunization programmes has been shown to substantially reduce pneumonia illness and death in children.[28]

The UIP provides vaccines against BCG, Oral Polio Vaccine, Hepatitis B Vaccine, Pentavalent Vaccine (covering Diphtheria, Tetanus, Pertussis, *Hemophilus influenza* type b infection and Hepatitis B), Rotavirus Vaccine (against diarrhoea), Fractional Inactivated Poliomyelitis Vaccine, Measles/ MR Vaccine, Japanese Encephalitis Vaccine, DPT booster (Diphtheria, Tetanus and Pertussis), Tetanus Toxoid Vaccine.[29] The immunization coverage has shown an increase over the past years. The current immunization coverage for DPT 3 and measles vaccine is close to 80%.

Table 10: Improvement in DPT 3 and Measles coverage over time

Prevent indicators	NFHS 1	NFHS 2	NFHS 3	NFHS 4
DPT 3	51.7	55.1	55.3	78.4
Measles	42.2	50.7	58.8	81.1

The states with coverage less than the national average include Assam, Haryana, Gujarat, MP, Maharashtra, Rajasthan, UP and north eastern states (except Sikkim).

In 2017, pneumococcal conjugate vaccine (PCV) was introduced against *Streptococcus pneumoniae* bacteria which was identified as a leading cause of pneumonia. The rollout was carried out in a phased manner across identified districts of Uttar Pradesh, Bihar and the entire state of Himachal Pradesh.[30]

The figure 12 below shows the current availability and expansion plan of PCV vaccine:

[27] https://www.who.int/news-room/fact-sheets/detail/pneumonia
[28] Madhi, S. A., Levine, O. S., Hajjeh, R., Mansoor, O. D., & Cherian, T. (2008). Vaccines to prevent pneumonia and improve child survival. Bulletin of the World Health Organization, 86(5), 365–372. doi:10.2471/blt.07.044503. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2647441/
[29] https://www.nhp.gov.in/universal-immunisation-programme_pg
[30] http://pib.nic.in/newsite/PrintRelease.aspx?relid=161763

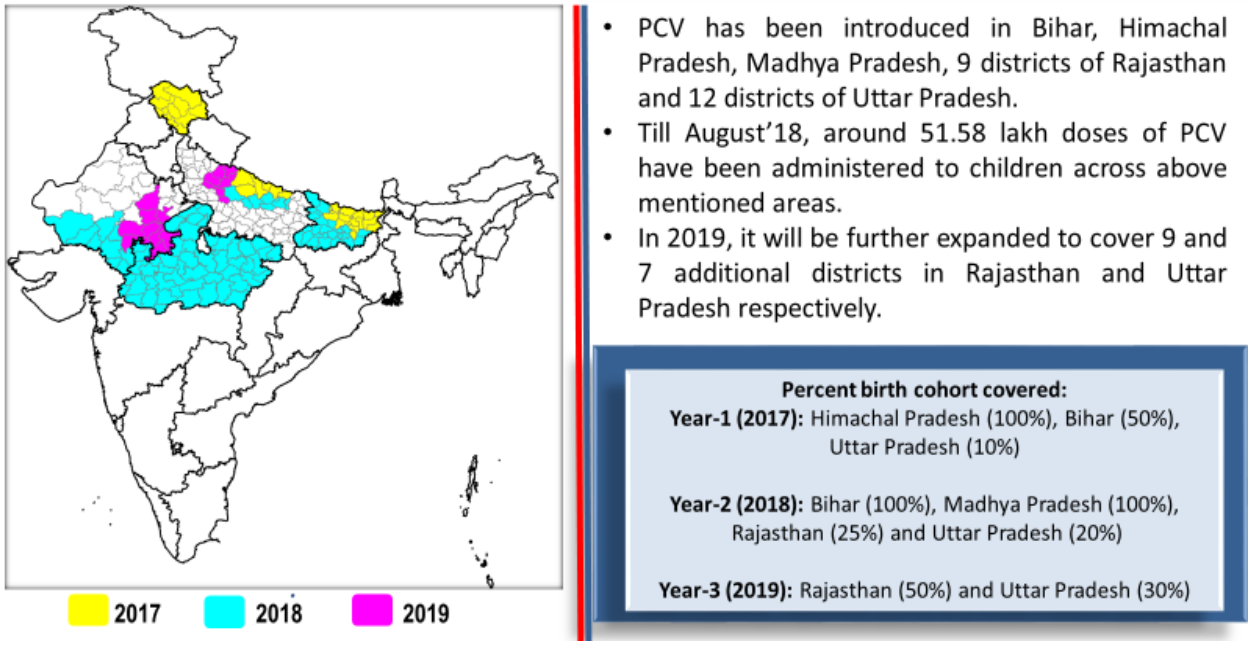


Figure 11:Availability and expansion plan of PCV

Controlling indoor air pollution:

Almost one in 10 under-five deaths are caused due to air pollution. Outdoor and Indoor air pollution together are directly linked with pneumonia and other respiratory diseases. The effects of indoor air pollution kill more children globally than outdoor air pollution. At the same time, around two billion children live in areas where outdoor air pollution exceeds international guideline limits[31]. The use of fuel other than LPG for cooking was reported as an important reason for ARI[32]. The use of LPG and improved stoves lowered the probability of ARI among children younger than five years**.** Children from households using LPG had a 5% lower probability of reporting ARI relative to exclusive users of polluting fuels.[33]

The proportion of households using clean fuel for cooking is close to 44%. It is less than 30% in the states of Assam, Bihar, Chhattisgarh, Jharkhand, Meghalaya, Odisha, and West Bengal.

Sanitation:

A clean home environment, good hygiene and the use of toilets are important practices that can prevent pneumonia, as are the availability of safe drinking water and the proper disposal of human waste, including child faeces; all these factors are also vital to stopping the spread of diarrheal disease among children and adults.[34] Hand washing with soap and the use of soap at critical times including before eating or preparing food and after using the toilet can reduce the incidence of ARIs by around 23%.. India's handwashing recommendations draw upon references from the Centres for Disease Control, and the Global Handwashing Partnership.

Table 11 shows NFHS – 4 data on improved sanitation which is defined as: flush to piped sewer system, flush to septic tank, flush to pit latrine, ventilated improved pit (VIP)/biogas latrine, pit latrine with slab, twin pit/composting toilet, which is not shared with any other household. Data shows that less than 50% of households across the country have access to proper sanitation. There exists a great deal of variability with Chandigarh, Lakshadweep and Kerala having more than 90% coverage. On the other hand, Bihar, Chhattisgarh, Jharkhand, Odisha and UP perform poorly with less than 40% coverage.

[31] United Nations Children's Fund, 2016
[32] Bhat RY, Manjunath N. Correlates of acute lower respiratory tract infections in children under 5 years of age in India, (2013)
[33]Lamichhane, Prabhat, et al. Impact of cleaner fuel use and improved stoves on Acute respiratory infections. Evidence from India (2017)
[34] United Nations Children's Fund, 2016

Care seeking behaviour

Care seeking behaviour:

Awareness of danger signs of ARI is a prerequisite for positive health seeking behaviour and further to appropriate management of ARI. Delay in seeking appropriate care or not seeking any care at all leads to a large number of pneumonia deaths in developing countries. The key barrier for health seeking has been symptom recognition[35]. Various studies have been conducted to understand the perception of caregivers about the recognition of danger signs of pneumonia. Evidence shows that many caregivers recognize chest indrawing as a sign of pneumonia, but they fail to identify fast/difficult breathing as a serious sign of childhood pneumonia.[36]

There is a need to develop locally relevant behaviour change communication (BCC) interventions for childhood pneumonia. Training of community health workers in prompt identification and appropriate management with the strengthening of public health facilities will be a key action point in the evidence-based management of childhood pneumonia.[37]

Studies reveal that families are generally prompt in seeking care outside the home and are mainly in favour of informal care providers due to easy access and access and affordable costs[38]. Most patients seek care through private practitioners, with village practitioners being a major healthcare provider[39]. Perceived poor quality of care in public sector can also lead people to bypass certain facilities. Households might choose to travel further distances or pay more out of pocket to seek better quality care. In India, many patients choose to seek care from the private sector, which is viewed as more competent than public facilities. India's District Level Household and Facility Survey found that 51% of households bypassed their nearby public facility for their usual care; of these, 80% cited at least one quality concern as a reason. Some people might also choose to bypass primary care facilities and seek care at hospitals or higher-level facilities for conditions that could be treated in primary care.[40]

NFHS data show that 73.2% of respondents underwent treatment at health facilities. While this seems to be encouraging, the kind of facilities visited (public or private) and the quality of treatment received remains unanswered.

[35]Minz A, Agarwal M, Singh JV, Singh VK. Care seeking for childhood pneumonia by rural and poor urban communities in Lucknow: A community-based cross-sectional study. Journal of Family Medicine and Primary Care. 2017;6(2):211-217. doi:10.4103/2249-4863.219987.
[36] A study done to find out the perceptions of caregivers and grass root health providers in Uttar Pradesh and Bihar, northern India
[37]Minz, Anurag, et al. Care seeking for childhood pneumonia by rural and poor urban communities in Lucknow: A community based cross sectional study (2017)
[38] Aurelie Brunie, Rachel Lenzi, Anamika Lahiri, and Rasa Izadnegahdar. Leveraging the private sector for child health: a qualitative examination of caregiver and provider perspectives on private sector care for childhood pneumonia in Uttar Pradesh, India (2017)
[39] Kumar R, Gupta M, Prinja S. Illness Burden, care seeking and treatment cost among less than 2 years old in rural Haryana, 2014
[40]Kruk, M. E., Gage, A. D., Arsenault, C., Jordan, K., Leslie, H. H., Roder-DeWan, S., … Pate, M. (2018). High-quality health systems in the Sustainable Development Goals era: time for a revolution. *The Lancet Global Health*, *6*(11), e1196–e1252. https://doi.org/10.1016/S2214-109X(18)30386-3

Table 11:Coverage of prevent and treat interventions for childhood pneumonia control as per NFHS 4

State	Prevent Interventions				Treat Interventions
	DPT 3 coverage	Measles coverage	Households using clean fuels for cooking	Improved sanitation (%)	Treatment at health facility for ARI
India	78.4	81.1	43.8	48.4	73.2
Andaman and Nicobar Islands	83.5	76.4	74.3	74.3	75.8
Andhra Pradesh	89	89.4	62	53.6	77.3
Arunachal Pradesh	52.3	54.6	45	87.5	37.5
Assam	66.5	71.4	25.1	47.4	46.8
Bihar	80.1	79.4	17.8	25.2	59.8
Chandigarh	95.9	95.9	93.9	93.9	*
Chhattisgarh	91.4	93.9	22.8	32.7	70.1
Dadar and Nagar Haveli	73.3	81.7	56.1	35.4	*
Daman and Diu	74	79.1	73.6	60.4	94.5
Delhi	84.8	91.1	97.9	74	81.4
Goa	94.2	96.5	84.1	78.3	89
Gujarat	72.7	75	52.6	64.3	70.2
Haryana	76.5	79	52.2	79.2	80.1
Himachal Pradesh	85	87.5	36.7	70.7	78.4
Jammu and Kashmir	88.1	86.2	57.6	52.5	78.5
Jharkhand	82.4	82.6	18.9	24.4	67.2
Karnataka	77.9	82.4	54.7	57.8	76.9
Kerala	90.4	89.4	57.4	98.1	90.1
Lakshadweep	95.1	93.7	31.8	99.4	86.5
Madya Pradesh	73.4	79.6	29.6	33.7	70.9
Maharashtra	74.9	82.8	59.9	51.9	84.7
Manipur	77.8	74.2	42.1	49.9	39.1
Meghalaya	73.9	71.8	21.8	60.3	74.9
Mizoram	61.9	61.3	66.1	83.5	50.1
Nagaland	51.6	50.1	32.8	75.2	31.3
Odisha	89.2	87.9	19.2	29.4	72.9
Pondicherry	95.9	95.7	84.9	65	72.8
Punjab	94.5	93.1	65.9	81.5	90.3
Rajasthan	71.6	78.1	31.8	45	82.6
Sikkim	93	93.3	59.1	88.2	63.8
Tamil Nadu	84.5	85.1	73	52.2	82.2
Telangana	87.9	90.1	67.3	50.2	76.3
Tripura	71.1	69.7	31.9	61.3	73
Uttaranchal	79.9	80.4	51	64.5	79
Uttar Pradesh	66.5	70.8	32.7	35	71.3
West Bengal	92.7	92.8	27.8	50.9	73.5

** Percentage not shown; based on fewer than 25 unweighted cases*

The Policy Environment to address pneumonia in India

The policy environment that supports pneumonia management in India can be seen under two broad areas components –a) global commitments, and b) national policy framework.

India adopted the global IMCI guidelines published by the WHO and the UNICEF, in the form of the Integrated Management of Neonatal and Childhood Illnesses (IMNCI), The Indian adaptation included strong focus on Neonatal issues, as almost half the under-five mortality rate (U5MR) in India was due to deaths during the neonatal period.

In 2015, Sustainable Development Goal 3 was articulated as "Ensure healthy lives and promote wellbeing for all at all ages". As a subset of this goal, Goal 3.2 targets to "By 2030, end preventable deaths of new-borns and children under five years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and U5M to at least as low as 25 per 1000 live births". Eliminating death due to pneumonia in under-five children has been identified as a key factor is achieving the SDG goals. With approximately 18% of the world's population, India's success in meeting the SDGs will remain heavily dependent on achieving these targets.

Various policies and guidelines for prevention and management of pneumonia have been developed in India covering different factors contributing to pneumonia as depicted in Figure 13. This includes the following:

- Swachh Bharat Abhiyan (Clean India Mission)
- Pradhan Mantri Ujjwala Yojna (Scheme of the Ministry of Petroleum & Natural Gas for providing LPG connections to women from Below Poverty Line (BPL) households)
- POSHAN Abhiyan (National Nutrition Mission)
- Universal Immunization Programme and National List of Essential Medicines
- IAPPD framework for prevention of diarrhea and pneumonia
- IMNCI guidelines for early diagnosis and case management
- Home based newborn and young child care for detection and early referral of child with pneumonia
- Other relevant programmes like Janani Shishu Suraksha Karyakaram (initiative to provide completely free and cashless services to pregnant women including normal deliveries and caesarean operations and sick new born), Ayushman Bharat (National Health Protection Scheme) etc.

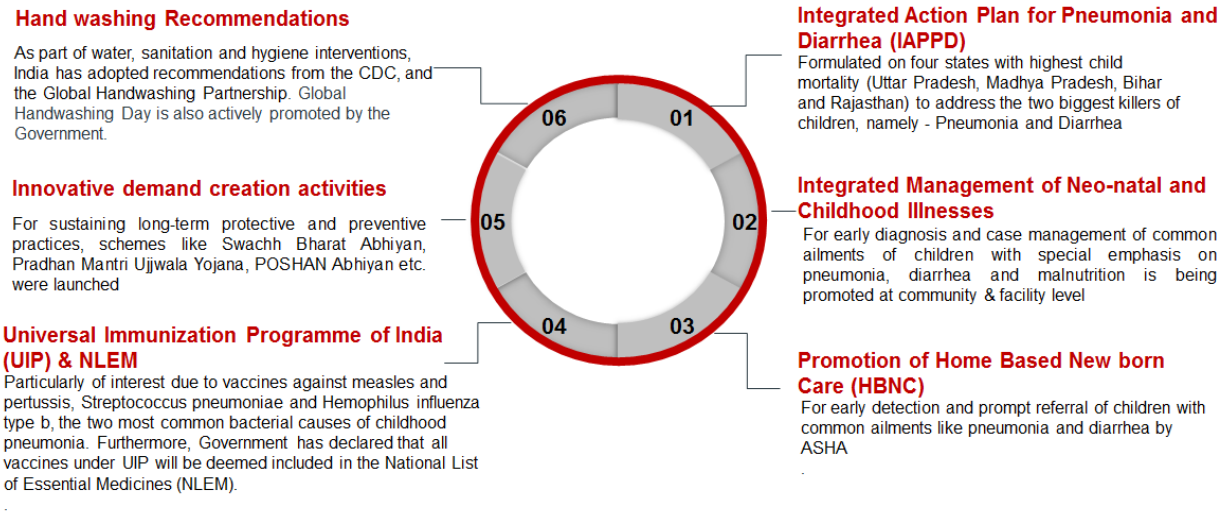


Figure 12: National Policies and guidelines having a bearing on pneumonia prevention and management

A brief about key National programs and schemes are given below:

Programs	Objectives
The Universal Immunization Programme (UIP)	The UIP is recognized as one of the largest health programs in the world. Under this, pregnant women, infants and children are provided vaccines free of cost. To strengthen and re-energize the programme and achieve full immunization coverage for all children and pregnant women at a rapid pace, the Government of India launched "**Mission Indradhanush"** in December 2014. To further boost the programme, the "`Intensified Mission Indradhanush" (IMI) was launched in October 2017 through which the government aims to reach every child up to two years of age and all pregnant women who have been left uncovered under the routine Immunization programme/UIP.
POSHAN Abhiyaan **(National Nutrition Mission)**	POSHAN Abhiyaan is a multi-ministerial convergence mission with the vision to ensure attainment of a malnutrition-free India by 2022 through a robust convergence mechanism and other approaches to create synergy. The objective of POSHAN Abhiyaan to reduce stunting in those identified districts of India where malnutrition burden is the highest, by improving utilization of key Anganwadi Services and improving the quality of Anganwadi service delivery. Its aim is to ensure holistic development and adequate nutrition for pregnant women, mothers and children.
Ayushman Bharat **(National Health Protection Scheme)**	Ayushman Bharat is a National Health Protection Scheme, which covers over 10 crore poor and vulnerable families (approximately 50 crore beneficiaries) providing coverage up to 5 lakh rupees per family per year for secondary and tertiary care hospitalization. It has subsumed the on-going centrally sponsored schemes - Rastriya Swasthya Bima Yojana (RSBY) and the Senior Citizen Health Insurance Scheme (SCHIS). This has been done to try and meet the unmet requirements of the earlier schemes, which was due to a lack of financial resources. Health and Wellness Centres are being set up by upgradation of subcentres/PHCs. These facilities will provide comprehensive primary care services closer to families and community. The centres are manned by trained mid-level health providers and have provision for range of essential drugs, point of care diagnostics and robust IT system.
Pradhan Mantri Ujjwala Yojana **(Schemes for providing LPG connections to BPL households)**	Pradhan Mantri Ujjwala Yojana is a scheme of the Ministry of Petroleum & Natural Gas for providing LPG connections to women from Below Poverty Line (BPL) households. The scheme aims to safeguard the health of women and children by providing them with LPG, so that they don't have to compromise their health in smoky kitchens. Under the scheme, the Union Government bears the connection cost of ₹1,600 per connection, and each household pays about ₹1,500 for the stove and the first LPG cylinder. This scheme is said to have high potential for reducing the risk from indoor air pollution.
Swachh Bharat Abhiyan	More than 85.2 million toilets have been built in rural India since the launch of the Swachh Bharat Mission (Gramin) in 2014, and 459 of the country's 718

Programs	Objectives
(Clean India Mission)	districts have been declared open-defecation free. Improving sanitation and hygiene results in fewer illnesses and better health.
Home Based Care for Young Child (HBYC)	A key component of India's attempts to improve mother and child health and reduce child mortality is the Home-Based Care for Young Child Operational Guidelines 2018, under the PM's POSHAN Abhiyaan. An incentive structures have also been built into the guidelines, with the following provisions for each ASHA being entitled to a sum of INR 250 for completion of 5 additional home visits for each young child. These visits are additional to 6 home visits by ASHA up to 6 weeks after birth under HBNC program. Under HBYC program all the three frontline health workers (ANM/AWW/ASHA) have been linked with clear defined roles and responsibilities.
Mothers Absolute Affection (MAA) Program	Under the MAA program, FLHWs are trained on specific modules to cover key facts on each recommended topic, review the importance and impact on growth and development, and cover the key steps and methodology for following the recommendations. Under this program, capacity building of CHWs is done to counsel mothers during breastfeeding and lactation period. Awareness of risk factors and danger signs is built into programs at all levels, targeting awareness of both primary health providers and beneficiaries. The MCP Card given to the beneficiaries contains messages on effective management of pneumonia.

A comparison of key indicators suggests that India fares better than global average, especially with respect to exclusive breast feeding, immunization and care seeking. There exists a lot of variations within and between states that are important to be addressed. Nevertheless, efforts in combating and treating pneumonia through implementation of a range of activities need further strengthening and sustenance for India to achieve its target of pneumonia mortality of 3 per 1000 live births by 2025.

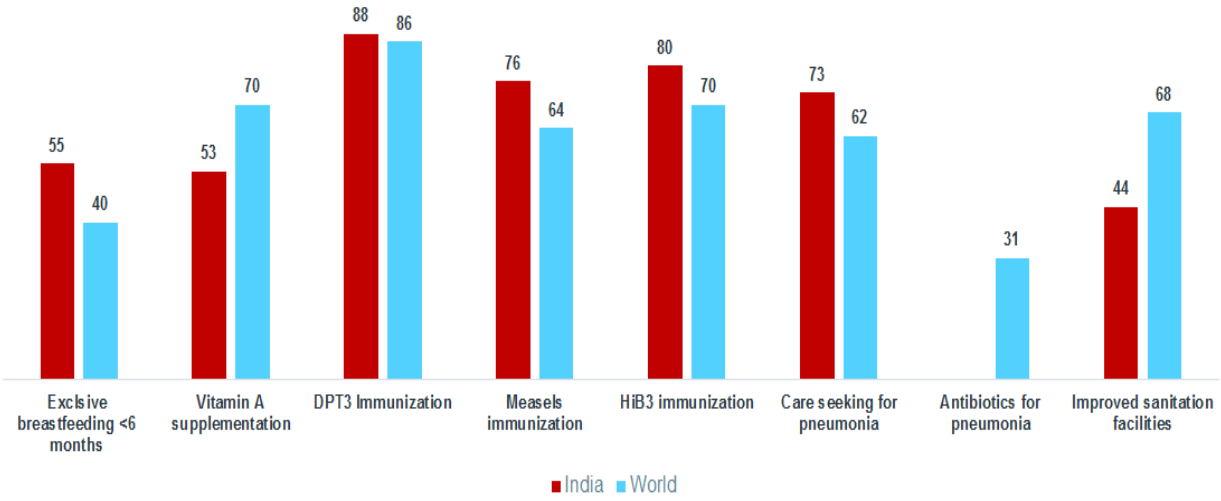


Figure 13: Pneumonia sensitive health indicators performance: India vs global (Source: NFHS-4 and UNICEF Data)

Enablers, challenges and gaps to address pneumonia in India

There are several challenges that are currently existing in the public health system and get presented as barriers to effective pneumonia management. Public health interventions, including nutritional rehabilitation, Vitamin A supplementation, exclusive breastfeeding, and WASH strategies have all contributed towards marked reductions in mortality – but current coverage of these cost-effective interventions remains low. Some of the health system challenges are enumerated below:

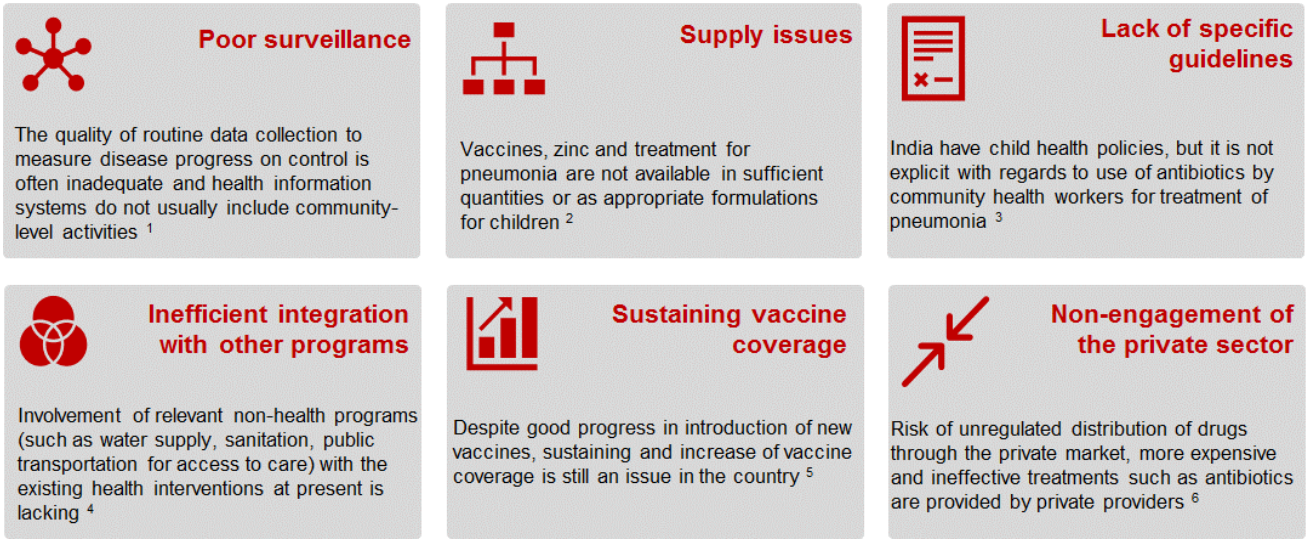


Figure 14: Existing challenges in the healthcare delivery system in India

Source: 1. Boerma, J. T., & Stansfield, S. K. (2007). Health statistics now: are we making the right investments? The Lancet, 369(9563), 779–786. https://doi.org/10.1016/S0140-6736(07)60364-X

2. GAVI ALLIANCE INVESTMENT CASE: Accelerating the Introduction of Pneumococcal Vaccines into GAVI-Eligible Countries Submitted by Gavi's Pneumatic at Johns Hopkins, October 23, 2006

3.Neeraj Masand, V. M. P. (2019). Use of Tobramycin in Ventilator Associated Pneumonia. EC PHARMACOLOGY AND TOXICOLOGY.

4. Prudhon, C., Prinzo, Z. W., Briend, A., Daelmans, B. M. E. G., & Mason, J. B. (2006). Proceedings of the WHO, UNICEF, and SCN Informal Consultation on Community-Based Management of Severe Malnutrition in Children. Food and Nutrition Bulletin, 27(3_suppl3), S99–S104. https://doi.org/10.1177/15648265060273S307

***5.** SURI, S. (2019). Reducing infectious diseases in children: Tracking India's progress and outlining the challenges (ORF Special Report No. 86). Retrieved from https://www.orfonline.org/wp-content/uploads/2019/04/ORF_Special_Report_86_Infectious_Diseases.pdf*

***6.** Awor, P., Peterson, S., & Gautham, M. (2018). Delivering child health interventions through the private sector in low and middle income countries: challenges, opportunities, and potential next steps. BMJ, k2950. https://doi.org/10.1136/bmj.k2950*

An assessment of 13 District Hospitals by Norweigian Indian Partnership Initiative (NIPI) brought out glaring challenges in the public health system.[41]General information about the DHs revealed that the total bed capacity at the DHs fell short of requirement by 50 percent. There was a 65 percent shortfall in the numbers of medical officers in position and 48 percent shortfall of nurses.

None of the DHs had a system for triage for children coming with acute conditions like pneumonia. All DHs had a separate area/department for managing emergencies; however, there was no separate area or

[41]MOHFW. Assessment of Quality of care for children in District Hospitals in India. New Delhi: National Health Mission; 2014.

arrangements for receiving seriously ill children. With one doctor and one nurse to manage each shift in emergency department, management of pneumonia remains a challenge.

Children with specific diagnosis of pneumonia or those with symptoms of fever, cough and respiratory distress were frequently referred to DH for management as the provision of radiography is usually available only at this level. The quality of care assessment showed that severity of pneumonia was not correctly assessed clinically in most places. Chest X – ray was usually carried out but correct use for diagnosis and treatment was lacking in 6 out of 10 DHs. Prescribing appropriate antibiotics only in children with clear indication and administering correct doses for pneumonia according to severity and weight was not followed by most doctors/pediatricians. Prescribing antibiotics without clear indication and administering dosages arbitrarily without considering the severity of pneumonia and body weight was noted. Use of third generation cephalosporin was common. Oxygen delivery system was inadequate in 9 out of 13 DHs. Oxygen saturation was not monitored both due to non-availability & non- use of pulse oximeters. Regular monitoring of admitted patients, even of severe cases was lacking. In cases where patients were checked, no records were maintained for cross verification.

The IMNCI package (that has a component of management of pneumonia in community and outreach settings) was adopted as part of RCH programme in India since 2005. F-IMNCI is the integration of the facility-based care package with the IMNCI package, to empower the health personnel with the skills to manage new born and childhood illness at the community level as well as at the facility. As per 2016 data, the IMNCI was being implemented in 575 districts across states in the country[42]. States have been reporting IMNCI implementation since 2005. In India, Auxiliary Nurse Midwives (ANMs), Anganwadi Workers (AWW) and Accredited Social Health Activists (ASHAs) are the categories of frontline functionaries. AWWs constituted the bulk of the workers trained in IMNCI since beginning. However, since the financial year 2012-13, utilization of NRHM funds for training of AWWs in IMNCI has been discontinued because AWWs comes under a different department and Ministry. As per the RMNCH +A strategy, home based new born care is primarily the responsibility of ASHAs**Error! Bookmark not defined.**. At the outreach, management of illness w ould be undertaken by ANMs using IMNCI guidelines. AWWs do not seem to be having a critical role in the process any more.

A rapid assessment of IMNCI undertaken in 12 districts (7 states) compared the difference between IMNCI and non IMNCI districts[43]. The assessment showed that home-visits under IMNCI reached only 64% of births and those new-borns not reached were likely to be the ones who were most vulnerable. The reasons attributed to why home-visits did not reach about one-third of all new-borns were absence of workers in several villages, poor supervision, lack of motivation of the workers for this additional task. On the positive side quality of home visits was found to be satisfactory. More than 80% of the sick children were correctly classified and treated. Several reports exist on the retention of skills of the doctors and nurses. Skills on assessing and classifying illnesses based on guidelines were conflicting in different studies conducted in Haryana, Gujarat, West Bengal and Maharashtra.[44] The authors concluded that training without effective implementation plans will not result in long term skill retention[45]. Independent assessments done in Odisha and Bihar showed that retention of skills was good for AWWs especially for the 0-2 months age group[46]. In a qualitative assessment undertaken, some experts are of the opinion that IMNCI was meant to be introduced in a moderately strong health system while others opined that IMNCI was a strategy to strengthen the health system. Some of them expressed that it was prematurely introduced in India without

[42] Neogi SB, Chauhan M. Towards a Grand Convergence for child survival and health: *A strategic review of options for the future building on lessons learnt from IMNCI; WHO India; 2016*

[43] Mohan P, Kishore B, Singh S, et al. Assessment of Implementation of Integrated Management of Neonatal and Childhood Illness in India. J Health Popul Nutr 2011;29:1-10.

[44] Mane A, Dohare S, Gitte SV. Child Health: understanding the home care practices in some illnesses among underfive children in IMNCI implemented rural areas. Int J Biol Med Res 2012;3:1251-54.

[45] Shewade HD, Aggarwal AK, Bharti B. Integrated management of neonatal and childhood illness (IMNCI): skill assessment of health and Integrated Child Development Scheme (ICDS) workers to classify sick under-five children. Indian J Pediatr 2012;DOI 10.1007/s12098-012-0835-4

[46] Biswas AB, Mukhopadhyay DK, Mandal NK et al. Skill of frontline workers implementing integrated management of neonatal and childhood illness: experience from a district of West Bengal, India.J Trop Pediatr. 2011 Oct;57(5):352-6. doi: 10.1093/tropej/fmq106. Epub 2010 Nov 16.

an introspection on whether it could be implemented; others felt that it was prematurely withdrawn before the results could be felt[42].

In order to understand the prescriptions for treatment of pneumonia, IQVIA's proprietary prescription and sales audit data was analyzed.

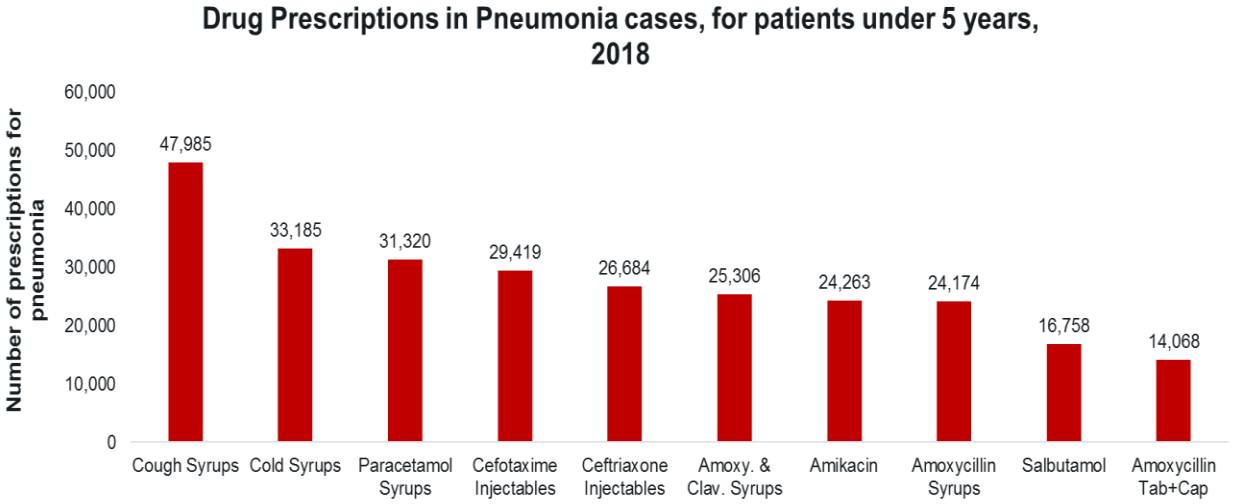


Figure 15: Most prescribed drugs for pneumonia cases among children under 5 years as per IQVIA's prescription and sales data

It was found that out of a total 1.97 lakh prescriptions for pneumonia cases, cough syrups are the most prescribed drug for pneumonia followed by cold syrups for children below five years. Amoxicillin syrups and Dispersible tablets of Amoxicillin plus capsules were prescribed in 12.2% and 7.1% prescriptions respectively for the children below five years. However, Ceftriaxone injectables and Amoxiclav syrups were prescribed in more cases, at 13.50% and 12.8% prescriptions respectively, for the children below five years. This is indicative of either higher burden of severe pneumonia cases in the private sector, or, prescribing more advanced antibiotics for treatment.

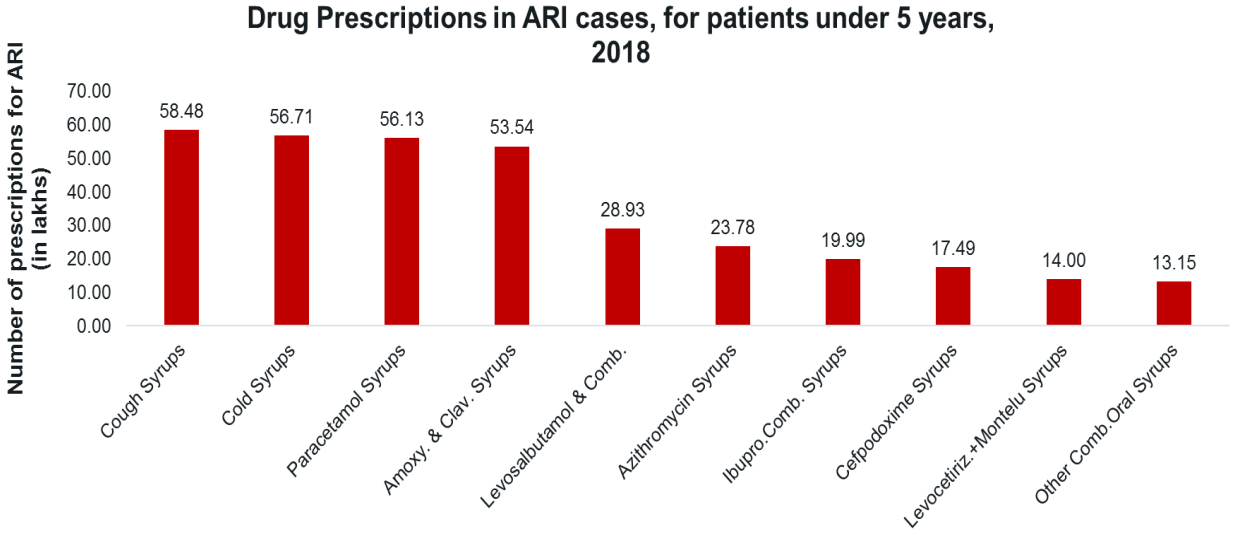


Figure 16:Distribution of drugs prescribed for ARI children under 5 years as per IQVIA's prescription and sales data

Out of a total 253.9 lakh prescriptions for ARI cases, cough syrups are the most prescribed drug for ARI followed closely by cold syrups, Paracetamol syrups and Amoxiclav Syrups for children below five years.

Salbutamol Inha Dose 00100 Y was the most prescribed inhaler in both ARI and pneumonia cases

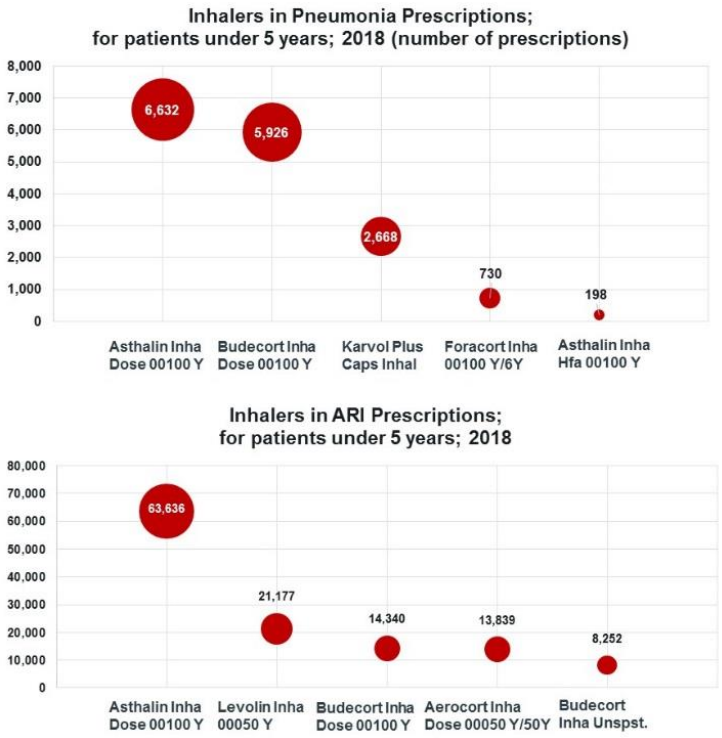


Figure 17:Inhalers prescribed for pneumonia cases (above) and ARI cases in children under five years as per IQVIA's prescription and sales data

Key findings from secondary data review

- Due to varying case definitions used in large scale surveys and health information system in India, it is difficult to get an accurate estimate on the burden of pneumonia in the country
- There is huge variation in the coverage of protect, prevent and treat interventions across the country
- While Immunization coverage, and sanitation has shown improvement, exclusive breast feeding, adequacy of diet and use of clean (improved) fuels require focused attention
- National programs and policies are conducive to prevention and management of pneumonia
- Health systems face challenges in terms of requisite infrastructure, human resources, delivery of clinical services, and shifting programmatic priorities

3.2 PRIMARY RESEARCH

This section consists of findings from the Household survey, the Facility Assessments and the qualitative analysis conducted in five states of the country, namely Bihar, Jharkhand, MP, UP and Rajasthan.

Household survey :

The Socio-Demographic Profile Of study participants

A total of 11,136 children were found in the 6930 households selected for the study. One child was selected from each of these households. Respondents for this study included mothers/fathers/caretakers of the identified children, though in more than 86% of the cases, mothers were the primary respondents.

Majority (70%) of the households were from rural areas and were from nuclear families (62%). Young infants constituted 6.2% of the child population while around 60% of the children were less than 2 years old. More than 40% of the households had a size of 6-10. Almost one- third of the mothers never went to school and another one-third were educated till primary school. More than 90% of the mothers were home makers while 56% of the fathers were daily wagers. A large majority of the children (89%) belonged to scheduled castes, scheduled tribes or other backward castes. Average monthly income varied from Rs 5000 to 10000 for most of the households. (Table 12)

Table 12:Socio-demographic profile of children and their respondents covered in the study (N=6930)

		n	%
Area	Urban Ward	2082	30
	Rural Area	4848	70
Type of Respondent	Mother	5968	86.1
	Father	574	8.3
	Care Taker	388	5.6
Type of Family	Nuclear	4309	62.2
	Joint	2474	35.7
	Joint Extended	147	2.1
Age Group of Child	0-2 month	432	6.2
	3-8 month	1036	14.9
	9-24 month	2634	38
	>24 &<=59 month	2828	40.8
Birth Order	1st	2400	34.6
	2nd	2395	34.6
	Third	1197	17.3
	More than 3	938	13.5
MCP Card	Yes	5235	75.5
Household Size	< 5 members	2156	31.1
	5 members	1364	19.7
	6-10 members	2955	42.6
	> 10 members	455	6.6
Education of Mother	Primary (I-V)	2070	29.9
	Upper Primary (VI-VIII)	1682	24.3
	Secondary (IX-X)	1231	17.8
	Higher Secondary (XI-XII)	868	12.5
	Graduate	532	7.7
	PG & above	547	7.9

		n	%
	Never Went to School	2070	29.9
Education of Father	Primary (I-V)	1118	16.1
	Upper Primary (VI-VIII)	1462	21.1
	Secondary (IX-X)	1522	22
	Higher Secondary (XI-XII)	1177	17
	Graduate	767	11.1
	PG & above	884	12.8
	Never Went to School	1118	16.1
Occupation of Mother	Govt. Service	44	0.6
	Private Service	63	0.9
	Self- Employed	34	0.5
	Daily wage labourer	232	3.3
	Homemaker	6405	92.4
	Agriculture	139	2
	Any Other	13	0.2
Occupation of Father	Govt. Service	200	2.9
	Private Service	979	14.1
	Self-Employed	717	10.3
	Daily wage labourer	3901	56.3
	Agriculture	1013	14.6
	Any other(specify)	120	1.7
Category	Scheduled caste	1752	25.3
	Scheduled tribe	1359	19.6
	OBC	3059	44.1
	Others	760	11
Household Income (Monthly basis)	<= Rs. 2000	270	3.9
	Rs. 2001- 5000	1471	21.2
	Rs. 5001- 10000	3782	54.6
	Rs. 10001- 15000	700	10.1
	Rs. 15001- 20000	213	3.1
	> Rs. 20000	296	4.3
	Don't Know	198	2.9
Type of House	Kachha	1735	25
	Semi Pucca	1756	25.3
	Pucca	3422	49.4
	Any Other	3	0

Burden of ARI/ pneumonia in select states

- ***Prevalence of ARI/ pneumonia***

Out of 6930 children surveyed, 929 (13.4%) were suffering from ARIs two weeks preceding the survey. Variability was observed in the distribution in prevalence across states with Rajasthan recording 8.4% while Bihar 18.2%. Overall males were found to have higher prevalence (14.1% v/s 12.6% among females). The prevalence was 12.2% in urban areas while it was 13.9% in rural areas.

Table 13:Prevalence of ARI in study states, disaggregated by gender and place of residence

State	Prevalence	Gender (N=6930)		Place of Residence (N=6930)	
		Male (n,%)	Female (n,%)	Urban Ward (n,%)	Rural Area (n,%)
Bihar	252 (18.2)	149 (20.1)	103 (16)	66 (18.8)	186 (18)
Jharkhand	178 (12.8)	93 (12.5)	85 (13.2)	18 (16.7)	160 (12.5)
Madhya Pradesh	164 (11.6)	94 (11.8)	70 (11.5)	66 (10)	98 (13.1)
Rajasthan	114 (8.4)	73 (9.6)	41 (6.8)	23 (4.8)	91 (10.3)
Uttar Pradesh	221 (15.9)	124 (16.6)	97 (15.2)	81 (16.7)	140 (15.5)
Overall	929 (13.4)	533 (14.1)	396 (12.6)	254 (12.2)	675 (13.9)

The prevalence seemed to vary with age, weight of children, caste, and education of mothers and fathers. It was highest among children 3-8 months (16.7%) followed by those between 9-24 months (13.4%). It was higher among underweight children as compared to normal weight children (19.6 v/s 10.6%). children belonging to SC/ST/OBC castes reported a higher prevalence of ARI.

Table 14:ARI prevalence according to various socio-demographic determinants

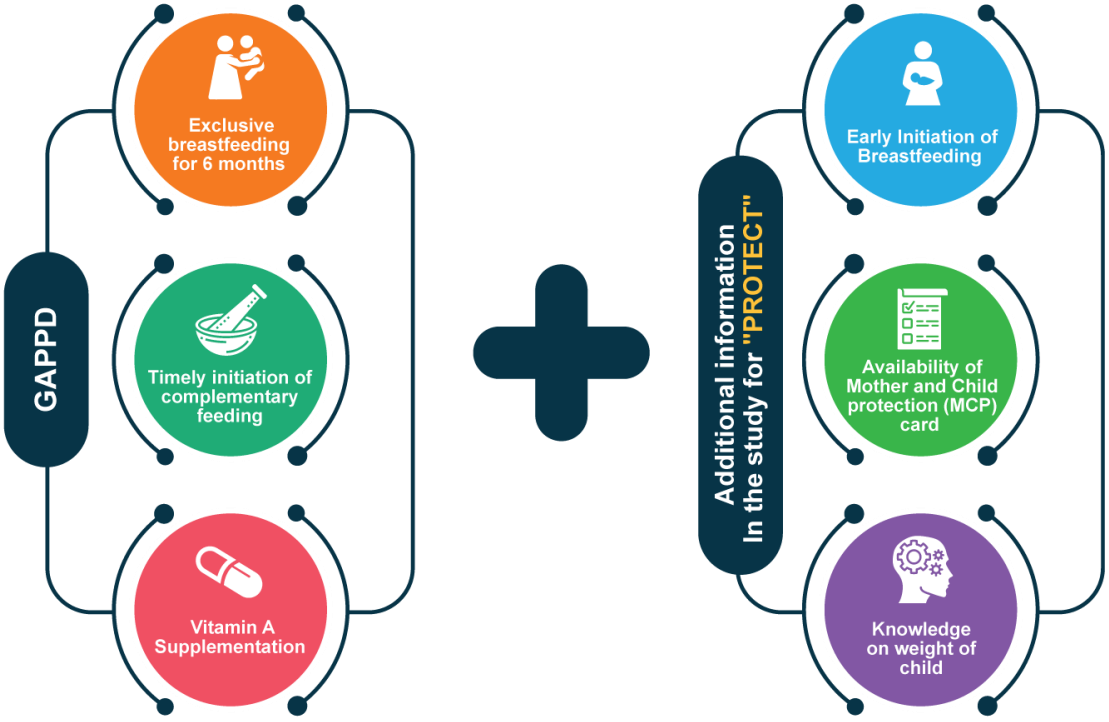
	Characteristics	n (%)
Age group	0-2 Months (432)	37 (8.6)
	3-8 Months (1036)	173 (16.7)
	9-24 Months (2634)	354 (13.4)
	>24 Months (2828)	365 (12.9)
Weight of Children	Underweight children (250)	49 (19.6)
	Normal (for their weight for age) (2695)	294 (10.9)
Caste Group	Schedule Tribal population (1359)	147 (10.8)
	Schedule Caste population (1752)	241 (13.8)
	OBC population (3059)	473 (15.5)
	General population (760)	68 (8.9)
Separate Room for Kitchen	Households with no separate room for kitchen (3366)	456 (13.5)
	Households with separate room for kitchen (3564)	473 (13.3)
Mother's Education	Never Went to School (2070)	287 (13.9)
	Primary (I-V) (1682)	202 (12)
	Upper Primary (VI-VIII) (1231)	178 (14.5)
	Secondary (IX-X) (868)	121 (13.9)
	Higher Secondary (XI-XII) (532)	79 (14.8)
	Graduate, PG & above (547)	62 (11.3)
Father's Education	Never Went to School (1118)	164 (14.7)
	Primary (I-V) (1462)	180 (12.3)
	Upper Primary (VI-VIII) (1522)	220 (14.5)
	Secondary (IX-X) (1177)	167 (14.2)
	Higher Secondary (XI-XII) (767)	105 (13.7)
	Graduate, PG & above (884)	93 (10.5)

In the five years preceding the survey, 96 out of 6930 households reported deaths among under five children due to ARI/ pneumonia. However, further exploration was beyond the scope of this study. Besides cough, the most common complaints among ARI children were running nose (72.9%), and fever (67%) followed by chest pain (16.6%), and persistent vomiting (13.6%). However, the symptoms that determined immediate referral were fever (58.8%), not feeding well (37.8%) and breathing problem (21.4%).

Analysis of protect interventions in the study population

The different protect interventions considered in the survey were adapted from GAPPD framework with three additional indicators

- Initiation of breast feeding within one hour of birth
- Exclusive breast feeding till 6 months of age
- Complementary feeding
- Vitamin A supplementation
- Knowledge of mothers about weight of the child among those who had MCP card



Early initiation of breastfeeding for children under two years of age

Initiation of breast feeding within one hour of birth confers protection to children against severe or fatal pneumonia. The colostrum produced in the first hours and days of a baby's life is rich in antibodies.

In our study, prevalence was significantly lower (13.2%) among children when breast feeding was initiated early compared to children where it was delayed (17.2%) (OR 0.73; 95% CI 0.57, 0.92).

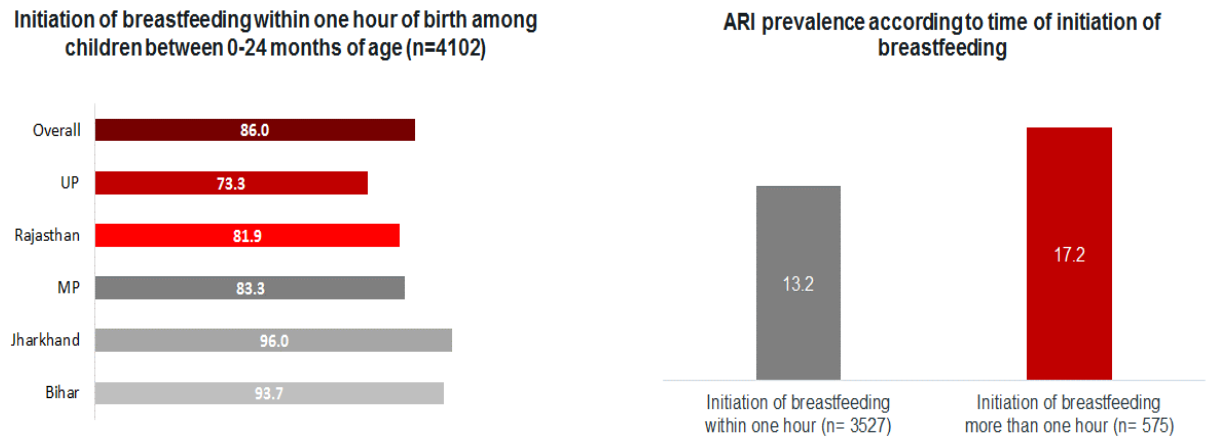


Figure 18:State-wise distribution of respondents who initiated breastfeeding within one hour among children 0-24 months (left) and impact of time of initiation of breastfeeding within one hour on ARI status (right)

Exclusive breastfeeding of children for 6 months

A majority of respondents (81.2% of total children aged six to 24 months) breastfed their children exclusively for six months. Among children in age group 6-24 months, the chances of occurrence of ARI was significantly higher among children who were exclusively breastfed for less than 6 months (15.7%) compared to those exclusively breastfed for 6 months (13.3%). (OR 0.78; 95% CI 0.61, 0.99).

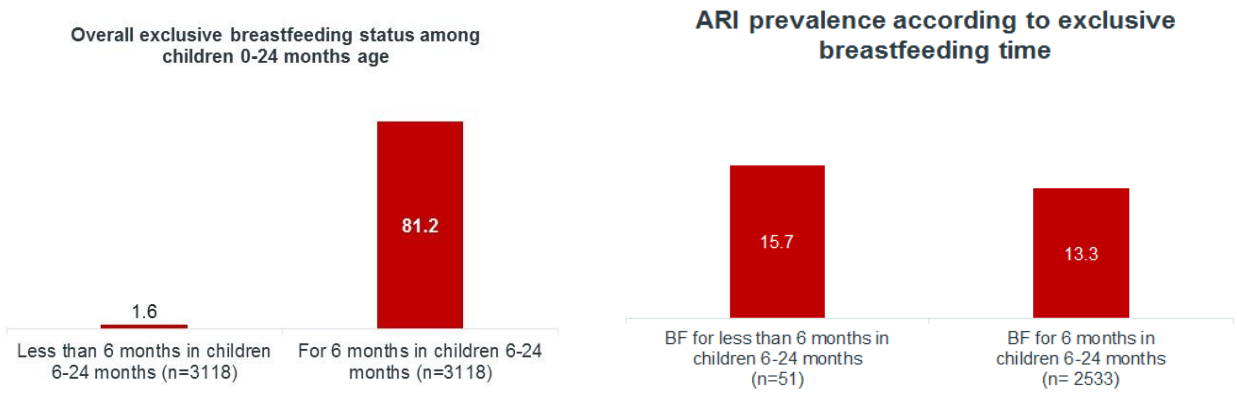


Figure 19: Exclusive breastfeeding status among children of 6-24 months selected for the study (Left) and Impact of breastfeeding practices among children 0-24 months on ARI status (right)

Complementary feeding among children

Timely initiation of complementary feeding is protective against ARI. In our study we found that the occurrence of ARI was lesser (13.7%) in children who initiated into CF within 6-8 months of age, then those initiated later than 6-8 months of age (14.4%). However, the difference was not statistically significant.

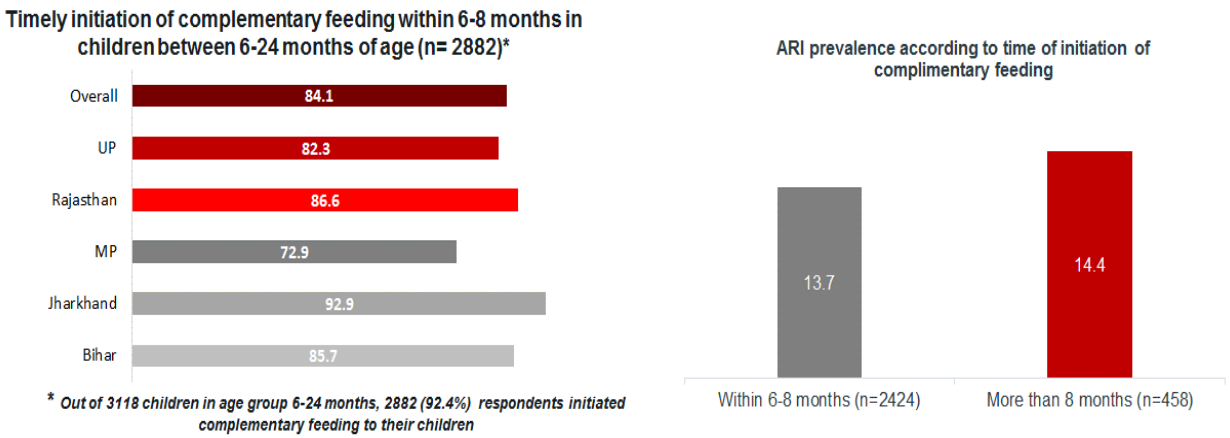


Figure 20:State-wise distribution of respondents who initiated complementary feeding within 6-8 months among children between 6-24 months (left) and impact of time of initiation of complementary feeding on ARI status (right)

Effect of vitamin A supplementation on ARI

The role of Vitamin A in childhood pneumonia is conflicting. Some studies report no benefits whereas some studies exhibit positive effects for specific groups. Even in this study, a positive relationship/protective action of Vitamin A supplementation on occurrence of ARI could not be established between Vitamin A supplementation and prevalence of ARI. In the current study we collected data on whether the children received any doses of Vitamin A. In our analysis, the prevalence was higher among those who were supplemented with Vitamin A as compared to those who were not (14.0 v/s 11.1%). However, this should be interpreted with caution since we do not have any estimates corresponding to the number of doses. Additionally, the prevalence was reported to be highest (14.9%) among those who were not aware about the supplementation status.

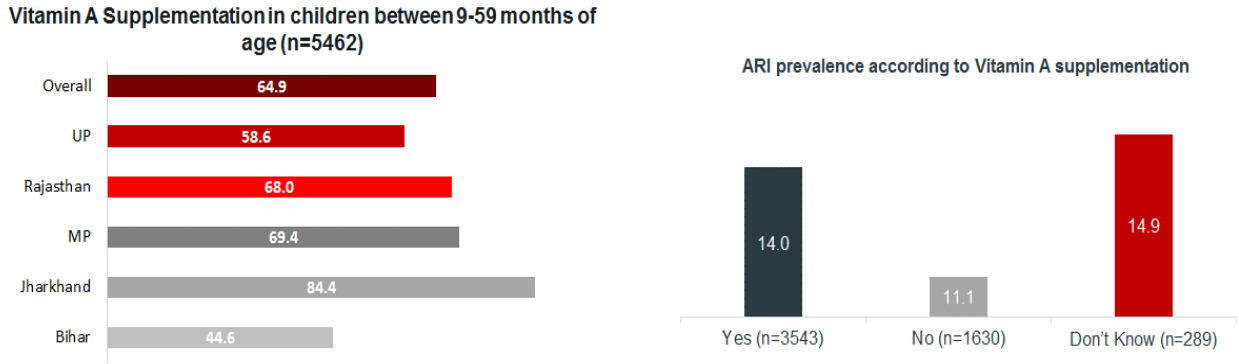


Figure 21: State-wise distribution of children (9-59 months) who received vitamin A supplementation (left) and effect of vitamin A supplementation of ARI (right)

Knowledge on weight of child

Only 44% (3,053) respondents were informed by the AWW/ASHA/ANM about the weight of their children. Occurrence of ARI was significantly lower in children whose mothers were aware on weight of their offspring (OR 0.78; 95% CI 0.67, 0.89).

Of those who knew the weight of child, 8.2% (250) children were underweight, 88.3% (2695) children were healthy, 0.7% (21) were overweight, and 2.8% (87) did not remember the weight of the child at the time of survey. Occurrence of ARI was significantly higher in children in underweight children than healthy children (OR 1.99; 95% CI 1.42, 2.78).

Table 15: Association between protect factors and pneumonia/ ARI

Protect factors	Number of children (n)	Prevalence of ARI/pneumonia	Odds ratio (95% CI)
Initiation of breast feeding within one hour of birth (n=4102)			
Yes	3527	465 (13.2)	0.73 (0.576-0.926)
No	575	99 (17.2)	
Exclusive breast feeding till 6 months of age (n=3118)			
Yes	2534	337 (13.3)	0.78 (0.609-0.998)
No	584	96 (16.4)	
Complementary feeding (n=2882)			
Yes	2424	332 (13.7)	0.943 (0.709-1.254)
No	458	66 (14.4)	
Vitamin A supplementation (n=5462)			
Yes	3543	495 (14.0)	1.229 (1.038-1.455)
No	1919	224 (11.7)	
Knowledge of mothers about weight of the child(n=6930)			
Yes	3053	358 (11.7)	0.769 (0.668-0.886)
No	3877	571 (14.7)	
Knowledge of weight of children in informed mothers (n=3053)			
Underweight	250	49 (19.6)	1.99 (1.42-2.78)
Overweight	2965	294 (10.9)	

The factors associated with ARI include initiation of breast feeding within 1 hour of birth, exclusive breast feeding within 6 months of age and knowledge of mothers about weight of their children.

Analysis of prevent interventions in the study population

The GAPPD framework aims at preventing pneumonia among children by addressing vaccination coverage, promoting good hygiene, ensuring sanitation, reducing household air pollution, preventing HIV infection and protecting HIV-infected and exposed children with Co-trimoxazole.

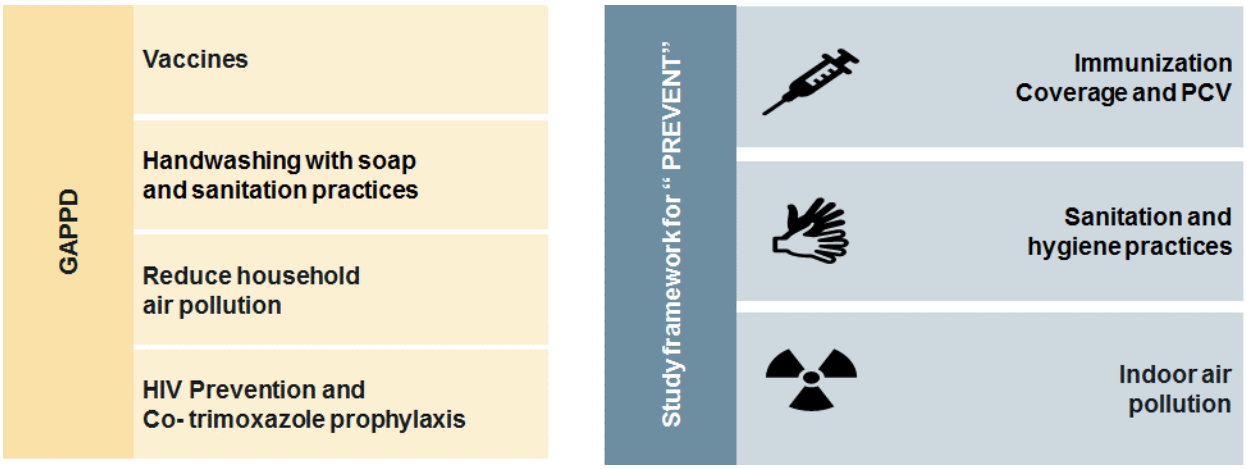


Figure 22:Prevent: Line of query/indicators

Immunization coverage:

For the purpose of this study, the definition of full immunization has been adapted from that of basic immunization as used in the NFHS 4[47], which includes vaccination for children aged 12-23 months who received specific vaccines at any time before the survey (according to a vaccination card or the mother's report). Fully Immunised Children (FIC) are those who are given one dose of BCG vaccine, three doses of DPT/Penta, three doses of polio vaccine and one dose of measles. Partial immunization means children aged 12-23 months receiving less than four of the above-mentioned vaccines.

Overall 78% of total children aged 12-23 months were FIC (Figure 28). The highest number of FIC in this study was recorded in Bihar (83.9%) and the lowest in Rajasthan (70.9%). Awareness around pneumococcal vaccine (PCV) and its coverage were also explored. However, owing to its recent introduction in a few states of the country, the study could not capture sufficient number of children to arrive at a conclusive analysis.

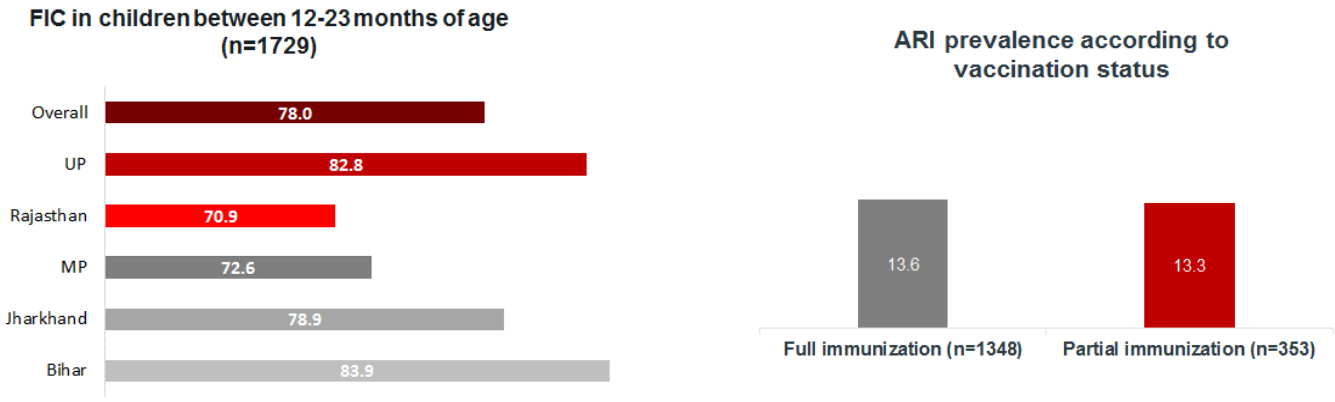


Figure 23:State-wise distribution of children (12-23 months) who were fully immunized (left) and impact of immunization on ARI status (right)

[47]NFHS 4 states that to have received all basic vaccinations, a child must receive at least: one dose of BCG vaccine, which protects against tuberculosis x three doses of DPT vaccine, which protects against diphtheria, pertussis (whooping cough), and tetanus x three doses of polio vaccine x one dose of measles

The prevalence of ARI among fully immunized children was not observed to be less as compared to those who were partially immunized or not immunized. The numbers of children who were not immunized were too small to draw in meaningful conclusions.

Sanitation and hygiene practices

One of the key non-clinical interventions for reducing the risk of ARI and diarrhoeal infections in children are regarding improved practices and infrastructure for sanitation and hygiene.

In our study, the prevalence of ARI was higher among children residing in households without a toilet facility (15.3%) as compared to those residing in households with a toilet facility (12.9%). –The percentage of ARI cases were significantly low in children whose care-givers washed hands with soap before breastfeeding, preparing food, feeding the child and before meal time. For the purpose of comparison, we considered hygiene practices as good when hand washing was followed for more than 3 critical times and poor when it was followed for three or less than three critical times. (OR 0.54; 95% CI 0.44, 0.65).

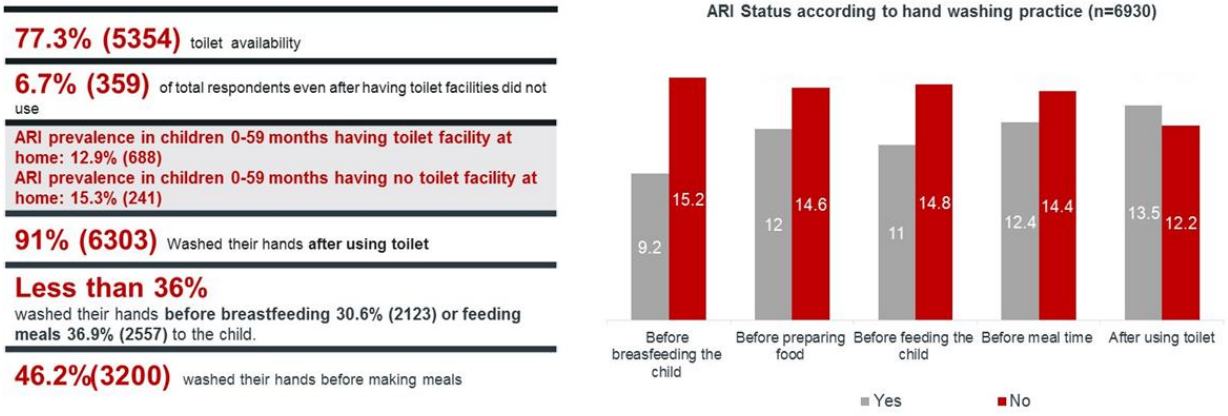


Figure 24:Sanitation and hygiene practices among respondents (left) and impact of their practice on ARI in children (right)

Indoor pollution and ARI prevalence:

According to International Energy Agency, about 63% households in India use biomass energy sources ranging from charcoal to wood, straw and animal dung. Young children are more susceptible to the effects of indoor air pollution, that puts them at an increased risk of pneumonia. In our study, it was observed that out of the 6930 households, 49% (3366) did not have a separate kitchen and the remaining 51% (3564) had a separate kitchen.

However, 74.1% (2642) households with separate kitchen had ventilation. In households with kitchen with ventilation, prevalence of ARI was lower (11.7%) as compared to 17.7% in households with kitchen with no/ poor ventilation. However, this difference was not statistically significant.

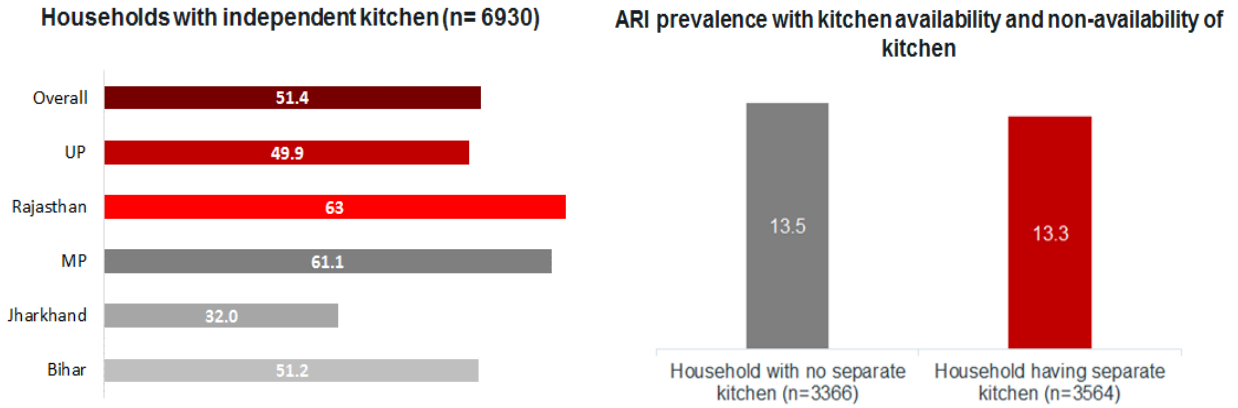


Figure 25:Kitchen availability among households and impact of availability of kitchen on ARI

It was observed that 54.3% of total households used non-improved fuels and the prevalence of ARI was significantly higher among children residing in households using non-improved fuels (14.2%) than those households using improved fuels (12.4%) (OR .86; 95% CI 0.75, 0.96). It was higher in households using improved fuel for cooking in rural areas (13.1%) as compared to urban areas (11.7%). However, among the households using non-improved fuel for cooking, not much variation was observed in ARI prelavence

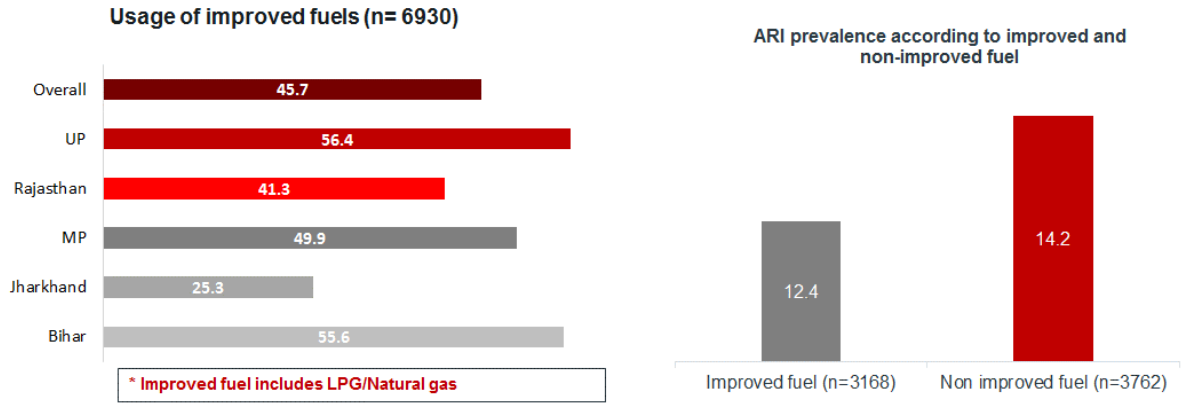


Figure 26:State-wise distribution of respondents using improved fuel (left) and effect of fuel on ARI in children (right)

Table 16: Association between prevent factors and prevalence of pneumonia

Protect Factors	Number of children (n)	Prevalence of ARI/pneumonia	Odds (95%)
Immunization coverage (n= 1729)			
Full Immunization	1348	183 (13.6)	1
Partial Immunization	353	47 (13.3)	0.978 (0.693-1.38)
No Immunization	28	1 (3.6)	0.236 (0.032-1.75)

Protect Factors	Number of children (n)	Prevalence of ARI/pneumonia	Odds (95%)
Separate kitchen (n=6930)			
Yes	3564	473 (13.3)	0.977 (0.85-1.12)
No	3366	456 (13.5)	
Kitchen with available ventilation (n=3564)			
Yes	2642	310 (11.7)	0.62 (0.5-1.76)
No	922	163 (17.7)	
Sanitation and hygiene practices(n=6930)			
Yes (4-5 practices)	1483	126 (8.5)	0.537 (0.44-0.65)
No (<= 3 Practices)	5447	803 (14.7)	
Indoor air pollution (n=6930)			
Yes (Improved Fuel)	3168	394 (12.4)	0.857 (0.75-0.96)
No (Non-Improved Fuel)	3762	535 (14.2)	

A bivariate analysis shows that sanitation and hygiene and use of improved fuel were associated with less prevalence of ARI/ pneumonia.

Findings Related to the 'Treat' Indicators

The treat framework of this study captures care-seeking behaviour and management of ARI at home and/or hospital and includes, among other factors:

a) Common danger signs of ARI and knowledge of the care-giver on danger signs of ARI that need immediate referral

b) Care-seeking behavior of the community that includes preferred choice of treatment, choice of facility and time of initiation of treatment

c) Treatment pathway for those seeking home-based and/or medical treatment. This section further elaborates the pathway of treatment covering the duration of the treatment, choice of drug, and outcome of treatment.

d) Cost implication for the treatment of an ARI child

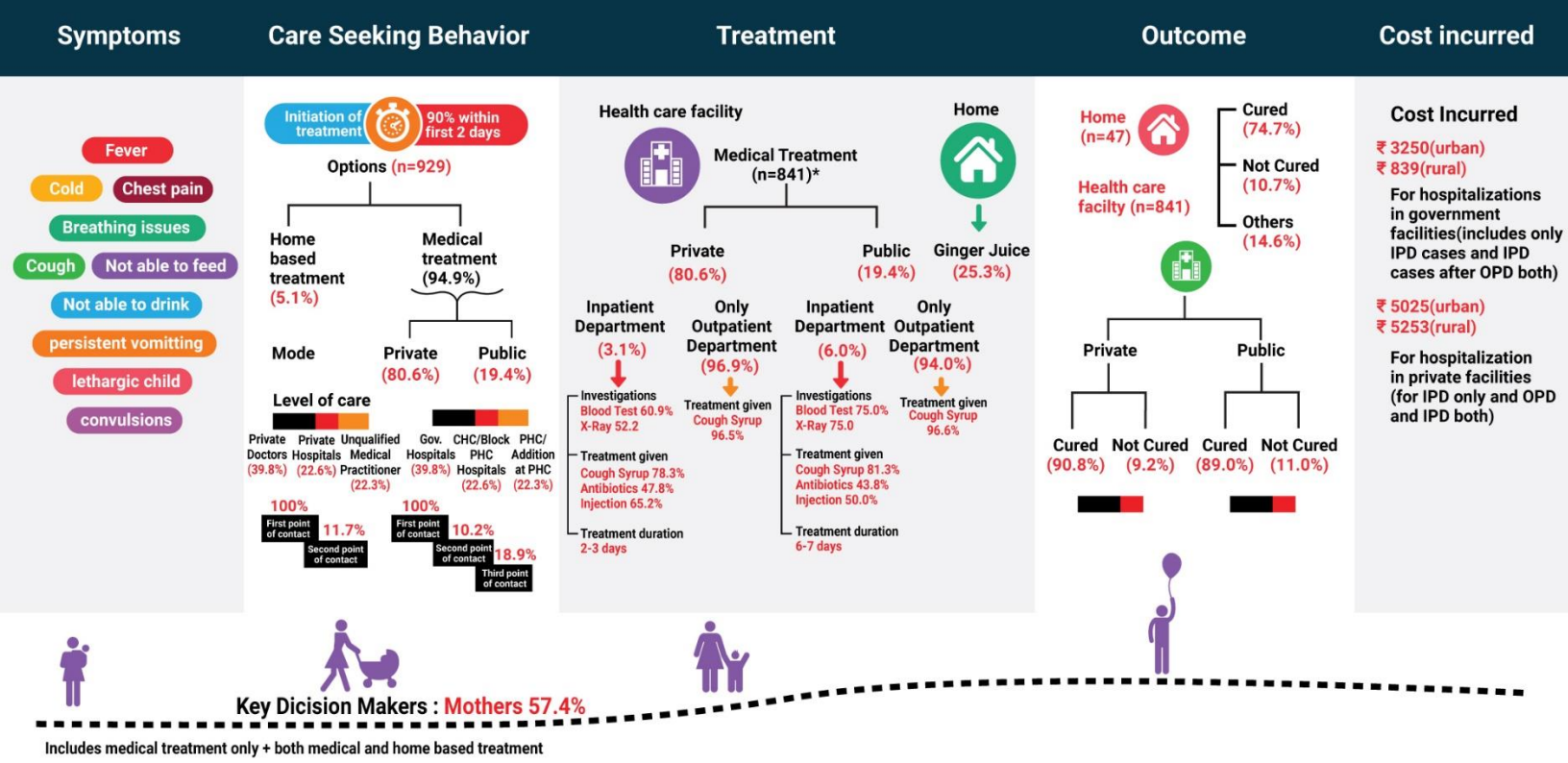


Figure 27:Care seeking pathway adopted by respondents for children with ARI selected for the study

Common danger signs of ARI and care-giver knowledge for immediate referral

Once a child develops pneumonia, prompt treatment which is essential to survival. This is dependent on a number of factors including knowledge of mothers and caregiver helping in prompt recognition of the symptoms and danger signs of pneumonia. Fever (58.8%), not feeding well (37.8%) and breathing problems (21.4%) were perceived as the signs for immediate referral.

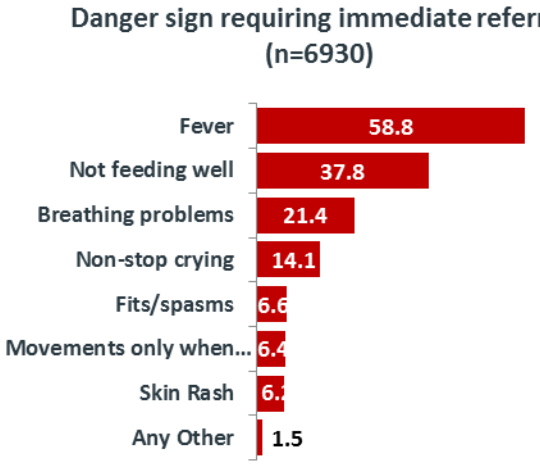


Figure 28: Perceived danger signs that require immediate referral

Care seeking behaviour

Deaths from pneumonia can be prevented if timely treatment is initiated. Healthcare-seeking behaviour is of prime importance and is pivotal to the well-being of the individual child as well as the community. The process of responding to perceived 'illness' or seeking care involves multiple steps. Therefore, it is important for caregivers to be able to identify the danger signs and seek timely treatment for them.

This study unravels that eighty two percent 766 (82%) of respondents seek medical treatment within the first two days of occurrence of symptoms of ARI.

Figure 38 reveals that 841(90.5%) respondents opted for medical treatment whereas only 47(5.1%) chose home remedies and 41(4.4%) did not seek any treatment. However, medical treatment was sought more often for male child 490(91.9%) with ARI compared to female child 351(88.6%). This reflects gender bias that translates into health disparities and inadequate utilization of healthcare services. Additionally, it was determined that more respondents in urban area 241(94.8%) seek medical treatment for their children with ARI compared to those in rural area 600(88.9%).

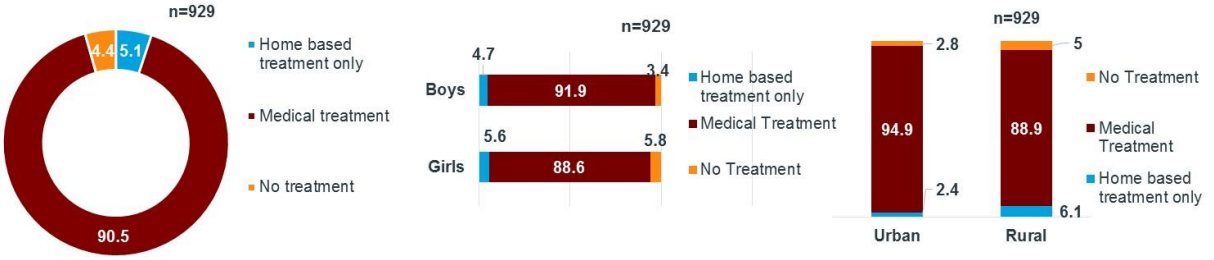


Figure 29: Choice of treatment by respondents for ARI children(left), choice of treatment according to gender of the child (middle) and according to area (right)

Private facilities are preferred over government institutions while seeking healthcare services for pneumonia as fewer respondents chose to go to government facilities 163(19.4%) as compared to private facilities 678(80.6%).

Within the government health sector, maximum respondents chose to go to the district hospital (95, 58.3%) followed by the CHC/Block PHC (32, 19.6%), and PHC/Additional PHC (27,16.6%).

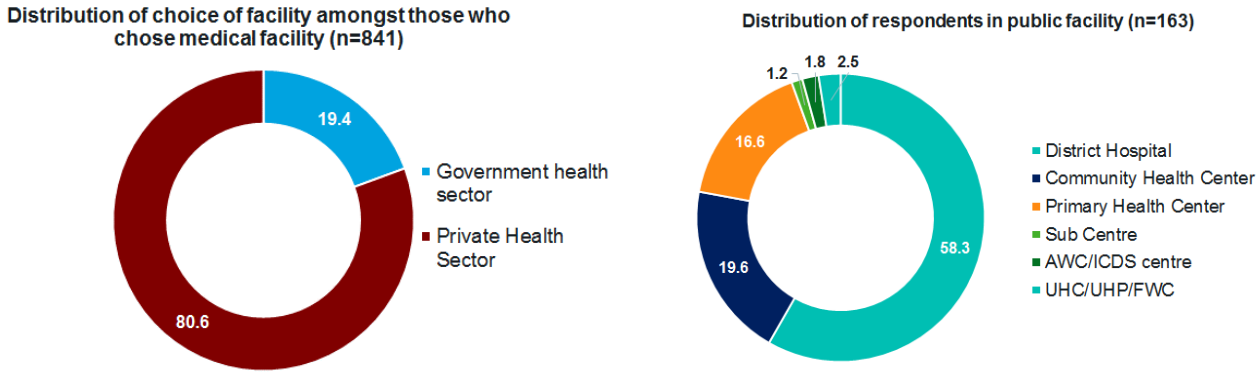
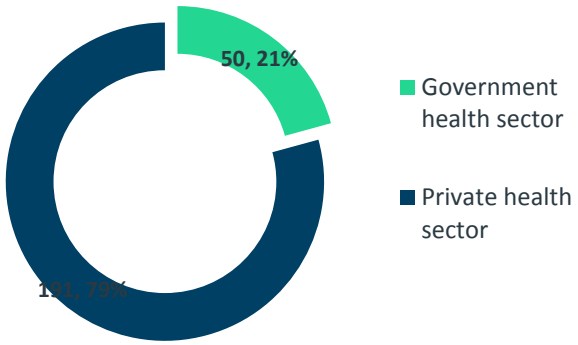
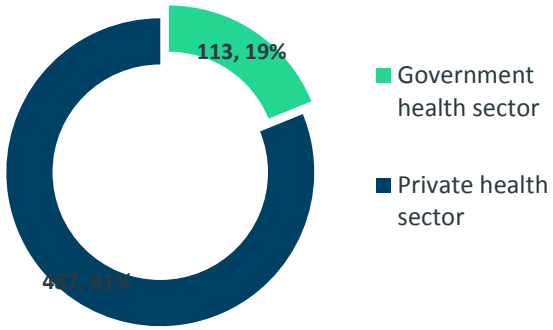


Figure 30:Distribution of choice of facility among those opted for medical treatment (left) and distribution of choice of facility amongst those who seek treatment in public facility (right)

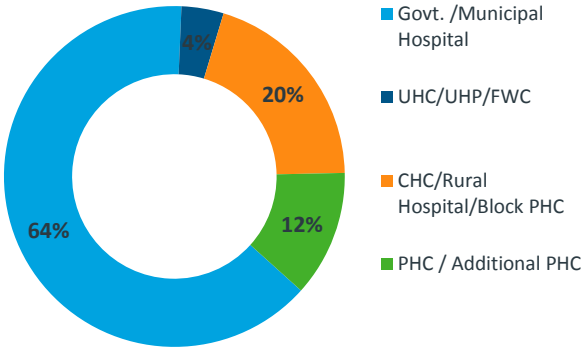
Distribution of choice of facility amongest those who choose medical facility in Urban Ward (n=241)



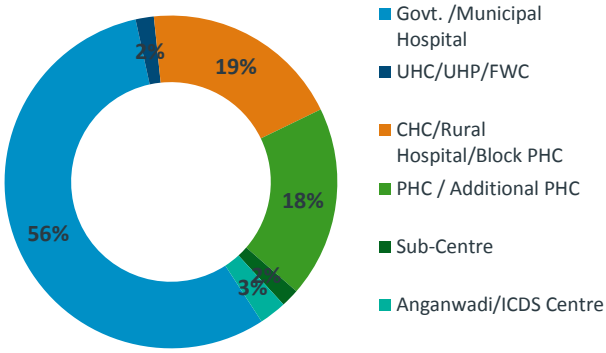
Distribution of choice of facility amongest those who choose medical facility in Rural Area (n=600)



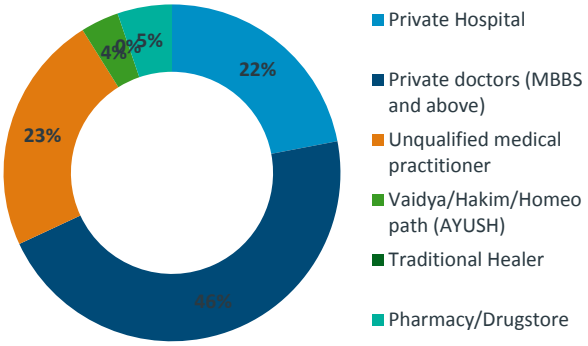
Distribution ofrespondents in Public facility in Urban Ward (n= 50)



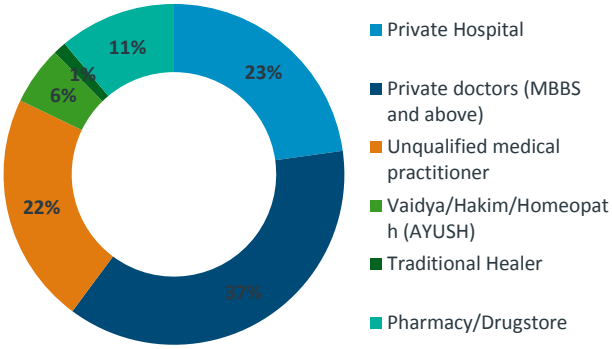
Distribution ofrespondents in Public facility in Rural Area (n=113)



Distribution ofrespondents in Public facility in Urban Ward (n= 191)



Distribution ofrespondents in Public facility in Rural Area (n=487)



More respondents in rural area (81.2%) compared to urban area (79.3%) seek treatment from private facility. Among respondents seeking treatment from the private sector, 77.8% (654/841) got treated in the OPD without

any need for hospitalization (76.8% in urban area and 78.2% in rural area). The majority among these (654, 39.9%) received treatment from private doctors' clinic (those with an MBBS qualification and above), 22.9% received treatment from unqualified medical practitioners, 21.3% in private hospitals, 9.8% from the pharmacy, 5.2% from alternative medicine practitioners such as a Vaidya/Hakim/Homeopath/Ayurveda (AYUSH) and 0.9% from traditional healers.

Treatment pathways & case management at the health facility & community level

This section details the treatment pathway for home-based vis-à-vis medical treatment. The areas covered include types of medicines used, treatment duration, investigations carried out and treatment outcomes.

Among all respondents, 5.1% chose home-based remedies for treating ARI. As anticipated, percentage of respondents in rural areas (87.2%) using home-based treatment was much higher than in urban areas (12.8%). Nearly two-thirds of the children with ARI (74.7%) treated with home remedies were cured, 10.7% were not cured while 14.7% children were still under home-remedial treatment during the time of the survey. Multiple remedies have been tried and tested for treating pneumonia. Among the home-based treatment options, the first choice of treatment was ginger juice (25.3%), followed by turmeric and milk (20%), tulsi juice (18.7%) and honey and tulsi (13.3%).

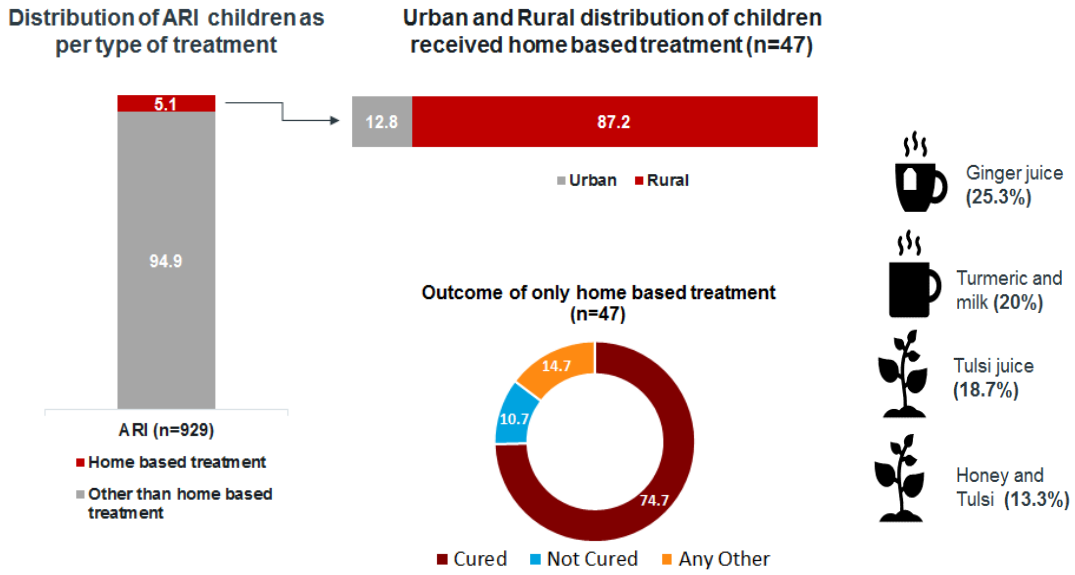


Figure 31: Preferred choice of treatment among respondents for ARI children (left), urban-rural distribution of those seeking home based treatment and outcome of the home base treatment (middle), home remedies provided by respondents to ARI children at home (right)

The treatment pathway for pneumonia at both government and private facilities was observed to be very similar. It was seen that at both kinds of facilities more than 90% children suffering from ARI were treated within the first two days. Cough syrup (95%) was the drug of choice for ARI management across both the sectors. However, the likelihood of taking cough syrup, and antibiotics was higher in urban areas compared to rural areas, although the difference was not statistically significant.

Our study revealed that majority of the ARI cases were managed in OPD alone (95.4%), 1.3% were treated in OPD but needed hospitalization while few needed immediate hospitalization (3.3%). Figure 33 shows OPD vs IPD treatment in government and private facilities.

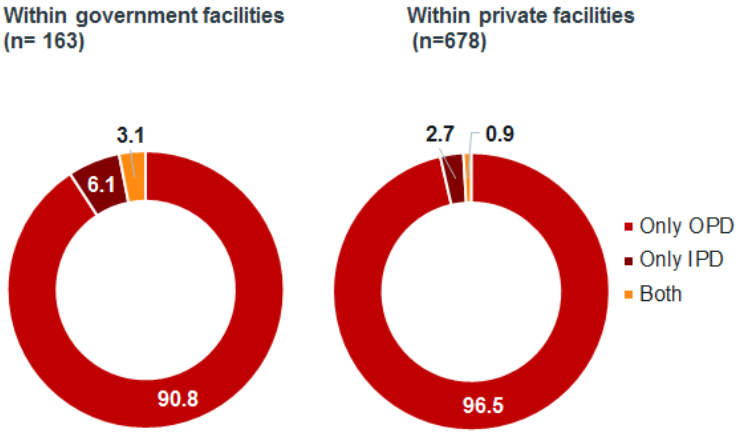


Figure 32: OPD vs IPD treatment in government and private facilities

Government - Among the cases treated in government facilities, 90.8% were treated in the OPD while 3.1% needed hospitalization following treatment in the OPD. There were 6.1% of cases which needed immediate admission in the hospital. The average length of stay was seven days.

Private - In observing the pathway of treatment in private facilities, it was found that 96.5% were treated in the OPD while 0.9% needed hospitalization after being treated in the OPD. The percentage of children who required admission was 2.7%. The average length of stay in the private facility was three days.

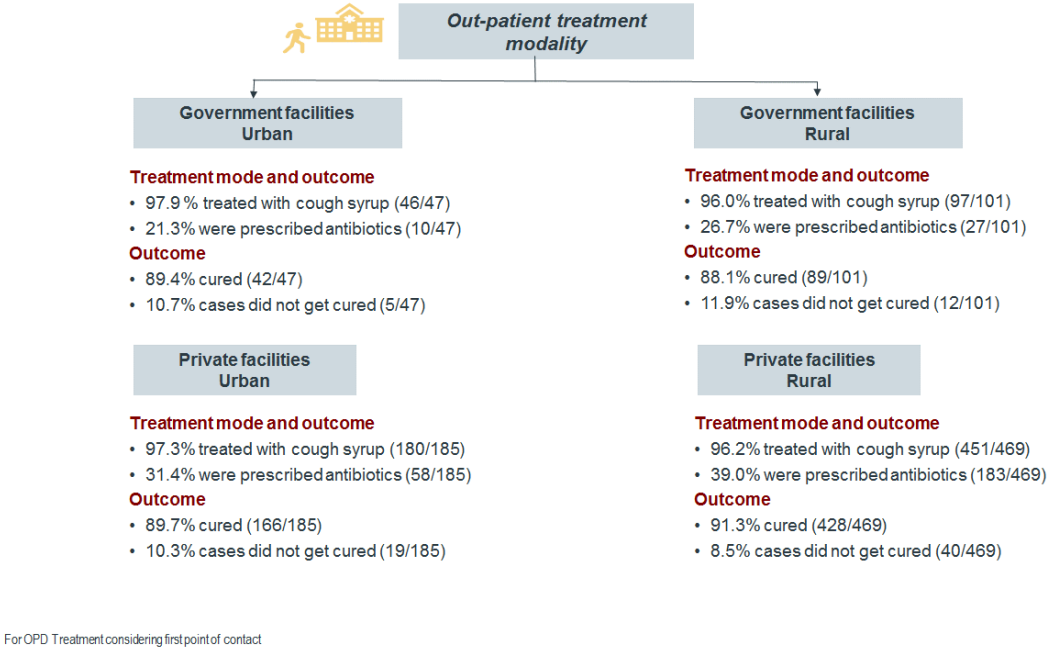


Figure 33: Outpatient treatment modality

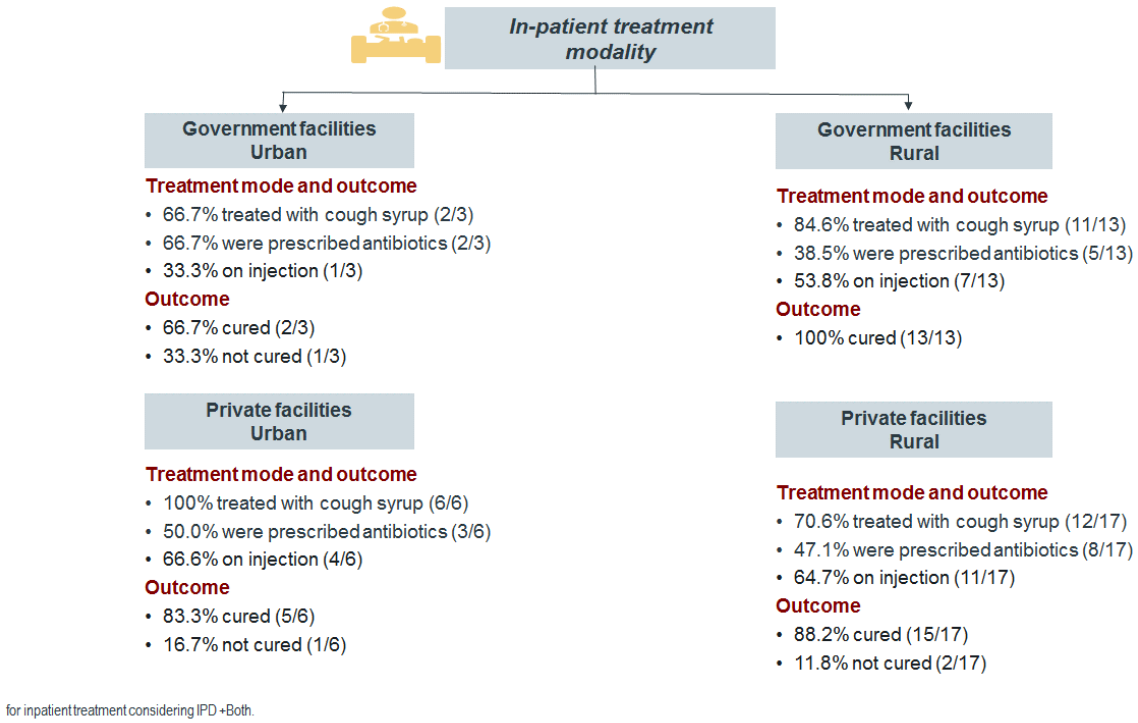


Figure 34: Inpatient treatment modality

Most practitioners prescribed antibiotics and supportive symptomatic treatment. In outpatient facilities, prescription of cough syrups was almost universal irrespective of type of facilities and settings. It was observed that antibiotics were prescribed more often in the private sectors. As care-givers lacked understanding/knowledge and expected rapid symptomatic improvements, this frequently led them to sequentially consult multiple providers. There were reports of multiple categories of drugs like cough syrups, antibiotics, antipyretics, steroids, bronchodilators and non-allopathic drugs being prescribed.

For inpatient treatment, data was insufficient for any meaningful conclusion.

Cost implication

The cost of treatment not only impacts the health seeking behavior amongst community members but also their choice of facility (government and private) and type of medication (home remedies or medicines). The cost of seeking medical treatment in urban areas was found to be almost double the cost in rural areas. Moreover, in rural areas, the cost incurred for treatment of ARI symptoms was five times higher in private facilities compared to government facilities.

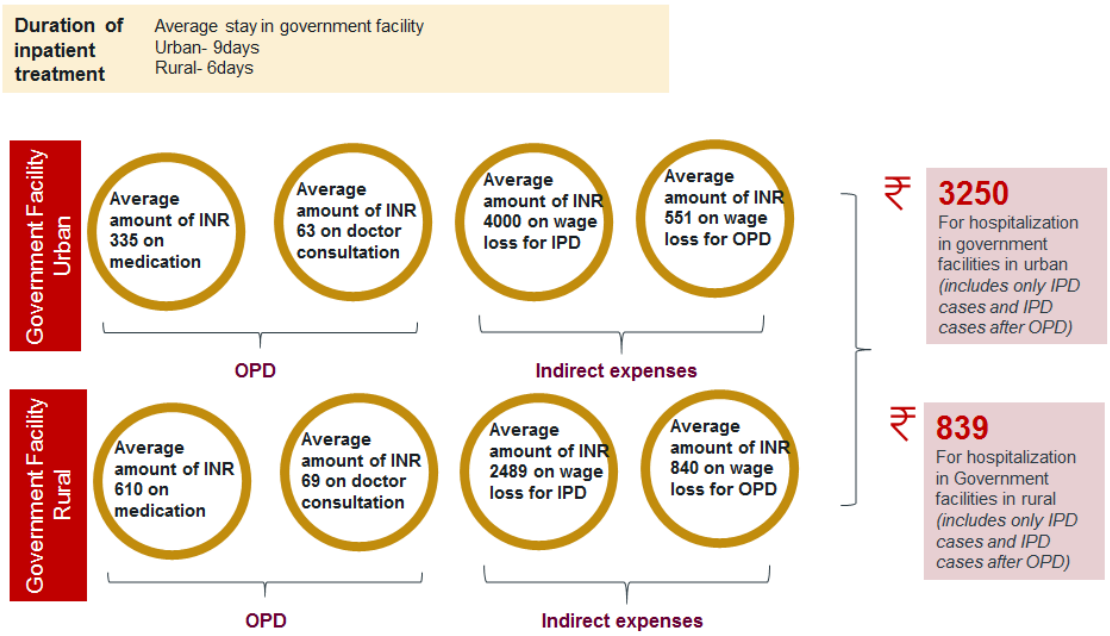


Figure 35: Cost implication for seeking medical treatment in government facility

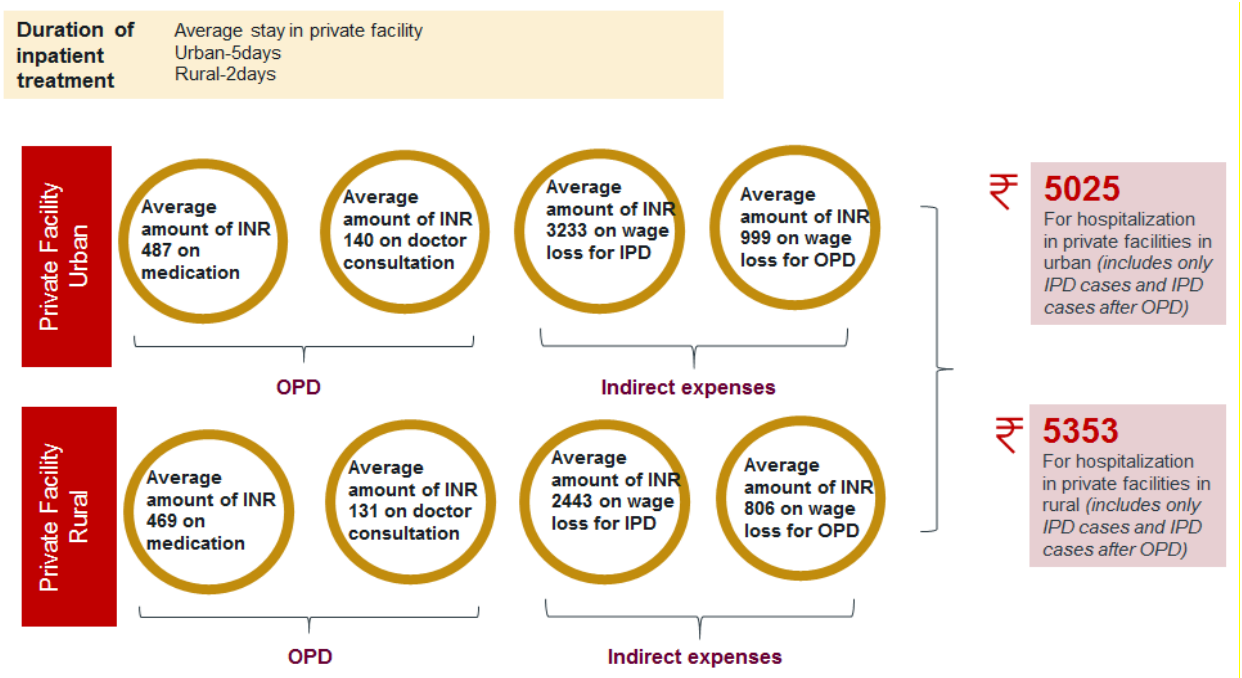


Figure 36: Cost implication for seeking medical treatment in private facility

Summary points from primary research

- Out of 6930 children surveyed, 929 (13.4%) were found to be suffering from ARIs two weeks preceding the survey
- The factors associated with ARI include initiation of breast feeding within 1 hour of birth, exclusive breast feeding within 6 months of age and knowledge of mothers about weight of their children.
- Prevalence of ARI was higher among children residing in households without a toilet facility (15.3%) as compared to those residing in households with a toilet facility (12.9%).
- Poor Ventilation seemed to be associated with ARI/ pneumonia, more than the presence of a separate kitchen
- Prevalence of ARI was significantly higher among children residing in households using non-improved fuels (14.2%) than those households using improved fuels (12.4%) (OR .86; 95% CI 0.75, 0.96)
- 82% of respondents seek medical treatment within the first two days of occurrence of symptoms of ARI
- Private sector was by far the most preferred choice of facility by most respondents (>80%)

3.3 ASSESSMENT OF FACILITIES FOR PNEUMONIA MANAGEMENT

Preparedness of health facilities is the cornerstone for successful implementation of pneumonia management. Ensuring that frontline health workers are available and accessible, adequately trained and supported to deliver these services; that families and communities can demand health services for a sick child; that there is a functioning referral system in place for more severe cases; and that facilities are equipped with the management protocols and antibiotics and oxygen to provide care… all are very critical to achieving our health goals.

a) ***Tertiary and secondary care hospitals:***

Medical College: While assessing the facilities for pneumonia management, it was found that the two medical colleges[48] visited during the study were well prepared for pneumonia management, despite heavy patient load. However, training of the staff was a concern in medical college with 14 out of 19(73.7%) of doctors in MC trained on F-IMNCI and IMNCI while only 12 out of 26 (46.2%) of staff nurses were trained on IMNCI.

CHC and DH:

Infrastructure and Human Resource:

- 70% DHs (7 out of 10) and only 30% CHCs (6 out of 20) and had separate pediatric OPDs, with only 5% CHCs displaying protocols majorly focusing on classification of pneumonia. No such posters were found in any of the DHs.
- **Lack of infrastructure and human resources** was evident across CHCs with only 6 out of 20 (30%) having New Born Stabilization Units (NBSU) and two-thirds of these (4 out of 6) having a pediatrician; however, 83% (5 out of 6) had adequate staff nurses. While it was observed that 80% of DHs (8 out of 10) had functional SNCUs with the required human resource and equipment.
- Separate pediatric ward was present in only 3 out of 20 CHCs while pediatrician was available in 45% of them.

Training of Staff:

- It was found that out of 29 doctors in DH, 14 were trained on F-IMNCI (48.3%) and 13 in IMNCI (44.8%) while only 36.4% of staff nurses (16 out of 44) were trained on F-IMNCI. Out of 17 doctors in CHCs, 6 (35.3%) were trained on F-IMNCI and 10 (58.8%) were trained on IMNCI while 47% staff nurses (7 out of 15) were trained on F-IMNCI.

[48] Uttar Pradesh and Madhya Pradesh

Equipment and Supplies:

- Out of 20 CHCs, 13 had pulse oximeters (65%), 17 had oxygen supply (85%), 15 had nebulizers (75%). District hospitals presented a better picture with 90% of them having all three.
- Availability of drugs was satisfactory at both CHC and DH with 80% CHCs (16 out of 20) and DHs (8 out of 10) having injection ampicillin and injection gentamycin. However, availability of dispersible tablets of Amoxicillin was lower with 60% of DH (6 out of 10) and 70% (14 out of 20) CHC reporting.

Table 17: Preparedness of medical college, district hospital and CHC for pneumonia management

	Medical College	District Hospital	CHC
Infrastructure	All had functional NICU	**80%** of **DHs** had all functional **SNCU**	**30%** of **CHCs** had **NBSU**
	All had separate OPD	**70% DHs** had a **separate OPDs**	**30%** of **CHCs** had a **separate OPDs**
	All had separate pediatric ward	80% had separate Pediatric ward	15% CHC had separate pedatric ward
Services	OPD, IPD and emergency services were available aross all MC	OPD, IPD and emergency services were available aross all DH	
Human Resource	Round the clock availability of pediatricians	**20% of DHs lacked** human resources (Pediatrician 2 /10, SNCU in charge 2 /10)	**55% of the total CHCs had staff nurses and 45% had a pediatricia**n with full availability of medical doctors
	Round-the-clock availability of FBNC trained doctor	85.3% of SNCU staff nurses were trained on FBNC	All functional NBSU **had staff nurse** while **two third had a pediatrician**
Equipments & Supplies	Both MC had X-ray, Nebulizer, Foot Operated and Suction Machine in SNCU. Oxygen supply and Pulse oximeter were available in SNCU and Pediatric ward of both MCs. All the available equipment were functional	40% of DH had Portable X-ray machine, 90% had Nebulizer, 40% had Foot operated suction machine. *All the available equipment were functional.* Pulse oximeter and Oxygen supply available in 90% in SNCU and Pediatric ward.	65% CHC had pulse oximeter, 85% had oxygen supply
	Both MC had all the essential medicines: Injection Ampicillin, Injection Amoxicillin, Injection Gentamycin in SNCU as well as Pediatric Ward	80% had Ampicillin and Ceftriaxone, 80% had Gentamicin and Salbutamol, 60% had Amoxicillin. Where as only 30% had penicillin.	80% had Injection Ampicillin, 80% had injection gentamycin, 75% had nebulizer
IEC Material	8% of MC displayed protocols with focus on awareness on signs of pneumonia followed by its classification	8% of DH displayed protocols with focus on awareness on signs of pneumonia followed by its classification	**5% CHCs displayed protocols** focusing on pneumonia classification

b) ***PHCs and SCs***

Infrastructure and Human Resource Availability:

- Only 10% of PHCs had beds reserved for pediatric cases. IEC material was observed only across 35% of PHCs and SCs.
- 80% of PHCs had Medical Officer, 55% had staff nurses and 90% had ANMs. While assessing the sub-centres, it was found that ANM was present across all the sub-centres covered under the study while the Multi-Purpose Worker (MPW) was available in 28% of the centres.

Training of Staff:

- Less than half of MOs were trained on F-IMNCI (48%) and IMNCI (35%), while 25% staff nurses were trained on F-IMNCI and only 37% ANMs were trained on IMNCI.

Equipment & Supplies:

- Only 10% of PHCs had X-ray facility, 40% had nebulizers and 45% had foot-operated suction machine. ***It was encouraging to note that all the available equipment was functional across PHCs at the time of the study visit***.

- Across all the sub-centres during study visits, it was observed that a weighing scale was available both for infants and children. Ninety percent (90%) of sub-centres had a digital thermometer while the availability of ARI timers (28%) and oxygen supply (15%) was quite low. Moreover, all the available equipment was not functional at the time of the visit. Among SCs, 68% had dispersible tablets of Amoxicillin while only 30% had the injection Gentamycin. This shows a huge gap in the existing services and supplies at the sub-centres.

Table 18:Preparedness of PHC and SC for pneumonia management

	PHC	SC
Infrastructure	**Only 10% of the PHCs had beds reserved for pediatric cases** **35% of PHCs displayed protocols** with focus on awareness on signs of pneumonia followed by its classification	**35% of SC displayed protocols** with focus on awareness on signs of pneumonia followed by its classification
Human Resource	80% PHCs had Medical officer. Out of these, 48% were trained on F-IMNCI and 35% on IMNCI 55% PHC had staff nurses. Out of which only 25% were trained on F-IMNCI 90% PHCs had ANM. Out of these, only 37% were trained on IMNCI	All **SCs had ANM** while **MPW** were available **only in 28% of SCs**
Equipment & Supplies	**10% of PHCs had X-ray**, **40% had nebulizer**, **68.4% had pulse oximeter, 45% had Foot Operated suction.** Other equipment's including oxygen supply (78.9%) were available across more than half of the PHC. ***All the available equipment was functional***	All the **SCs** had **weighing scale** for children and infant, 90% had digital thermometer, 28% had ARI timer and only 15% had oxygen supply while ***all the available equipment's were not functional*** at the time of visit
	Only 70% of PHCs had **Tab Amoxicillin, 60% had injection ampicillin, 75% had injection Gentamycin** while **Cotrimoxazole** was found in **85%** of the PHCs	95% had syringe, 68% had Syrup and Dispersible tablet of Amoxicillin, 63% had dispersible tablet Cotrimoxazole, 55% had Syrup Cotrimoxazole while only 30% had injection Gentamycin.

Summary of findings

- Medical Colleges seemed to be prepared in terms of facilities for pneumonia care. However, the system preparedness for providing inpatient care for pneumonia cases was found to be compromised at district and sub-district level.
- While observing the facilities at district and sub-district level, a huge gap was found in the services at district level compared to sub-district level. At least 70% DHs had adequate infrastructure, special care units, human resources, equipment and supplies while training remains an issue at district level public facilities as well. However, sub-district facilities presented a different picture. Though majority CHCs had adequate equipment and supplies, not even half had adequate infrastructure and human resource while majority. While the major concern area at PHC and SC was human resources crunch rather infrastructure and supplies.
- Trained staff and reporting remained an area of concern across health facilities.

3.4 FINDINGS FROM QUALITATIVE ASSESMENT

Different categories of stakeholders including Government officials, implementation partners, health care providers and community members were interviewed to explore and understand various aspects of ARI/ pneumonia. A total of 153 IDIs and 40 FGDs were conducted.

The broad domains of exploration included their perceptions on existing policies and guidelines for management of pneumonia among children, their perceptions on predisposing factors of pneumonia, care seeking behaviour, performance gaps of health system, explore good practices and innovations for pneumonia case management and to understand challenges in addressing pneumonia. Responses obtained from them have been categorized into the following thematic areas.

Perceived burden of pneumonia according to healthcare providers at various levels:

All the stakeholders agreed that pneumonia continues to be a public health concern. More than half of thirty ANMs interviewed perceived pneumonia as a major problem in children under 5 children. Other half did not consider pneumonia as burden. However, they mentioned that most common ailment in children was cough, cold, fever and diarrhoea.

Out of fifteen medical officers interviewed, more than 90% mentioned pneumonia and diarrhoea the most common reason of sickness in children. They cited that cough and cold were most common reasons for which parents bring their children in the health facility. Similar to MOs, more than 90% of thirty staff nurses were of opinion that pneumonia was one of the main health problems in their area. One staff nurse from Bihar mentioned dearth of facilities for immediate treatment as the reason behind fatality of the disease. Almost 25 out of 33 SNCU and NBSU in-charge (respondents) found it difficult to pin point pneumonia as major ailment in neonates. All mentioned that most common cause for neonatal admission were asphyxia, sepsis, bronchitis, aspiration and respiratory distress. Further, they mentioned that they seldom got to know if children under their care had pneumonia or some other possible serious bacterial infection.

Of 40 paediatricians interviewed, more than 80% perceived that most common ailments in children under 5 years were ARI, cough and cold, diarrhoea, Vaccine Preventable Diseases (VPDs), fever followed by other illnesses. They added that though pneumonia is not a direct contributor for mortality; malnourishment, lack of knowledge about disease, not taking timely treatment, weak immunity makes children more susceptible for pneumonia, which at times becomes life threatening.

Existing policies and guidelines

Out of 31 respondents interviewed, 90% of Government officials reported New-born Action Plan (NABP), Home-based new-born care (HBNC), IMNCI and Mission Indradhanush as the key programs to address pneumonia. Most of them (25 out of 31) agreed that the guidelines emphasize on exclusive breast feeding during their stay in the facilities (place of delivery) that can prevent pneumonia in children. One to one counselling on EBF and timely initiation of complementary feeding before discharge from the facilities can have long term implications on prevention of pneumonia in children. One public paediatrician from Madhya Pradesh was of opinion that efforts on promoting importance of complementary feeding were not as robust as for promotion of optimum breastfeeding practices. One state official from Rajasthan although praised the governments' efforts to create awareness on breastfeeding, but at the same time felt the need to create more awareness on dietary diversity in pregnant and lactating women, which he felt was strongly associated with children's health.

Besides, counselling during home visits (through HBNC) and outreach sessions can reiterate these messages. Capacity building of grassroot level functionaries are aptly covered through existing programs. Supportive supervision is given due importance across all programs such as facility based and home-based programs and also during outreach sessions.

Awareness among care providers about signs and symptoms of pneumonia

Our interactions with care providers revealed that only those staff nurses and ANMs who were trained knew the signs and symptoms which are critical for disease identification. Others related cough, cold, fever and rapid breath to ARI/ pneumonia.

Trained ANMs had adequate knowledge on common signs and symptoms of pneumonia identification. Majority of them mentioned rapid and loud breaths, difficulty in breathing, chest withdrawing, nose blockage, reduced feeds, weakness, high body temperature, fatigue, increased heart rate as common signs of pneumonia. Few also mentioned about cyanosis in advanced cases. However, those who were not trained could not tell pneumonia specific symptoms. When asked if there were different identification signs for child 0-2 months and older, only a few could mention different breathing rates of 60 or more per minutes in 0-2 months old baby and 40 breathes per minutes in child of up to 5 years age as identification signs. Those who attended the any of the trainings further added that in a child up to 7 days old, rapid breathing was a sign of severe infection.

Rapid breathing, difficulty in breathing, severe chest indrawing are the common symptoms. Child also has difficulty in taking feeds.
-ANM, Uttar Pradesh

The most common sign is chest indrawing, high body temperature, nose block and children are very uncomfortable because of difficulty in breathing.
- ANM, Rajasthan

Rapid breath, loud breaths, cold, nose blockage, and if the baby's lips or he himself has turned blue are the classical signs of pneumonia. We confirm the blood oxygen level with the help of pulse oximeter. Child also has rapid heart rate and high fever.
- ANM, Madhya Pradesh

Their behaviour starts changing and they don't feel hungry due to which they don't consume any healthy food item. They suffer from some chest problem and a problem of congestion.
– ANM, Bihar

The care providers expressed that WHO recommends checking the rapid respiration rate with ARI timer, watch or counting beads are required for labelling case as pneumonia. All the states reported that there were no aids provided to ANMs for counting respiratory rate. However, majority of them had thermometers with them for measuring temperature. ANMs from Madhya Pradesh added measuring height and weight of the child, checking eye colour and nutritional status for pneumonia identification.

Few ANMs from Bihar who knew using nebulizer in pneumonia treatment demanded the provision of nebulizer and digital thermometers in their facilities for providing better care at the SC.

Diagnosis is done by observing symptoms like chest indrawing. High fever is checked using thermometer and breathing rate is counted using wrist watch.
-ANM, Uttar Pradesh

I just observe the child's chest while counting his breath. I do not have any timers. I think I should be provided with a nebulizer too.
-ANM, Bihar

The stakeholders mentioned that apart from the field level functionaries, care providers are not always adept in identifying signs and symptoms of pneumonia. A respondent remarked, "Even doctors do not know about the signs and symptoms of pneumonia, therefore it is not surprising if community does not know how to identify pneumonia."

"The FLHW and doctors do not know, how are villagers supposed to know the symptoms of pneumonia? Very few people, which include health officials and doctors knew about World Pneumonia day in November"
- Development partner, Bihar

State level officers from Madhya Pradesh cited the need of having a simple book stating all the clinical signs of pneumonia in pictorial format. He mentioned that booklet should be made keeping in knowledge and practices of community in mind. District officer from Bihar stated that government should be prompter and more active in updating the administrative officers and doctors about latest newsletters, and advancements in the field. He demanded periodic workshops on the subject. Officials from Jharkhand and Bihar were of opinion that medical superintendents of civil hospitals should be provided budget for filling in logistics requirement. Uttar Pradesh officials demanded having more budget for training and establishing paediatric ward in the hospitals.

MS should have power to buy stuff on his own. I mean if he needs to replace ambu bag, he should be able to buy it immediately – Official, Jharkhand

All of them recommended increased number of trainings for staff, and refresher trainings for better retention of their knowledge and skills. Periodic CMEs on topics such as basic neonatal care, malnutrition, anemia, preventive measures, importance of nutritious food in children and mothers can help address the problem to some extent. Leading private pediatricians also help in spreading awareness on importance of exclusive breastfeeding and continuous feeding.

Knowledge on treatment and referral of a child suffering from pneumonia

Majority of ANMs interviewed stated that they decide on treating or referral according to the child's condition. Most of them stated that if child is stable and not showing any danger sings, then home remedies work. They counsel women on keeping their children warm, covered and not to give them frequent baths with cold water, especially in winters. But when the child comes with danger signs, they ask the parents/caregivers to go to the government health facilities.

While ANMs from Madhya Pradesh and Rajasthan reported prescribing antibiotics before referring the children to higher facility, most ANMs from Uttar Pradesh mentioned counselling and referring children to higher facilities without any pre-referral treatment. Antibiotics available for treatment of pneumonia were Amoxicillin (tablets and syrup), gentamycin and co trimoxazole. A few ANMs also mentioned giving paracetamol for fever. During referral ANMs mentioned that they counsel women on hygiene, clean environment, protection from cold, exclusive breastfeeding for first six months, kangaroo mother care.

Almost all the ANMs stated that no written guidelines on pneumonia prevention and treatment were shared with them. It was reported by ANMs from MP that they knew about pneumonia because of the training given to them by UNICEF under *Dastak* program.

Information like child's name, child's age, Parents' name, duration of illness, symptoms are collected. After initial treatment like Co-trimoxazole, patient is then further referred. 108 facility is arranged only in emergency cases.
-ANM, Bihar

I counsel on KMC and refer to CHC or any government hospital. I learnt in a training that it is beneficial to refer to facilities with KMC arrangements.
-ANM, Uttar Pradesh

Almost all the ANMs were affirmative about the need of giving them more trainings. Majority of them insisted that they should be given training on IMNCI and SBA along with exclusive training on pneumonia and diarrhoea. They further stated that trainings make them confident to interact with community. In MP, ANMs complained about having traveling in the field for long periods of time, thus unable to provide services at SCs. They wanted dedicated SC for working.

We need better training to communicate more effectively so that parents are motivated towards health benefits. We wish to learn more about mother & child health.
-ANM, Madhya Pradesh

Factors predisposing to pneumonia

In order to understand the perceptions of stakeholders on addressing the problem of pneumonia, they were asked about different factors that predispose to pneumonia. The factors that emerged are as under:

Socio economic factors: 62 out of 70 healthcare providers (respondents) mentioned that factors such as poverty, overcrowding, poor hygiene, unavailability of clean drinking water predispose to pneumonia. Besides, another factor, indoor air pollution resulting from use of fire woods and cow dung as cooking fuels was incriminated as a cause of pneumonia. More than 60% officials out of 40 interviewed from Bihar, Madhya Pradesh and Jharkhand officials cited indoor pollution as a main factor for having pneumonia among infants. Fire woods and cow dung were most commonly reported fuels. Officials from Bihar mentioned open defecation from urban slums report high cases of pneumonia. Rajasthan and Madhya Pradesh officials stated unavailability of clean drinking water a major reason. Open defecation was highlighted as a cause of pneumonia by some respondents from Bihar. These factors often get aggravated by cultural factors and beliefs of the community. For instance, the belief that disease could get cured with some *jhadfunk* or the superstition that the child got sick because of evil's eye prevent the community from getting treatment on time.
Preterm babies, those with low birth weight and malnutrition, and those who have suffered from birth asphyxia increase the susceptibility of children to pneumonia.

Pneumonia is a multifactorial disease. The major factors contributing are malnutrition, infection, air pollution and use of indoor chullah
- Official, Jharkhand

In urban slums, sanitation and hygiene is a big problem. Children often fall sick because of water born disease. There is very little awareness on importance of clean and purified water.
- Official, Madhya Pradesh

"Mothers should be made aware on symptoms of pneumonia like fever, fast breathing, child not feeling hungry, weight loss etc."
- Paediatrician, Uttar Pradesh

As mentioned by the 55 out of 70 respondents, risk of pneumonia increases because of inadequate knowledge of the community regarding the factors that can prevent and protect children from pneumonia. They expressed that community should be made aware about the benefits of using clean fuel and its association with pneumonia. On similar lines, role of exclusive breast feeding, and complementary feeding is usually not considered a measure to protect children from pneumonia, though these are often discussed in the context of malnutrition.

I can say with confidence that there is a lot of difference in pneumonia presentation in urban and rural settings. Where rural poor has open defecation and indoor pollution as leading factors, urban poor population deals with pollution, poor sanitation, they live in under constructed areas and sometimes they don't even get sunlight.
- Official, Bihar

Rajasthan still has high number of diphtheria cases. The reason for the same is left out cases as booster is given at 5 years of age and there is no mechanism to trace children above 2 years of age. VPDs eventually lead to pneumonia.
- Development partner, Rajasthan

Stakeholders also noted that differences exist between urban and rural areas in factors that could lead to pneumonia.

Role of vaccination in prevention of pneumonia

The stakeholders were asked about the efficacy of vaccines in prevention of pneumonia. Measles and diphtheria were cited as the two common diseases that are associated with pneumonia. Hence the role of measles and DPT vaccine assume importance in prevention of pneumonia. However, partial and inadequate coverage in the population pose a barrier to pneumonia prevention. Common reasons behind inadequate coverage include migratory population, less awareness in the community, unavailability of vaccine at healthcare facilities and a smaller number of cold chain points to cater to large population. On the other hand, immunization was not perceived as a potential factor for protection from pneumonia. Although they seemed to know about measles and DPT, they could relate these to pneumonia prevention. They were ignorant about PCV vaccination.

When asked about PCV, all of them stated that PCV was relatively new and therefore difficult to comment on the efficacy. The respondents were not very convinced about the effectiveness of PCV vaccine in prevention of pneumonia. Those from private sectors stated that pneumonia has multifactorial aetiology. The vaccine can only control disease of bacterial origin, but it will not cover all causes. However, WHO officials mentioned that the vaccine will be effective in the long run.

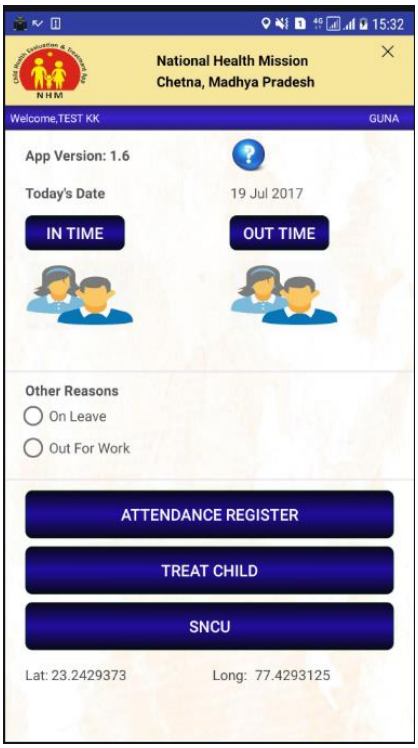
Newer vaccines cannot circumvent the health system challenges. One of the respondents mentioned that we are still not able to address the requirement of basic immunization program, what to talk of newer vaccines.

Pneumonia is a multifactorial disease and PCV can only affect bacterial pneumonia. In MP, the reason for developing pneumonia changes according to geography
- Official, Madhya Pradesh

It's too early to say if PCV can prevent pneumonia. If we do a cost-effective analysis of pneumonia, I don't see a need for a new vaccine. The state should first work on stock out of existing vaccines. Even DPT gets out of stock. Same will be the fate of pneumonia
- Official, Jharkhand

Monitoring and evaluation strategies

Clear guidelines for monitoring and evaluation are available. However, their implementation remains a challenge. The stakeholders expressed that monthly review meetings are held at the district level from all states where child and maternal death reviews are conducted. Discussions on deaths resulting from pneumonia are also discussed. CMHO, district health officers, state consultants, pediatricians are reported to be part of such review meetings.

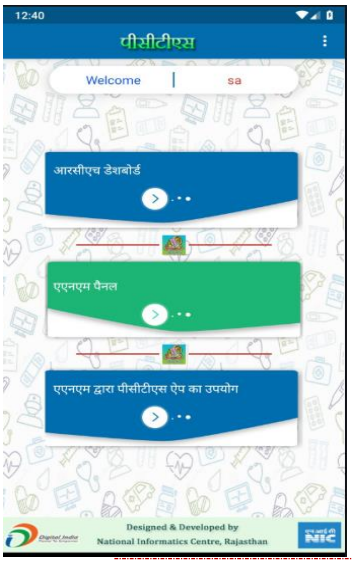


Besides this, the states shared their experiences and efforts to strengthen the monitoring in their respective states.

In ***Madhya Pradesh*****,** review meetings are conducted for monthly Child Death Review.

It was reported that because pneumonia has not been a reason for child mortality in recent times, it was not a topic for discussion. They reported having dedicated checklists for CDR. In the meetings, detailed discussion on causes of child death takes place. The state reported doing paperless monitoring with the use of "supportive supervision app" which enables the state officers to monitor real time work.

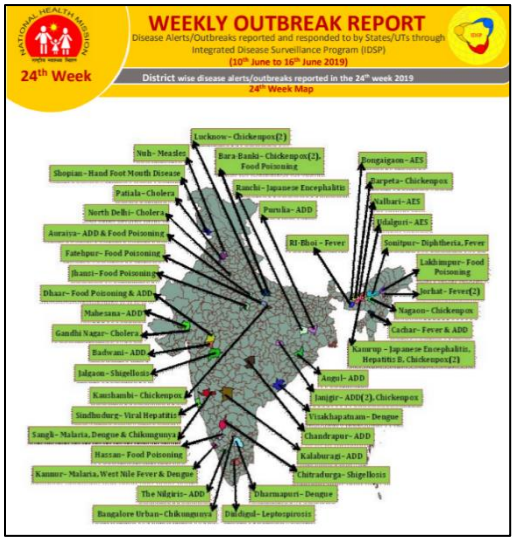
IT monitoring is carried out with the help of app. 51 districts and 55000 villages are visible with a single click. No one can fudge the data now. I can tell if FLHW is actually in the session or not by sitting in my office. – Official, Madhya Pradesh



The district officials from ***Rajasthan*** mentioned having review meetings once or twice in a month at district level, and once a month at block level. They also reported app-based monitoring and discuss PCTS data during review meetings. They stated that agenda for meeting is set according to current topics and events. They gave reference to a discussion on PCV vaccine in the recent past. Village level supervision was also conducted using VHND checklist.

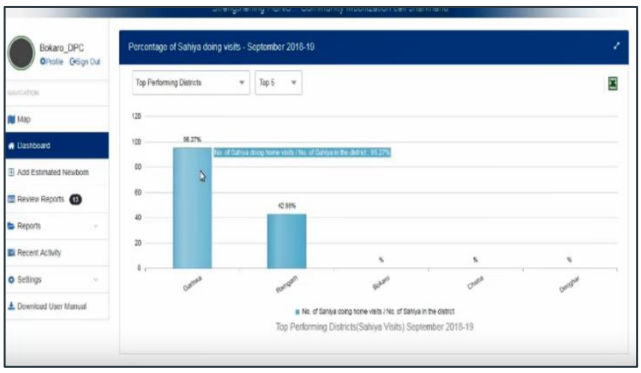
Further, they mentioned that facility level monitoring was done through hospital visits. They reported checking the records on child health services and also take feedback from patients. Citing the importance of monitoring and supervision, personnel from Rajasthan expressed that disease surveillance and review could throw some light on the actual prevalence of ARI but that is not done at the moment.

I supervise the running programs; visit villages on VHND. I check if ANM is working properly, if she has all the medicines and functional equipment. - Official, Rajasthan



Monthly review meetings in **Uttar Pradesh** are conducted in the districts which were reported to be headed by district magistrate. District officials mentioned that discussions are carried out according to current topic and not disease specific. They mentioned that UNICEF of ficials are part of review meetings. The most commonly discussed topics are HBNC, child weight and family planning. They also mentioned having discussions on OPD and IPD numbers and gap analysis. Integrated Disease Surveillance Programme (IDSP) portal is used for data analysis for PHC and CHC. Further, they mentioned using HMIS for getting information about HIV patients, inpatients, outpatients, number of deliveries, mother mortality rate, infant mortality rate, still births, tuberculosis cases, number of ARIs and diarrhoea. One of the stakeholders opined that data from these two portals should be triangulated for better clarity.

In ***Jharkhand*** the meetings at district level were reported to be conducted on monthly basis where maternal death reviews were conducted by CMO. At the time of visit, planning was going on to introduce child death reviews as well. The officials mentioned that programs under RCHS, national level programs and pneumonia are topics of discussion. They further mentioned using Sahiya Portal for tracking the home visit coverage of FLHW in the state.



Respondents from **Bihar** also mentioned having review meetings once a month where they discuss current situation and finances. In their last meeting they discussed the training requirement of pneumonia. The district officials reported the use of Darpan App (mobile based) for real time monitoring of health services in government hospitals of the state. The app allows the health department to keep track of government health facilities, drug availability, functional and non-functional equipment at the facilities and ambulance availability among other things.

Overall, the respondents believed that besides monitoring data on pneumonia, data on prevent and protect indicators should also be tracked. Information obtained from Zn and ORS supplementation, data from SNCU, NBSU and NRCs, immunization related facts could give useful insights into the health system factors that have a bearing on pneumonia as well.

"Data analysis of HMIS is conducted which provides insightful information. There is less reporting of Pneumonia. The data is compared with state level figures and strategies are formulated accordingly."
Official, Madhya Pradesh

HMIS gives a wealth of data on various aspects of child health including pneumonia. However, state and district program officials from Rajasthan and Jharkhand mentioned that referral outcomes should be included in HMIS. Other respondents from UP highlighted the need to analyse HMIS data and cross validate it from other resources.

The available data could be analysed to know how many deaths took place, their reasons- whether those were due to delayed care seeking, or delay in initiation of treatment, or due to inappropriate choice of facilities as indicated by multiple referrals. These can be interpreted in the light of seasonal variation and health systems factors.

"There is monitoring and evaluation department at district level. All the parameters like immunization reach & coverage, breast feeding etc. are analysed at district level. Based on the data analysis, poor performing regions are identified, and reasons are evaluated. I think the same should also be carried out at block level as well."
- Official, Madhya Pradesh

Perspectives of the community:

Interactions with almost 180 mothers revealed gaps in knowledge being transmitted to the community. Only 54 respondents stated counselling on pneumonia from FLHWs. Where it was done, it was limited to fever, and rapid breathing. Twenty of them mentioned about knowledge sharing by FLHW on malnourishment and maintaining hygiene.

More than 100 out of 180 women denied any home visits by FLHWs. This appears to be clear gap in the accessibility of care. Often the source of knowledge is a care provider when a child gets admitted for pneumonia.

Preferred choice of treatment of the community was explored. Most respondents reported home treatment as the first line of treatment. Most

"I know about the symptoms because last year my kid got admitted in hospital due to pneumonia. Doctors told me everything about the disease and what to do when the child falls sick. There is no counselling by ASHA or ANM."

- A member from community mentioned during FGD in Madhya Pradesh

commonly given home remedies included balm, oil, Vicks, milk with turmeric, clove, honey, black pepper, tulsi, ginger tea, steam inhalers, garlic, egg, fish, ghutti of gud and ajwain etc. Self-medication, giving steam at home were second choice of treatment. Medical treatment is usually sought when the child does not get better with these measures.

On the other hand, stakeholders opined that the delay is often due to complacence on the part of parents. Ignorance about the presenting symptoms and parent's feasibility of visiting a doctor or any care provider further aggravate the situation. The delay was reported more from rural areas than from urban areas.

Optimal use of Allopathic, Ayush, Unani, Homeopathic healthcare workers to provide counselling on danger signs and importance of timely treatment can be potential solutions to address the problem.

Private facilities are usually preferred to government facilities for treatment of pneumonia. This was mentioned by both stakeholders and the community respondents. Although the respondents were aware about private doctors, they were unsure about their qualifications.

Several reasons were cited for choosing private facilities: long waiting time in government facilities, unavailability of medicines, distance of healthcare facility from home, lack of transport, unavailability of "doctors for children" and mistrust on quality of medicines.

As a respondent during an FGD remarked, *"We have to buy medicines from outside even if we go to government facility. So, it is better to spend a little more money in private clinic and save our time" - FGD participant, Bihar*

"Most of the parents are daily wage workers, they don't visit doctors on fear of losing of day's wage."
- Official, Uttar Pradesh

"Unavailability of drugs, vacant doctors' position in health facilities, lack of staff who had skill-based training, unavailability of child care ward makes the community to seek care from private providers"

- SNCU In-charge, Madhya Pradesh

Government doctors and implementation partners stated that that only the poorest of poor visit government facilities. Others either chose unqualified practitioners or private clinics. On the other hand, private healthcare providers highlighted the practice of community coming to them after taking treatment from local traditional healers or quacks (when child has still not recovered or have become sicker)

It was brought out quite succinctly that guidelines and recommendations do not always translate into actions. The stakeholders stated that more innovative ways should be devised to make community aware on common signs and symptoms of pneumonia.

Enabling health systems factors related to pneumonia prevention and management

Discussions with stakeholders brought out a number of good practices that are pertinent to health systems strengthening. These have an influence- direct or indirect- on the prevention and management of ARI/ pneumonia.

- **Efforts to strengthen immunization**

All the WHO officials and state level officials mentioned their efforts to improve mortality and morbidity in children due to VPDs. Stakeholders also mentioned conducting MR campaign as part of global efforts to reduce illness and deaths due to measles and rubella/Congenital Rubella Syndrome (CRS). UNICEF's activities on monitoring and supervision of cold chain points, session sites and Routine Immunization (RI), is a positive move for reducing morbidity and morbidity due to VPDs. In Bihar, a van called "Pentavalent Express" was used to traverse the villages thereby raising awareness during MR campaign. 390 vehicles were deployed in 39 districts with GPRS installed. Messages related to importance of immunization were

spread via speakers. This brought a positive impact on immunization coverage in the state. MP state official very gladly shared the state government's achievement in terms of immunization coverage.

My role is to prevent pneumonia by strengthening the immunization by streamlining the data. I check for 100% registration, I track the live session at session site, the list of drop outs. I take steps to ensure complete immunization. MP witnessed the maximum jump in immunization in mission Indradhanush last year which was highest in the country. Knowledge, demand and service goes hand by hand.
– Official, Madhya Pradesh

- **Efforts to improve environmental conditions**

UNICEF Officials from Bihar mentioned about a study conducted in 2 high priority districts in Dobhi and Gaya in 2016. They conducted a baseline survey where particulate matter (PM) was calculated with use of indoor *chulha* and an end line survey in same AWCs after providing LPGs in those AWCs. It was found that there was drastic reduction in PM after LPG installation. The result was presented to Bihar Government following which LPGs were provided in almost all AWCs.

People in the community still use the stove leading to high level of pollution but at least mid-day meals are being provided without any smoke.
– Official, Bihar

"Saat Nischay Scheme" another initiative by the Bihar State government to improve hygiene and sanitation. Three of the promises made by government were on improving sanitation and hygiene in the state "Har ghar nal ka jal"; "Ghar tak pakki gali -Naaliyan"; "Shauchalay Nirmaan, Ghar ka Samman". There has been a positive impact of initiative and a greater number of districts are being declared "open defecation free" following these initiative.

- **Home Based Care for Young Child (HBYC)**

Another key component of India's attempts to improve mother and child health and reduce child mortality is the Home-Based Care for Young Child Operational Guidelines 2018, under the PM's POSHAN Abhiyaan. An incentive structures have also been built into the guidelines, with the following provisions for each ASHA being entitled to a sum of INR 250 for completion of 5 additional home visits for each young child. These visits are additional to 6 home visits by ASHA up to 6 weeks after birth under HBNC program. Under HBYC program all the three frontline health workers (ANM/AWW/ASHA) have been linked with clear defined roles and responsibilities.

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- **Utilization of Information & Communication Technologies (ICT) platform:**

All the stakeholders reported using Health Management Information System (HMIS) for monthly service delivery data reporting from public health facilities to improve program monitoring and management. Rajasthan stakeholders mentioned Pregnancy, Child Tracking & Health Services Management System (PCTS) & ASHA soft[49]. They reported that all the data on PCTS is collected by 5th day of each month. Officials from Madhya Pradesh mentioned using Supportive Supervision app. The officials mentioned that

[49] ASHA Soft (The Online Payment and Monitoring System):- It facilitates the user to capture beneficiary wise details of services given by ASHA to the community, online payment of ASHA to their bank accounts, generate various reports to monitor the progress of the programme and to ensure their timely and seamless online payment.

they monitor real time data through this app. Jharkhand officials mentioned using Sahiya Sangi portal *(Sahiya and Sangi are ASHA and ASHA helper)* as an online platform for tracking Sahiya coverage. Uttar Pradesh officials mentioned using Integrated Health Information Platform (IHIP)[50] and provides near-real-time data to policy makers for detecting outbreaks, reducing the morbidity and mortality and lessening disease burden in the populations and better health systems.

- **Support from development partners**

The stakeholders from the states acknowledged the contribution of the states in facilitating activities related to pneumonia prevention and management. UNICEF officials are providing support in RI, new vaccine launch, cold chain monitoring, capacity building of FLHWs for RI, SNCU and pediatric ICU monitoring, monitoring of WASH facilities, monitoring about patient satisfaction for HBNC program, ASHA visit records verification etc. Use of electronic vaccine intelligence network for real time information on cold chain temperatures and vaccine stocks and flows is supported by WHO. It also aids in digitized vaccine inventories and record-keeping in vaccine stores and cold chain points. Professional bodies such as IAP had supported multiple trainings of public and private pediatricians and MBBS doctors. Besides, the states are supported by NGO officials in providing capacity building activities for FLHWs. They further added that they help in operationalizing IMNCI and F-IMNCI guidelines.

Health systems barriers and challenges

The health systems are fraught with several challenges that impedes effective the implementation of guidelines.

- **Pneumonia prevention not perceived as a priority**

Pneumonia is not perceived as that big a problem as TB, diarrhoea and polio as deduced by interacting with a range of stakeholders. As a result, very limited attention is paid to the management and control of pneumonia by health providers as well as community members. Several initiatives are being implemented that have an indirect effect on the prevention of pneumonia and protection from it and these also show glaring gaps.

There are various programs and guidelines like MAA, POSHAN Abhiyan, HBNC, Enhancing Optimal Infant and Young Feeding launched in 2016 etc. under which the health workers are trained on proper feeding practices, timely initiation of CF, increased care to malnourished and under weight babies etc. However, discourse and action to uphold the provisions under the act has been sub-optimal. Actual practices of the community still differ from what is being claimed under the schemes and training programs. Timely initiation of breastfeeding might have improved but community still has limited knowledge on other practices like exclusive feeding for six months, initiation of CF at six months, continued feeding and adequate diet to the child. The inability to abide by basic child health demands makes the child more susceptible to pneumonia.

Initiative to increase awareness on sanitation and hygiene is very often not accorded importance. Although the construction and use of toilets at home has been advocated in the recent past, limited attempts are made to counsel the community on hand washing and proper sanitation practices.

Moreover, there are several development and implementation partners working in the field. However, lack of coordination across different government departments as well as between the departments and relevant implementing partners including NGOs, absence of concerted focus and attention, prevents the smooth implementation of activities of national importance.

[50] Web-enabled near-real-time electronic information system that is embedded with all applicable Government of India's e-Governance standards, Information Technology (IT), data & meta data standards to provide state-of-the-art single operating picture with geospatial information for managing disease outbreaks and related resources.

- **Challenges in pneumonia prevention and case management**

The knowledge of the key stakeholders within the health systems on management of pneumonia is far from satisfactory. The healthcare system in India has multiple stakeholders at various levels: policy makers, program officers, healthcare providers in public and private settings, NGOs and grassroots level workers. Significant or not, each one of them plays a direct or indirect role in the health outcomes of children. With ignorance among program officers regarding the GAPPD/IAPPD framework and limited knowledge among healthcare providers on Prevent Protect and Treat interventions, existing policies will remain ineffective until those capable of spreading them are unaware on the same.

A large segment of the community still prefers the informal health provider. The injudicious prescription of antibiotics, steroids and injectables is another barrier in the effective management of the high pneumonia burden in the country. Several socio-cultural beliefs, low awareness of danger signs and little knowledge about whom to approach in an emergency also prevent the community from seeking timely care from qualified health care providers. Inadequate infrastructure was second most commonly reported gap diagnosing and treating pneumonia in public health care facilities. Almost all thirty ANMs interviewed denied having any diagnostic tools at SCs to accurately diagnose pneumonia.

Case identification and assessment of severity of pneumonia, timing of administration of first dose of appropriate antibiotic and overall management all play a key role in the prognosis of the disease. Initial care has been reported to be associated with improved survival of children suffering from community-acquired pneumonia, but non-compliance to the standard treatment guidelines was reported as a barrier to pneumonia prevention. National Pneumonia guidelines have yet not been finalized with the result there is variations amongst state regarding use of first line antibiotic at primary care level.

Majority of the stakeholders mentioned the following factors as barriers in proper treatment to the children: Low economic status, fear of wage loss, high cost of consultation, diagnosis, treatment and transport prevents parents from bringing their children to facility. Distant public health facility and unavailability of transport facility either delay or prevent timely treatment to the child. The health status of children in directly dependent on nutritional status of pregnant women. Less nourishment of pregnant women (due to unaffordability of protein rich food, less knowledge on diet diversification etc.) was reported a reason for malnourished children, which was reported to be directly linked with ARI. It was reported from all the states that services from 108, though available, were availed only in emergency cases. Most commonly preferred means for transportation was private vehicles, which further added to the cost of providing quality treatment for children.

It was reported that rural population was more likely to be exposed with open defecation and indoor pollution, whereas urban poor population dealt with pollution, poor sanitation and crowding. Use of Chulha, especially in rural areas was also an important factor associated with high occurrence of ARI.

At present, identifying pneumonia cases and administering appropriate antibiotic therapy is the primary strategy to reduce mortality and morbidity caused by pneumonia. For severe pneumonia cases (almost 10%) immediate referral and admission in health facilities is needed. Non-availability of common drugs and lack of skills in health workers in public settings affects community management of pneumonia cases. The essential services for inpatient care of sick children below district level is almost non-existent. Families of sick children are forced to travel long distances to reach district/medical college hospitals for care. This results in overcrowding at secondary and tertiary level health facilities adversely affecting quality of care.

There is a lack of clear policy on whether the community health workers (especially ASHAs and AWWs) can use antibiotics for treatment of childhood pneumonia, as mentioned by two state nodal officers. They also felt that policies and guidelines pertaining to child care were not given that importance which other schemes on immunization and maternal and child nutrition were given.

- **Lack of trained human resources**

The stakeholders expressed that insufficient human resources are the biggest barriers in providing adequate child health care services. Less than adequate number of staffs especially paediatricians, medical officers and staff nurses in healthcare facilities lead to increased workload on remaining staff, decreased motivation, high attrition and increased absenteeism which directly affects the quality of care. Inadequate human resources in public health facilities was mentioned by fifteen out of twenty-five state and district officials. It was cited that even when SNCUs, PICUs, NBSUs and pediatric departments were equipped with functional equipment of child care like radiant warmers and incubators, more than fifty percent of the facilities lacked doctors and staff nurses required to cater to the needs of community

Almost all (66 out of 70 respondents) felt that FLHWs are not skilled enough to manage cases of pneumonia. The factors that could be attributed to this gap are multiple: Less number of FLHWs trained on IYCF and IMNCI guidelines, no mechanism of follow up or refresher trainings or to assess retention of skills, no mechanism of assessment of training needs of front-line health workers or of existing capacity building systems, or to assess quality of trainings. Most of them are not aware about the recommended antibiotics for pneumonia management. The ANMs are overburdened with multiple health and non-health programs that hampers their actual activities of providing healthcare services at SCs.

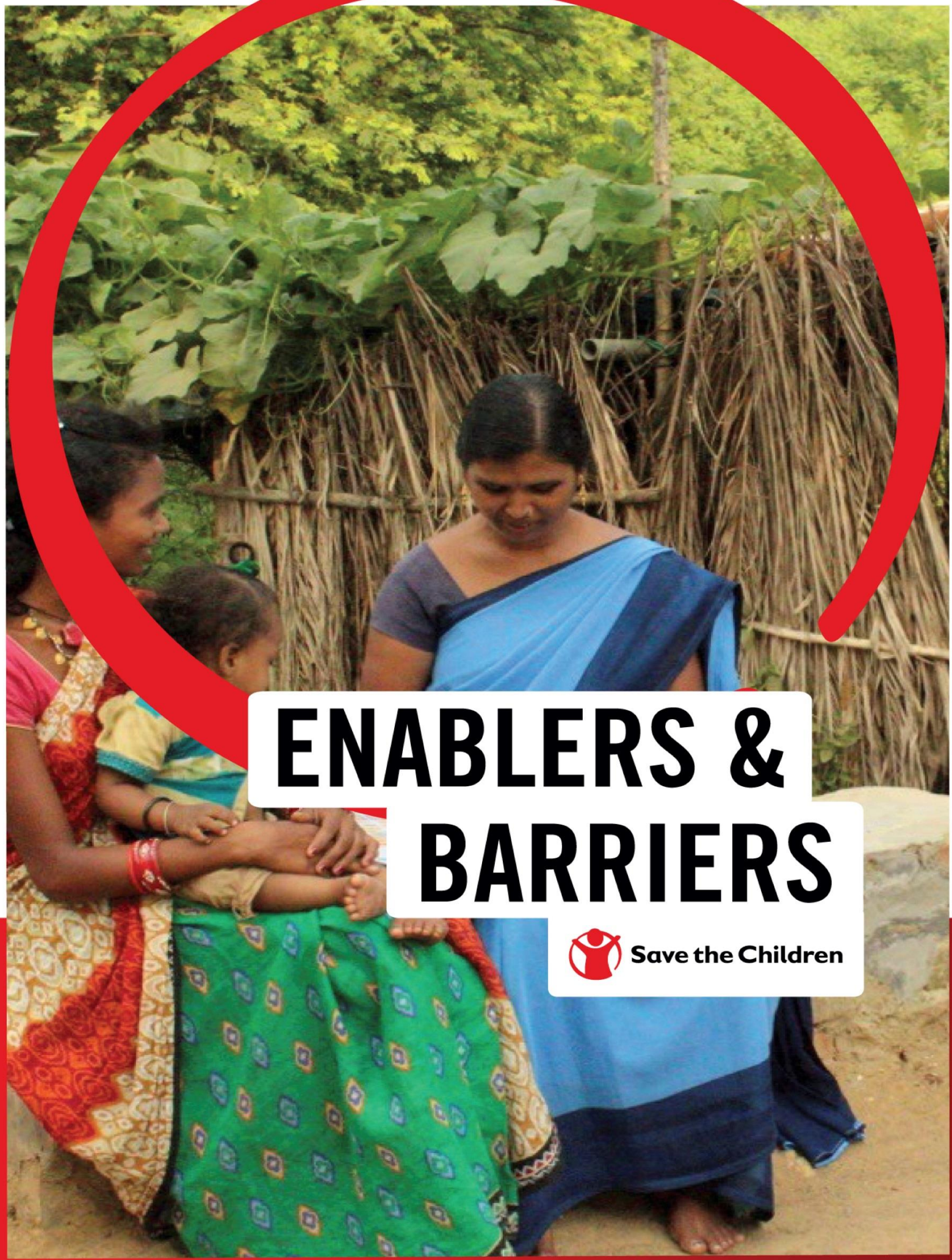
Unfavorable HR policy was reported as a big challenge by a few (6 out of 22) public paediatricians and NBSU and SNCU in-charge. They demanded incentives for doctors who were dealing with high patient burden, especially in those facilities where there were less than adequate staff.

- **Suboptimal use of data for program management and improvement**

Rational use of data is central to program review and improvement. Several apps are developed and are in use by the care providers already. A robust mechanism of collation of data from facilities through Health Management Information System (HMIS) exists in India. Although the use of HMIS has substantially increased in India and several indicators related to ARI/Pneumonia have been incorporated, under-reporting of common childhood illness like pneumonia is still a challenge. Both at outpatient and inpatient levels especially below district hospital levels. proper diagnosis is not entered in records which hampers accurate reporting of pneumonia cases.

Summary of qualitative findings:

1. All the stakeholders agreed that ARI/Pneumonia continues to be a common illness affecting children
2. There are several government based policies and programs to address pneumonia
3. Knowledge on signs and symptoms of pneumonia was variable across all cadres of health care providers
4. The FLHW were not equipped with timers to count respiratory rate
5. The practice of providing pre-referral management was variable across different respondents and different states
6. Factors predisposing to pneumonia/ARI include poor socio-economic factors, in-door air pollution, malnutrition, low-birth weight and lack of exclusive breastfeeding
7. People perceived measles and DPT vaccine as useful strategies to prevent pneumonia however they didn't consider PCV to be effective
8. States have devised innovative strategies to track and monitor data on pneumonia/ARI
9. The awareness among community members were inadequate about the signs and symptoms of ARI/Pneumonia especially danger signs
10. The coverage of home visits by FLHW seem to be inadequate
11. Private facilities are the preferred over public for seeking care on pneumonia



ENABLERS & BARRIERS

Save the Children

4. ENABLERS AND BARRIERS IN PNEUMONIA CARE AND MANAGEMENT

The situational assessment of pneumonia among under five children in India, based on research undertaken in the states of Bihar, Rajasthan, Madhya Pradesh, Jharkhand and Uttar Pradesh, brought up certain interesting findings related to the overall framework of pneumonia/ARI management in the country. These have been classified as enablers (aspects within the overall scenario that could support any strengthening or improvement in the response) and barriers (specific issues that are confounding the response in terms of quality, speed, reach, access and availability for communities).

This chapter details the Enablers and Barriers that can be studied and understood to address critical windows of opportunity to strengthen the pneumonia/ARI management framework and response in India.

4.1 ENABLERS

a) Political commitment

Over the years, India opted for several policies and guidelines that are clear enablers and facilitators for the response to tackle pneumonia. Some of these initiatives can be traced back to 1985, which is when the UIP was adopted. In 2006, national guidelines for IYCF were developed by the Ministry of Women and Child Development. In 2003, India adopted the IMCI guidelines published by the WHO and UNICEF in the form of the IMNCI guidelines. In 2011, guidelines on Facility Based New Born Care (FBNC) and Home Based New Born Care (HBNC) were made. In 2013, under the National Rural Health Mission (NRHM) , RMNCH+A strategy which emphasised on high impact child health interventions under the continuum of care approach. In 2014, India adopted IAPPD, the guidelines on the India New-born Action Plan, Child Death Review (CDR) guidelines and the guidelines for use of gentamycin by ANMs. The same year, Mission Indradhanush was launched. The stakeholders across the study geographies mentioned all the above-mentioned programs and guidelines being successfully implemented in their states. Apart from these, they also mentioned SBA trainings (for midwives, nurses and doctors); roll out of IDCF program for diarrhoea and provision of Vitamin A supplementation in their states. It was reported that monthly reviews were being conducted using checklists for multiple programs on number of ANC registration, ANC check-up, anaemic patients, deliveries (private vs government), time of initiation of breastfeeding, number and causes of infant deaths, low weight births, number of cases referred, immunization reports, Vitamin A supplementation, maternal deaths, number of tuberculosis cases, number of ARI and diarrhoea cases etc.

b) Availability of guidelines with latest management protocols

The above-mentioned programs have led to the development of time-tested guidelines for management of pneumonia. It finds place in most guidelines that focusses on child health. IMNCI, FIMNCI, and HBNC are some of them. There are ample opportunities for sensitization at both facility and community levels. Although adequate training remains a glaring gap, yet availability of pneumonia protocols strengthens the case that trainings can be initiated with minimum investments.

c) Network of health facilities with a scope to treat pneumonia

There exists a huge network of facilities at primary, secondary and tertiary care levels, at public and private sectors to deliver services pertinent to pneumonia management. Most of the families seek care within 2 days of occurrence of symptoms (as emerged in this study), which is a positive change in the care seeking pathway. Making adequately resourced facilities accessible to families is the next line of action. Health system preparedness to deliver appropriate services is not uniform across all levels. While Medical colleges fare better than lower level facilities, availability of a structured system provides opportunities for further strengthening.

d) Health care providers who are sensitized about ARI/ pneumonia

Different cadres of health care providers have been sensitized about ARI/ pneumonia through some or the other program. This provides the health system with a rich resource that can be easily mobilized to deliver requisite services. Availability of human resources is constrained within the health system. However, the presence of ASHAs in the community (who are sensitized through HBNC program), of ANMs (sensitized through IMNCI/ FIMNCI/ HBNC), nurses (sensitized through FBNC/ FIMNCI) and doctors are opportune resources who can be easily trained and monitored.

e) Robust health management information system to capture routine data

Availability of HMIS provides a nationwide platform to capture and report data on pneumonia. Presence of some indicators within HMIS reflects the priority that India accords to pneumonia. It provides an opportunity to build on this system and mechanism to enhance reporting.

f) Insurance scheme for illnesses

Ayushman Bharat is a National Health Protection Scheme, which covers over 10 crore poor and vulnerable families (approximately 50 crore beneficiaries) providing coverage up to 5 lakh rupees per family per year for secondary and tertiary care hospitalization. It has subsumed the on-going centrally sponsored schemes - Rastriya Swasthya Bima Yojana (RSBY) and the Senior Citizen Health Insurance Scheme (SCHIS). This has been done to try and meet the unmet requirements of the earlier schemes, which was due to a lack of financial resources. Special packages are developed to address the mounting demand for pneumonia treatment. According to various sources, many private hospitals have submitted their claims against the treatment of pneumonia thereby increasing the adoption of medical treatment for pneumonia cases.

g) Commitment to Prevent illnesses due to indoor air pollution

Pradhan Mantri Ujjwala Yojana is a scheme of the Ministry of Petroleum & Natural Gas for providing LPG connections to women from Below Poverty Line (BPL) households. The scheme aims to safeguard the health of women and children by providing them with LPG, so that they don't have to compromise their health in smoky kitchens. Under the scheme, the Union Government bears the connection cost of ₹1,600 per connection, and each household pays about ₹1,500 for the stove and the first LPG cylinder. This scheme is said to have high potential for reducing the risk from indoor air pollution. Universalization of use of safe fuels will go a long way in reducing pneumonia deaths.

h) Utilization of Information & Communication Technologies (ICT) platform:

Ministry of Health & Family Welfare has undertaken various initiatives using ICT for improving efficiency & effectiveness of the public healthcare system. There are various online services like National Health Portal (NHP), e-Hospital, Online Registration System (ORS), Central Drugs Standards Control Organization, "SUGAM" etc. Examples of ICT as mobile applications (available on Google Play) are Vaccine Tracker (Indradhanush Immunization), NHP Swasth Bharat, NHP Directory Services, Pradhan Mantri Surakshit Matritva Abhiyan Mobile App etc. There are several Service Delivery and Tracking services i.e. Mother and Child Tracking System (MCTS) / Reproductive Child Health (RCH) application, Kilkari[51], TB Patient Monitoring System "Nikshay" etc. These platforms can be used for telemedicine, capacity building of frontline workers, improving reporting and recording and in building pneumonia campaigns.

4.2 BARRIERS

To end preventable deaths due to pneumonia in children under 5 years of age is a big battle to win. Although the number of deaths in under five children has decreased, the trend has not changed much for pneumonia. There are many reasons identified for this slow decline, however, the largest contributor is its multifactorial aetiology. This study has tried to list down the most common barriers of pneumonia care both from literature review as well as from the perception and experience of key informants and stakeholders involved in providing child health care in study states.

i) Childhood pneumonia still not 'a priority'

Despite being a leading cause of under 5 mortality, pneumonia has not received adequate attention as compared to other childhood diseases. There are no pneumonia specific guidelines available.

j) Gaps in immunization coverage

Despite significant achievements under UIP program like introduction of HiB vaccine and MR campaign, still children from difficult to reach areas and in marginalized families remain unimmunized. The national coverages have improved but there are huge variations amongst states, districts and blocks. As per NFHS-4, the national coverage of full immunization was 62% and state coverages ranged from 36-91%.These unimmunized children remain unprotected against vaccine preventable diseases. Multiple operational challenges in expanding the coverage of immunisation services to all like last mile vaccine delivery, shortage and maintenance of cold chain points and individual tracking of beneficiaries. [52]

Pneumococcal vaccines have been recently introduced in the public health system in few states which is yet to be scaled up across the country. This vaccine is also available through private sector, but the current high prices creates barrier to access for large section of population.

k) Poor compliance to and low advocacy of government schemes and guidelines related to child nutrition

Govt. of India's IMS Act is one of the strongest legal frameworks for protecting and promoting breastfeeding. However, discourse and action to uphold the provisions under the act has been sub-optimal.

[51] It delivers free, weekly, time-appropriate 72 audio messages about pregnancy, child birth and child care delivery to families' mobile phones. Approximately 6 crore successful calls have been made so far under Kilkari in Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh and Uttarakhand

[52] http://pib.nic.in/newsite/mbErel.aspx?relid=117759

Other programs like MAA, POSHAN Abhiyan, HBNC, Enhancing Optimal Infant and Young Feeding launched in 2016F etc. are also plagued with several operational challenges resulting in poor child nutrition indicators. Poor nutritional status of the child makes the child more susceptible to pneumonia.

l) Inadequate knowledge of policies and guidelines amongst stakeholders

The healthcare system in India has multiple stakeholders at various levels: policy makers, program officers, healthcare providers in public and private settings, NGOs and grassroots level workers. Significant or not, each one of them plays a direct or indirect role in the health outcomes of children. With low awareness among program officers regarding the GAPPD/IAPPD framework and limited knowledge among healthcare providers on Prevent Protect and Treat interventions, existing policies remain ineffective.

m) Unconventional treatment demands

A large segment of the community still prefers the informal health provider who propagate irrational use of antibiotics, steroids and injectables.
Several socio-cultural beliefs and low awareness about the disease leads them to seek care from traditional healers/ unqualified practitioners.

n) Shortage of skilled human resources

Insufficient skilled human resources are the biggest barrier in providing adequate child health care services. There are high vacancies of paediatricians, medical officers and staff nurses in healthcare facilities. Existing health workers have not been trained or they have become deskilled after initial IMNCI and HBNC trainings.

o) Indoor air pollution

Despite the launch of various government programs promoting the use of clean fuels like LPG; cow-dung and wood are still preferred by the community for cooking purposes. Even if the community is aware about the usability of LPG, affordability is a major issue leading to preference for less clean fuels over LPG.

p) Social determinants of health

Majority of the stakeholders mentioned the following as major barriers in proper treatment to the children:
Income and social status: Low economic status, fear of wage loss, high out of pocket expenditure on treatment act as barriers.
Access to health services: Distant public health facility and unavailability of transport facility either delay or prevent timely treatment to the child.
Education: Illiteracy is one of the major barriers to pneumonia care.
Environment: Unavailability of toilets, crowding, kitchen without ventilators, unavailability of food leading to malnutrition acts as major barriers to pneumonia care.

q) Under-reporting of pneumonia cases

The quality of data in HMIS has improved significantly over the years. Various indicators on pneumonia has been introduced recently. However, the data being reported on these indicators lack completeness and correctness. This is creating impediments in informed decision making.

r) Non-adherence to standard treatment guidelines

Case identification and assessment of severity of pneumonia, timing of administration of first dose of appropriate antibiotic and overall management all play a key role in the prognosis of the disease. Initial care has been reported to be associated with improved survival of children suffering from community-acquired pneumonia, but non-compliance to the standard treatment guidelines was reported as a barrier to

pneumonia prevention. National Pneumonia guidelines have yet not been finalized with the result there are variations amongst state regarding use of first line antibiotic at primary care level.

s) Non-availability of services at government health facilities

For severe pneumonia cases (almost 10%) immediate referral and admission in health facilities is needed. The essential services for inpatient care of sick children at sub-district level is almost non-existent. Families of sick children are forced to travel long distances to reach district/medical college hospitals for care. This results in overcrowding at secondary and tertiary level health facilities adversely affecting quality of care.

t) Lack of convergence between different line departments to address basic community needs

Pneumonia being a multifactorial disease requires convergent actions of communities, departments/ministries, professional associations and development partners. Lack of coordination amongst these stakeholders is a major obstacle in tackling pneumonia.

RECOMMENDATIONS

Save the Children

5. RECOMMENDATIONS

India is undergoing an epidemiological and demographic transition, represented by a growing burden of lifestyle driven chronic and non-communicable diseases in the working population, while still grappling with infectious disease burden like pneumonia which is still a prolific killer, claiming the lives of several children every hour. Changing this current reality requires high levels of commitment and perseverance. It is critical that we have a thorough and continual understanding of the disease burden, premature mortality, causation factors, effective interventions, and the best means of implementation, from a population health perspective. For India to meet its SGD targets, including SDG 3, it is imperative to deepen and catalyse communication between various government agencies and other stakeholders on one hand, and citizens and the private sector on the other. This target will be impossible to achieve without concerted collaborative efforts on pneumonia from the central and state governments, international NGOs/donors and supporting partners from private sector. A focused, measurable and integrated action on pneumonia protection, prevention, and treatment, as foreseen in the GAPPD, is needed immediately.

Although the Government and other stakeholders have taken several initiatives to combat pneumonia and fulfil the global pledge of achieving Goal 3 of the SDGs, however, there are still barriers to better health for many children and families that threaten the future well-being of the nation's population.

The following section summarizes eight broad approaches that emerged from the field and are based on the data collected under this study. These may be useful to strengthen future action to manage pneumonia and reduce child morbidity and mortality in India.

1. Advocacy to Address the Silent Killer

Partners and organisations involved in the fight against pneumonia, need to come together to mainstream the discourse around pneumonia. Their joint efforts will ensure clear commitments and resources from global and national stakeholders to address this silent killer.

Government of India (GoI) should articulate clear operational guidelines on pneumonia control and support its roll out in the states. Subsequently, state and district operational plans be prepared, and resources be allocated in the annual Program Implementation Plans (PIPs).

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2. Knowledge and Information for the Community: Pushing for Effective Behavior Change

There is a definite need for far more robust and energized health education for the community . Along with FLHWs, local school teachers, PRI members, local influencers can also be used to sensitize the behaviour of communities. It is recommended that key messages specific to pneumonia causation, symptoms and prevention should be developed, and events and activities related to health literacy should be more frequent and well-designed for impact. Emphasis should also be on making the community aware about seeking timely and proper treatment from skilled practitioners only. Messages on the indispensable role of vaccination in prevention of disease should also be emphasized. Factors which can protect and prevent pneumonia, like early initiation of breastfeeding, exclusive breastfeeding, timely initiation of complementary feeding, vaccination, hand washing and sanitation etc. should be given importance .For creating awareness, mass media camps should be given importance. Audio aids should include announcements and radio ads and audio-video aids like showing short movies during camps or on TV should be given importance.

A campaign on the lines of "Intensified Diarrhoea Control Fortnight (IDCF)" should be planned and operationalises across the country especially in high burden states and districts. The success of the Polio eradication campaign is the biggest example of the power of media and influence of celebrities on the

community. Such measures should also be taken for pneumonia eradication. Practitioners from other practices like Unani/Ayush/Siddha/Homeopathy etc. should be involved in counselling the community on proper care seeking behaviour.

3. Improving access to quality healthcare through public health systems

The long distance from home to the public health facility was most commonly identified as the primary reason for seeking healthcare services from private clinics or unregistered practitioners. Secondary reasons included the non-availability of staff, services, equipment, and diagnostic aids specific for sick childhood care at primary and secondary care centres. Majority of sick new-borns and children are not attended and asked to go to higher level facilities. To overcome these barriers, it is recommended to:

- Bring the primary health care closer to households, through establishment of Health and Wellness centres & mobile medical Units
- Strengthen facility based paediatric care at health facilities as per national guidelines[53]
- Ensure skilled and empathetic staff, uninterrupted supplies of medicines & availability of diagnostic services.

4. Capacity building of human resources

Early case identification and management at community level is one of the key interventions for pneumonia control. Capacity building of FLHWs on identification of cases, classification and providing appropriate first line antibiotic(Amoxicillin) is critical and part of IMNCI strategy. Also, the FLHWs should be able to timely refer severe cases to higher level facilities for hospitalization. The health staff at hospitals should also be trained to provide quality standardised inpatient care. Plan should be made to provide continuous trainings to health staff using innovative approaches like use of skill labs, telemedicine and through online self-learning platforms.

5. Data driven decision making – strengthening pneumonia reporting in HMIS

There is a huge gap in pneumonia reporting despite inclusion of few indicators in HMIS in the recent past. Our study found lack of recording and reporting of pneumonia cases at all levels of health care. The lack of reporting is a major issue that must be addressed to have stronger and more effective health systems responses. Also, decision makers and program managers should regularly use this HMIS data during monthly and quarterly child health reviews for informed decision making. This will inherently improve data quality in due course

6. Routine Immunization - reaching the unreached and marginalized groups

Achieving more than 90% coverage of full immunization is one of the key interventions to address high burden of pneumonia in children. Several vaccines like BCG, DPT, Measles, HiB have a role in reducing pneumonia morbidity and mortality. Unfortunately, children from poorer and marginalized families remain unvaccinated and at risk of death from vaccine preventable diseases including pneumonia. Efforts under Mission Indradanush strategy should be augmented to reach the unreached children through effective vaccine delivery and individual child tracking systems. Pneumococcal vaccines are available and there is evidence to show their efficacy across the world. India has recently introduced PCV in certain states with plan for expansion. Government should try to include this vaccine in the full national immunization schedule and its inclusion in rest of the states should be fast tracked.

[53] Strengthening facility based pediatric care: Operational guidelines for planning and implementation in district hospitals and National Quality Assurance Standards (NQAS)

7. Convergence between various government department programs and the efforts of other stakeholders including international partners

Convergence of sectoral programs and departments is essential to address various preventable aspects of controlling pneumonia and scaling up essential pneumonia management interventions, such as:

- Swachh Bharat Abhiyan – Gramin - for improved sanitation practices
- Pradhan Mantri Ujjwala Yojana – for reducing household pollution
- POSHAN Abhiyaan – for improved nutrition
- UIP – for universal Immunization
- Ayushman Bharat – for affordability of treatment, care seeking behaviour etc.

This would require pneumonia to be tackled at a larger level than just at the MoHFW, involving synchronization of efforts of other ministries such as the Ministry of Drinking Water and Sanitation, the Ministry of Petroleum & Natural Gas, the Ministry of Women and Child Development, and many others. Thus, there is a need for trans-sectoral convergence for comprehensive care with identified indicators for accountability and for monitoring progress. There should be good coordination between policy formulation and program implementation at District, State and Central levels for effective inter-sectoral coordination.

8. Private Sector Engagement

There is vibrant and flourishing private healthcare sector in the country which can be leveraged to expand the coverage and quality of services. Engagement of private health sector with public health system should be explored keeping in mind the local context

Areas of Operational Research

This section details the key potential areas of operational research:

- Implementation research on key intervention packages (GAPPD/IAPPD framework) for tackling childhood pneumonia in resource constraint settings.
- Conducting feasibility and acceptability studies for various point of care diagnostics for pneumonia management.
- Use of digital technologies in pneumonia care.
- Community knowledge, attitude and practice (KAP) studied for devising contextual specific BCC strategies.
- Study on efficacy and cost effectiveness of Pneumococcal vaccine in Indian context

Annexure 1

Situational analysis at National level (National Level vis-à-vis inter-state variations)

Main Evaluation questions/ objectives	Methods	Key data sources/ database	Data Sources	Line of inquires
1. What is the current situation of pneumonia and the associated health challenges among children (under five years of age) in India?	Secondary literature review	• NFHS-4 data on ARI[54] • HMIS[55] data on ARI • IQVIA total sales data for consumption pattern for pneumococcal vaccines in private sector	• PubMed (http://www.pubmed.com) *with special ref. to Lancet*, JSTOR (https://www.jstor.org) • Google scholar (https://scholar.google.co.in/) • GAPPD[56] report • UNICEF's report on tackling pneumonia • IAPPD[57] • National Health Plan • Comprehensive multi-year plan for immunization • National New Born Action Plan • IMNCI[58] and/or child health/survival strategic plan • National nutrition/IYCF[59]policy/strategy • Standard Operating Procedures	• Existing policies and established guidelines for management of Pneumonia among children[60] with linkage to global commitments and Sustainable Development Goals • Performance gaps of health system in responding to needs and expectations of pneumonia management • The challenges in addressing pneumonia in line with the GAPPD intervention • % variations in

[54]Acute Respiratory Infection
[55] Health Management Information System
[56] Global Action Plan for Pneumonia and Diarrhea
[57] Integrated Action Plan for Pneumonia and Diarrhea
[58] Integrated Management of Neonatal and childhood illness
[59] Infant and Young Child Feeding
[60]Children refers to children under 5 years of age in entire document

Main Evaluation questions/ objectives	Methods	Key data sources/ database	Data Sources	Line of inquires
				consumption pattern of pneumococcal vaccines cough syrups, HiB and pediatric antibodies

7. High burden states (State Level vis-à-vis district variations)

Main Evaluation questions/objectives	Methods	Primary data sources/ database	Data Sources	Indicators
1. What is the burden of morbidity and mortality due to pneumonia among children in five states/districts? 2. What is the demographic, geographical and epidemiological variations across states and districts in prevalence of pneumonia and what are the associated factors? 3. What is the knowledge, attitude, behavior and practice among mothers of children for pneumonia management?	1.Quantitative survey 2.Qualitative Survey	• Facility • Household • Key Informative Interviews (KIIs) • Focus Group Discussions (FGDs)	• NFHS-4 State-wise data • HMIS-state and district-wise data • IQVIA private sector data state and district-wise data	**Household**: • % of children with fever or symptoms of ARI and then taken to a health facility in the last two weeks preceding the survey • % of deaths due to ARI in the last two weeks preceding the survey • % of children under five years of age reported symptoms of pneumonia (cough or difficulty in breathing due to chest related problems) in the last two weeks preceding the survey

4. The average State/district wise variations among households in Out of Pocket expenditure for pneumonia management? 5. The impact of Behavior Change Communication (BCC) interventions at State/district level to improve care-seeking practices among community?				• % of women who are aware of danger signs of ARI and whose children suffer from ARI and sought advice/treatment • % distribution of the first point of care during illness (ANM/ASHA/health facility/Any other) • % of children receiving appropriate case management for pneumonia as per WHO guidelines • Total expenditure of household on treatment of pneumonia during the last one year • Total number of man days lost of family members for pneumonia management of their children in a year • % of children who are exclusively breastfed up to initial 6 months of age • % of households using solid fuels[61] as the main cooking fuel • % children age 12-23 months fully immunized (BCG, measles, and 3

[61] Solid fuels include wood, coal, charcoal, crops or other agricultural waste, dung and shrubs

				doses each of polio and DPT) (%) • % of children receiving pneumococcal vaccine • % of HIV exposed children receiving a complete course of co-trimoxazole therapy • % of households using clean fuel for cooking • % of households using household remedies for management of ARI • Type of antibiotic being prescribed to children with ARI
6. What are the community- related enablers and constraints in case of pneumonia case management?				**FGDs** • Main barriers to health care seeking and health care access for children with pneumonia (community groups & Front-Line Health Workers) • Knowledge of symptoms of pneumonia (community groups & Front-Line Health Workers) • % having knowledge of severity and causes of pneumonia (community groups

				& Front-Line Health Workers)
7. What are the challenges in addressing pneumonia in line with GAPPD (Prevent, control and treat) intervention? 8. Are budgetary allocations enough for the states to tackle pneumonia management? 9. What are the areas of operational research at state/district level for management of pneumonia?				**Facility and KII:** • Variations in management of pneumonia among children (State-wise) • Innovations in tackling pneumonia management (State-wise) • Number and availability of trained human resources for pneumonia management • Supply chain management • Availability of functional equipment (radiant warmer, suction machine, oxygen concentrator etc.) • Availability of antibiotics (Ex. Oral and injectable Amoxicillin) and vaccines (HiB, pneumococcal conjugate, measles, DPT/pentavalent etc.) • Availability of oxygen and referral protocols respectively • HMIS reporting in place

Annexure 2 - Training Agenda

Day 1: January 7th, 2019		
Time	**Sessions**	**Facilitators**
10:00 to 10:15	*Welcome and Introduction*	Sukhvinder Kaur
10:15 to 11:00	**Understanding on ARI and Pneumonia** - *Basics concepts of ARI and Pneumonia* - *National and State level burden of disease* - *National guidelines and reporting*	Dr. Abhay Saraf
11:00 to 11:45	**Public Health System and referrals** - *Health and ICDS System* - *Stakeholders*	Dr. Abhay Saraf
11:45-12:00	Tea break	
12:00 to 13:00	**Introduction about the Project** - *Study Objectives* - *Stakeholders* - *Timelines*	Sukhvinder Kaur
13:00 to 14:00	Lunch	
14:00 to 15:00	**Understanding on survey methodology** - *Brief about Sample and Distribution* - *Selection of household* - *Selection of facility*	Sukhvinder Kaur and Imtiyaz
15:00 to 15:30	**Developing Understanding on Household Questionnaire** - *Background Information* - *ARI Management* - *Non-ARI Management*	Dr. Abhay Saraf and Sukhvinder Kaur
15:30 to 15:45	Tea Break	
16:00 to 17:30	*Cont.* **Developing Understanding on Household Questionnaire**	Dr. Abhay Saraf and Sukhvinder Kaur

Day 2: January 8th, 2019		
Time	**Sessions**	**Facilitators**
9:00 to 11:00	*Role play using CAPI*	Vivek Aserkar and Apoorva Kashyap
11:00 to 14:00	*Field work*	Vivek Aserkar and Apoorva Kashyap
14:00-15:00 Lunch		
15:00 to 15:30	*Addressing of Queries from the FIs*	Apoorva and Imtiyaz
15:30 to 15:45	Tea Break	
15:45 to 17:30	**Developing Understanding on Facility Assessment** - *SHC* - *PHC*	Apoorva Kashyap

Day 3: January 9th, 2019		
Time	**Session**	**Facilitator**
9:30 to 12:00	**Developing Understanding on IDIs** - *ANM* - *MO in-charge*	Dr. Sonali
11:00 to 11:15	Tea	
12.00 to 13:00	*Cont.* **Developing Understanding on IDIs** - *Staff nurse*	Dr. Sonali
13:00 to 14:00	Lunch	
14:00 to 15:30	*Group work (2 members in each group)* - *Facility assessment* - *IDIs*	Sukhvinder Kaur and Dr. Abhay Saraf
15:30 to 15:45		
15:45 to 16:30	**Field and Reporting Guidelines/ SOPs** - *Do's and Don'ts during field work and data collection* - *Ethical Considerations* - *Quality Assurance*	Neha Ahuja and Hassan
16:30 to 17:20	**Finalization of Field Movement Plan and Logistics Management** - *Planning of field work* - *Timelines and workload* - *Logistics Management and Reporting* - *Trouble Shooting*	Hemant Chaudhary
17:20 to 17:30	**Closing** - *Expected outcomes*	