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Original Research Article

Bridging the gap: parental knowledge and attitude towards pneumococcal disease and vaccine among children under five: a cross-sectional study in Nagpur, India

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ABSTRACT

Background: Pneumococcal infection is a major public health concern and a leading cause of death among children under five, particularly in developing countries. Pneumonia accounted for 14% of all deaths among children under five in India, with an estimated 740,180 fatalities in 2019. Although pneumonia is vaccine-preventable, low awareness and knowledge hinder access to immunisation. This study aimed to assess the knowledge and attitude of parents toward pneumococcal disease and the pneumococcal conjugate vaccine (PCV) among children under five attending the immunisation clinic of Government Medical College, Nagpur.
Methods: A cross-sectional study was conducted from November 2022 to January 2023 among 340 parents/guardians of children under five who visited the immunisation clinic using a convenience sampling technique. Data were collected using a pre-tested, semi-structured questionnaire via face-to-face interviews, covering demographic details, awareness of pneumococcal disease and knowledge and attitudes regarding PCV. Data were summarised using frequencies and percentages.
Results: Among the participants, 37.7% were aged 26–30 years and 33.8% had attained a graduate degree or higher. Awareness of pneumococcal disease was reported by 85.6% of parents/guardians; however, knowledge of the pneumococcal vaccine and its benefits was limited. The main reason for non-vaccination among children was unavailability of the vaccine at health facilities.
Conclusions: While general awareness of pneumococcal disease was relatively high among parents, understanding of the PCV and its importance was inadequate. Strengthening parental education and ensuring consistent vaccine availability at health facilities are essential to improve PCV coverage and reduce childhood morbidity and mortality from pneumonia.

Keywords: Childhood pneumonia, Immunization coverage, Pneumococcal disease, Pneumococcal conjugate vaccine, Vaccine knowledge and attitudes

INTRODUCTION

Pneumococcal infection, caused predominantly by the bacterium *Streptococcus pneumoniae*, is a major public health concern and a leading cause of mortality among young children, especially in developing nations.[1] Globally, it is estimated that pneumococcal infections cause the death of approximately 476,000 children under the age of five each year. In India, pneumonia accounts for 14% of all deaths in this age group, claiming the life of about 740,180 children in 2019 alone.[2] This disease can manifest as invasive pneumococcal disease (IPD), which includes severe conditions like bacteremic pneumonia, meningitis and sepsis and can also lead to upper respiratory infections, otitis media and paranasal sinus infections.[3] Immunisation is recognised as one of the most successful and cost-effective public health interventions for improving child survival worldwide.

The development of PCVs has revolutionized the prevention of IPD.[4] Several studies have demonstrated a significant reduction in vaccine-type invasive diseases in children after the introduction of PCVs into routine immunisation programmes. These vaccines are highly effective, with some studies suggesting a protection rate of 76%–92% against pneumococcal infections.[5]

In India, PCV was introduced into the Universal Immunisation Programme (UIP) in a phased manner starting in May 2017, with the goal of reducing infant mortality and morbidity from pneumococcal pneumonia. Initially launched in select states, the vaccine was expanded nationwide in 2021-22.[6]

Despite this, the coverage for pneumococcal vaccination remains low. Several factors contribute to this, including the high cost of optional vaccines and various barriers related to parental perceptions. A parent's knowledge, attitude and practices (KAP) are critical factors that influence a child's immunisation status, as their decisions are crucial for enhancing vaccination rates and compliance.[7]

Studies conducted across India and other developing countries have consistently shown that parental awareness regarding optional vaccines like PCV is often inadequate. Studies have found that many parents were unaware of PCV and its benefits and revealed low awareness levels for pneumococcal vaccine, at 39% and 27% respectively.[8] This lack of knowledge is a primary reason for non-vaccination. Socio-economic status and parental education level are often significantly associated with vaccine awareness and uptake; mothers with higher education and from higher socio-economic groups tend to have better knowledge.[5] Furthermore, recommendations from healthcare providers, such as doctors and nurses, are a major source of information for parents and strongly influence their decision to vaccinate. However, counselling on optional vaccines is not always consistently provided.

Given that pneumonia is a vaccine-preventable disease and the PCV is now part of the national immunisation schedule, understanding the specific knowledge gaps and attitudes of parents is essential for designing effective health education strategies. Therefore, this cross-sectional study aims to assess the knowledge and attitude towards pneumococcal disease and the pneumococcal vaccine (PCV) among parents of children under five attending the immunisation clinic of Government Medical College, Nagpur.

METHODS

Study design and setting

This cross-sectional study was conducted among parents/guardians of children under five years of age attending the Immunisation Clinic of Government Medical College, Nagpur, India, between November 2022 and January 2023.

Study population

Parents or guardians of children under five attending the immunisation clinic were included. Individuals who did not provide consent were excluded.

Sample size and sampling technique

A sample size of 340 participants was estimated using the formula.

n=(Z_(1-α⁄2)^2 p (1-p))/d^2

where P (prevalence of knowledge regarding vaccination as a preventive measure for newborns) was taken as 66.54% as reported by Sharma et al. Awareness, attitude and knowledge about pneumococcal infection and vaccination.

A survey across North Delhi. Int J Health Allied Sci 2019;9:51-6.", Z corresponds to a 95% confidence interval and d represents an allowable error of 6%. Participants were selected using convenience sampling technique until the required sample size was achieved.

Data collection

Data were collected through face-to-face interviews using a pre-tested, semi-structured questionnaire administered via Google Forms. The questionnaire captured.

Sociodemographic information (age, education, occupation, socioeconomic status). Knowledge regarding pneumococcal disease and the pneumococcal conjugate vaccine (PCV), assessed using a categorical response format (Yes/No/Don't Know).

Attitudes toward pneumococcal disease and vaccination, assessed using a single closed-ended question.

Data management and analysis

Data were entered into a Microsoft Excel and analysed using Jamovi v2.6 software. Descriptive statistics such as frequencies and percentages were calculated.

Ethical considerations

Informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity of responses were maintained throughout the study.

RESULTS

The majority of respondents (65.9%) were aged below 30 years. Most participants were unemployed (62.4%),

reflecting that mothers were the primary respondents. Educational attainment was relatively high, with 70% having completed high school or above. More than half (52.4%) lived in nuclear families, while 39.1% belonged to joint families. Regarding socioeconomic status, most participants were from the middle and upper-middle classes (41.5% and 40.6%, respectively), while very few (5.3%) were from lower socioeconomic classes (Table 1).

Overall, 85.6% of parents had heard of pneumococcal disease. Among these (n = 291), the majority (81.1%) recognized that babies are at risk and 67.4% correctly identified vaccination as a preventive measure. However, 22.4% were uncertain about the role of vaccination in prevention (Table 2).

Detailed knowledge assessment revealed that while 58.4% correctly identified pneumococcal disease as bacterial, 23.7% mistakenly attributed it to a viral cause, indicating misconceptions regarding etiology. Recognition of common symptoms such as fever and cough (69.6%), difficulty in breathing (64.0%), poor feeding (60.8%) and lethargy or wheezing (64.0%) was high.

However, only 32.8% recognized convulsions as a warning sign. Awareness of complications was better, with meningitis (61.6%), sepsis (64.8%) and unconsciousness (65.6%) frequently identified. Nevertheless, less than half (33.6%) acknowledged that pneumococcal disease could be fatal (Table 3). Of the 291 participants aware of pneumococcal disease, only 43% (n=125) had heard of the PCV (Figure 1).

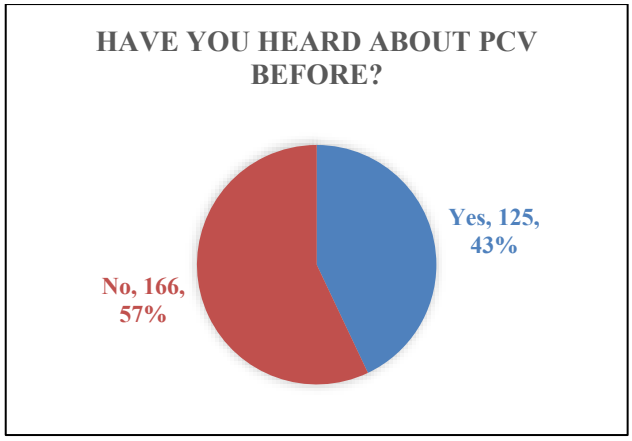

Figure 1: Knowledge about pneumococcal conjugate vaccine (PCV) (n=291).

Among these, 92% knew that PCV is included in the National Immunisation Schedule, but only 54.4% had previously heard of it as a preventive vaccine. Knowledge regarding dosage was poor: 59.2% did not know the correct schedule and only 32% identified the correct number of doses (three). Misconceptions about duration of protection were also observed, with nearly half (48.8%) believing the vaccine provides lifelong protection (Table 4). Among the 34 parents who had not vaccinated their children with PCV, the most frequently reported reason was unavailability of the vaccine at health facilities (64.7%). Fear of side effects (2.9%), fear of needles (2.9%) and reliance on alternative protection (5.9%) were reported by a small proportion of participants (Table 5).

Table 1: Sociodemographic details of parents/guardians of children under five (n=340).

Sociodemographic variable	N	%
Age (in years)		
<30	224	65.88
≥30	116	34.12
Occupation		
Employed	128	37.65
Unemployed	212	62.35
Education		
High school certificate and above	238	70
Middle school certificate and below	102	30
Type of family		
Nuclear	178	52.35
Three generation	29	08.53
Joint	133	39.12
Socioeconomic status		
Upper class	43	12.65
Upper middle class	138	40.59
Middle class	141	41.47
Lower middle class	16	04.70
Lower class	2	00.59

Table 2: Knowledge regarding pneumococcal disease among parents/guardians (n=340).

Knowledge	Response	N	%
Have you heard about pneumococcal disease?	Yes	291	85.59
	No	49	14.41
Are babies at risk of developing pneumococcal diseases?	Yes	236	81.10
	No	8	02.75
	Do not know	47	16.15
Can vaccination prevent pneumococcal disease?	Yes	196	67.35
	No	30	10.31
	Do not know	65	22.37

Table 3: Knowledge regarding pneumococcal disease among parents/guardians (n=125).

Knowledge	N	
	Response	**N (%)**
What do you know about Pneumococcal disease?		
It is caused by a virus	Yes	69
	No	12
	Do not know	44
It is caused by a bacterias	Yes	73
	No	8
	Do not know	44
It can spread from one person to another	Yes	68
	No	15
	Do not know	42
It can be prevented	Yes	83
	No	2
	Do not know	40
What are the common symptoms of Pneumococcal disease?		
Fever and cough	Yes	87
	No	3
	Do not know	35
Difficulty in breathing	Yes	80
	No	5
	Do not know	40
Inability to drink or breast feed	Yes	76
	No	4
	Do not know	45
Convulsions	Yes	41
	No	35
	Do not know	49
Lethargic and wheezing	Yes	80
	No	2
	Do not know	43
What are the complications of Pneumococcal disease?		
Meningitis	Yes	77
	No	8
	Do not know	40
Sepsis	Yes	81
	No	5
	Do not know	39
Unconsciousness	Yes	82
	No	6
	Do not know	37
Death	Yes	42
	No	36
	Do not know	47

Table 4: Knowledge regarding pneumococcal conjugate vaccine among parents/guardians.

Knowledge	Response	n=125	%
Is PCV[a] included in nis[b] schedule?	Yes	115	92
	No	10	8
Have you heard of vaccine to prevent pneumococcal disease before?	Yes	68	54.5
	No	57	45.5
How many doses required for complete vaccination of PCV[a]?	1 dose	1	0.8
	2 doses	8	6.4
	3 doses	40	32
	4 doses	2	1.6
	Do not know	74	59.20
For how long can the vaccine protect?	5 years	44	35.20
	5-10 years	20	16.00
	Life Long	61	48.80

[AP]neumococcal conjugate vaccine [b]National immunisation schedule

Table 5: Reasons for not giving PCV to your child on time (attitude towards PCV vaccine among parents).

Have your child vaccinated with PCV[a] before?	n=125 (%)
Yes	91 (72.80)
No	34 (27.20)
Reasons	n=34 (%)
It has serious side effects	01 (2.94)
I have alternation protection	02 (5.88)
Fear of needles and injections	01 (2.94)
Unavailability of vaccine	22 (64.71)
Not applicable	08 (23.53)

[a]Pneumococcal conjugate vaccine.

DISCUSSION

This study explored the knowledge and attitudes of parents of under-five children towards pneumococcal disease and the pneumococcal conjugate vaccine (PCV) at a tertiary care centre in Nagpur, India. Although overall awareness of pneumococcal disease was relatively high (85.6%), specific knowledge regarding PCV was limited, with only 43% of respondents having heard of it. Furthermore, misconceptions regarding etiology, symptoms, complications and duration of vaccine protection were prevalent. The most frequently cited barrier to vaccination was unavailability of the vaccine at health facilities (64.7%).

Our findings are consistent with those of Sharma et al, who reported that only 27% of parents in North Delhi were aware of PCV, underscoring the persistent knowledge gap even in urban settings.[8] Similarly, Muppidathi et al found that awareness of pneumococcal and rotavirus vaccines among Indian mothers of under-five children was poor, suggesting a nationwide challenge.[9] Globally, inadequate parental knowledge about childhood vaccines has also been reported in Ethiopia, the UAE and Pakistan.[4,10,11] These findings highlight that low vaccine literacy remains a barrier across diverse socio-cultural contexts.

Education and socioeconomic status are often associated with vaccine awareness and uptake. In the study, although 70% of respondents had at least a high school education, misconceptions were widespread. Comparable results were reported in Singapore, where even well-educated parents demonstrated gaps in knowledge about pneumococcal disease and vaccination schedules.[5] A similar trend was observed in South China, where young workers exhibited inadequate awareness and misconceptions about influenza vaccines.[12] This suggests that formal education does not necessarily translate into vaccine-specific knowledge and that focused health education campaigns are required.

The primary reason for non-vaccination in our study vaccine unavailability is in line with earlier findings from rural India, where logistical issues and limited access were major barriers.[7] Programmatically, although PCV was rolled out nationwide in India in 2021–226, supply chain challenges and inconsistent availability at health facilities remain obstacles. Evidence from Latin America shows that sustained and widespread introduction of PCV significantly reduces invasive pneumococcal disease in children.[3] Thus, ensuring uninterrupted supply is a prerequisite for achieving public health impact. Misconceptions regarding vaccine protection were also prominent, with nearly half of parents in our study believing PCV provided lifelong immunity. Similar

misunderstandings have been documented in Japan among the elderly population1 and in South Africa among high-risk adults.[13] In our setting, such misconceptions could delay timely vaccination or reduce adherence to the recommended schedule. This indicates the urgent need for clear communication strategies on vaccine schedules and benefits.

Globally, healthcare providers remain the most trusted source of information and strongly influence parental decisions on vaccination.[5,7] However, counselling on optional vaccines like PCV is often inconsistent, leading to missed opportunities. Strengthening provider–parent communication during routine immunisation visits, as recommended in previous studies from India and Pakistan, is critical to bridging this gap.[4,6]

CONCLUSION

This study highlights a significant gap between general awareness of pneumococcal disease and knowledge about the pneumococcal conjugate vaccine among parents of under-five children in Nagpur, India. While awareness of disease burden was high, misconceptions about etiology, symptoms, complications and vaccine protection were widespread. The major barrier to vaccination was unavailability at public facilities, reflecting systemic programmatic challenges.

To improve PCV uptake, interventions must focus on three key areas: strengthening parental education through targeted health campaigns, ensuring consistent vaccine availability at health facilities and enhancing healthcare provider counselling on optional vaccines. Global evidence demonstrates that sustained supply chains and effective communication strategies can dramatically improve coverage and reduce childhood morbidity and mortality from pneumococcal disease. Integrating these lessons into India's Universal Immunisation Programme is essential to maximize the benefits of PCV introduction.

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