SEEJPHVolume XXV S1, 2024, ISSN: 2197-5248;Posted:05-11-2024

Respiratory Vaccination And Their Correlation On Incidence, And Severity Of Illness In Children Admitted To Hospital For Pneumonia.

Dr Krithika MV[1], Dr Apoorva V Ramanan[2], Dr Somashekar A R[3*]

[1]*Assistant professor, Department of Pediatrics, Ramaiah medical college, Bangalore*
[2]*Junior Resident, Department of Paediatrics, Ramaiah Medical College*
[3*]*Professor, Department of Paediatrics, Ramaiah Medical College*

***Corresponding Author:** Dr Somashekar A R*
**Professor, Department of Paediatrics, Ramaiah Medical College*

INTRODUCTION AND NEED FOR STUDY

Pneumonia accounts for 14% of all deaths of children under 5 years old, killing 740 180 children in 2019. India has the second highest burden of childhood pneumonia deaths worldwide. With a child infected with Pneumonia every second, India contributes 26% of the total pneumonia cases worldwide for the period of 2019-21. In the years 2019-21, the average occurrence rate of Pneumonia in India was 2.8% according to the NHFS – 5-6. Based on the data from the Sample Registration System, the under-five mortality rate was seen to be 32 per 1000 live births. Pneumonia was identified as the second most common cause of mortality, with 19.4 percent of deaths in the age group of 1-4 years and 16.8 percent in the age group under 1yearold in India from 2016 to 2018. Prevention efforts, such as vaccination and promoting good hygiene practices, are crucial in reducing the impact of pneumonia on children's health.[1]

Vaccination plays a significant role in preventing diseases like pneumonia among children in India. The National immunization schedule includes vaccines such as the Pneumococcal vaccine, Haemophilus influenzae vaccine, measles vaccine, and Pertussis coverage. Additionally, the Annual Influenza vaccine is also available for prevention. Despite these efforts, NFHS-5 data from 2019-21 shows that India's full immunization coverage stands at 76.1%, indicating that there is still a portion of children who are not receiving essential vaccines. This highlights the need for continued efforts to increase vaccination rates and promote good hygiene practices to reduce the impact of diseases on children's health.

This gap in immunization coverage poses a significant risk to children, leaving them vulnerable to preventable diseases such as pneumonia. Healthcare providers and policymakers need to work together to increase awareness about the importance of vaccination and ensure that all children have access to the necessary vaccines. By prioritizing immunization efforts and addressing barriers to vaccination, we can help protect the health and well-being of India's children and reduce the burden of pneumonia in the country.

This can be achieved through targeted vaccination campaigns, improving access to healthcare services in rural and underserved areas, and implementing policies that make vaccines more affordable and readily available. Additionally, educating parents and caregivers about the benefits of vaccination and addressing any misconceptions or concerns they may have can help increase vaccine uptake rates and protect more children from preventable diseases like pneumonia. Collaboration between healthcare providers, government agencies, and community organizations is key to ensuring that every child in India receives the life-saving vaccines they need to stay healthy and thrive.

Respiratory infections, such as influenza and pneumonia, can cause significant morbidity and mortality in children. Vaccination is a crucial preventive measure against these illnesses. Key respiratory vaccinations recommended for children include Pneumococcal Vaccination (PCV), Influenza Vaccination (IIV), Measles, Mumps, Rubella(MMR), Varicella (V), Whooping Cough (Pertussis), COVID-19 Vaccination (Pfizer-BioNTech, Moderna), and Haemophilus influenzae type b (Hib).

PCV13 is recommended for children aged 2, 4, 6, and 12-15 months, while PCV15/PCV20 may be used for older children with higher risk factors. Influenza vaccines provide moderate protection against influenza, with effectiveness varying by season and virus strain. MMR and Varicella vaccines are highly effective in preventing these infections, leading to serious respiratory complications like pneumonia.

Pertussis is a highly contagious respiratory disease caused by Bordetella pertussis. DTaP or Tdap vaccines are recommended for children aged 2-6 months and boosters at 4-6 years. COVID-19 vaccines, such as Pfizer-BioNTech, Moderna, and other approved mRNA-based vaccines, target SARS-CoV-2 and provide strong

protection against severe illness, hospitalization, and death. Hib conjugate vaccines provide strong protection against Hib-related pneumonia and meningitis, reducing hospitalizations and long-term complications.
Thus, respiratory vaccinations are essential for public health in children, and parents should work closely with healthcare providers to ensure timely administration of all vaccines, particularly during infancy and early childhood.Thus, studying the correlation between vaccination and the incidence and severity of pneumonia will help show how important vaccination is, thus increasing immunization coverage.

OBJECTIVES
To correlate respiratory vaccinations with the incidence and severity of pneumonia in children hospitalized for Pneumonia.

METHODOLOGY
Study design: Prospective single-centre observational study.
Study period: July 2024 – September 2024

Inclusion criteria: All children aged 1 month to 18 years were admitted to Ramaiah hospitals and diagnosed with pneumonia as per IMNCI guidelines.

Exclusion criteria: Children with chemical pneumonitis/Aspiration pneumonia/Hypostatic pneumonia

Sample size with proper justification:
Based on the study by Kasundriya SK et al, where among 270 children, children who were incompletely vaccinated had a 66% risk of severe pneumonia, the sample size with 95% confidence interval, and 9% absolute precision, the study requires a minimum sample size of 83 children.
Detailed description of the procedure: All children aged 1 month to 18 years admitted to Ramaiah hospitals with pneumonia will be included in the study and classified according to severity based on IMNCI guidelines. We will enter the child's demographic details in a proforma. Vaccination details will be reviewed using their immunization cards and will be entered in a proforma. Treatment history will be considered, like the requirement of ventilator support, and inotropes will also be considered for the severity of the disease.
The vaccination the child has received will be correlated with the severity of pneumonia, admission to the PICU, length of the PICU stay, and hospital stay.

RESULTS
The study found that 54 children received at least 3 doses of the pneumococcal vaccine, while 11 received 2. Four children tested positive for Pneumococcal PCR, while 10 with incomplete/no pneumococcal vaccine tested positive.

Table 1 – Demographic details of the children in the study population

Characteristics	Values
Total number of children	96
Gender (Male/Female)	46/50
Age in years (Median(IQR))	3(1,14)

Table 2 – Association of Pneumococcal Vaccination and Detection of Streptococcus pneumoniae by PCR

Children who have received complete vaccination	PCR positive for Streptococcus pneumoniae		P - value
	Positive	Negative	
Yes	4	50	0.039
No	10	32	

In hospitalised children with pneumonia, those immunized against the Pneumococcal vaccine showed reduced ICU stay, reduced requirement of ventilator support, and thus reduced hospital stay and mortality. The odds of developing Streptococcal pneumoniae were approximately 74.4% lower in vaccinated children when compared to unvaccinated children which were noted to be statistically significant with a p-value – 0.039. Influenza vaccines were taken yearly by 37.5% of children, and 66% of vaccinated children required

only ward admission, with no ICU or oxygen requirement. 9 children required oxygen support in the form of low-flow or high-flow oxygen support.

Overall, the study showed that immunization against Pneumococcal and Influenza vaccines significantly decreased the severity of pneumonia in hospitalized children. The reduction in ICU stay, ventilator support, and mortality rates highlights the importance of vaccination in preventing and managing respiratory infections. Additionally, the low percentage of children requiring oxygen support further demonstrates the effectiveness of vaccines in protecting against severe complications of pneumonia.

DISCUSSION

This study was done to understand the importance of vaccination in decreasing the incidence of Pneumonia, and the severity of Pneumonia.

In our study, those completely vaccinated with the Pneumococcal vaccine, had a decrease in the severity of Pneumonia in the form of the reduced requirement of ventilator support, reduced ICU and hospital stay and thus reduced morbidity and mortality than those who were incompletely vaccinated or not vaccinated. This was similar to the finding in the study by Blyth CC in New Guinea which noted children vaccinated completelyhave a 57% reduction in pneumonia hospitalisation, a 65% reduction in severe pneumonia and a 29% reduction in hypoxic pneumonia.

This was in alignment with the study done by Kasundriya SK et al in Ujjain, India in which Children who are incompletely vaccinated, have a higher risk(66%) of severe pneumonia than children who are completely vaccinated(34%).

Among the children who were incompletely or not vaccinated with the Pneumococcal vaccine, 10 children had Empyema/Necrotizing pneumonia necessitating ICD insertion and VATS, and thus the requirement of ventilator support, increased ICU and hospital stay.

CONCLUSION

Pneumococcal vaccine coverage significantly reduces pneumonia severity in children, reducing hospital stays, ventilator support, and mortality. Annual influenza vaccination reduces intensive care unit admissions and oxygen support requirements. Both pneumococcal and influenza vaccinations significantly impact the health outcomes of pediatric patients with pneumonia, emphasizing the importance of vaccination in reducing respiratory illnesses.

Healthcare providers must educate parents and caregivers about the benefits of vaccinating their children against these respiratory illnesses. Increasing vaccination rates not only protect individual children but also helps to prevent the spread of these infections within the community. By prioritizing vaccination as a key component of pediatric healthcare, we can work towards reducing the burden of pneumonia and influenza on children and improving overall public health outcomes.

REFERENCES:

1. Oliwa JN, Marais BJ. Vaccines to prevent pneumonia in children - a developing country perspective. Paediatr Respir Rev. 2017 Mar;22:23-30.
2. Marangu D, Zar HJ. Childhood pneumonia in low-and-middle-income countries: An update. Paediatr Respir Rev. 2019 Nov;32:3-9.
3. Ferdinands JM, Olsho LE, Agan AA, Bhat N, Sullivan RM, Hall M et al. Effectiveness of influenza vaccine against life-threatening RT-PCR-confirmed influenza illness in US children, 2010-2012. J Infect Dis. 2014 Sep 1;210(5):674-83.
4. Bhavsar A, Zaryczański J, Wasilewska A, Saragoussi D, Devadiga R, Colby C et al. Pneumonia hospitalizations of children aged <2 years in Poland before (2013-2016) and after (2017-2018) universal mass vaccination with 10-valent pneumococcal non-typeable *Haemophilus influenzae* protein D conjugate vaccine. Hum Vaccin Immunother. 2022 Nov 30;18(6):2128566.
5. Blyth CC, Britton KJ, Nguyen CD, Sapura J, Kave J, Nivio B et al. Effectiveness of 13-valent pneumococcal conjugate vaccine against hypoxic pneumonia and hospitalisation in Eastern Highlands Province, Papua New Guinea: An observational cohort study. Lancet Reg Health West Pac. 2022 Mar 15;22:100432.
6. Kasundriya SK, Dhaneria M, Mathur A, Pathak A. Incidence and Risk Factors for Severe Pneumonia in Children Hospitalized with Pneumonia in Ujjain, India. Int J Environ Res Public Health. 2020 Jun 27;17(13):4637.