Research Article

Knowledge on routine pentavalent vaccines and socioeconomic correlates among mothers of children aged younger than 5 years in Urban Puducherry

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Abstract

Background: Introduction of any new vaccine into the community needs lot of efforts in disseminating the knowledge to the community and getting their cooperation for appropriate compliance.

Objectives: To study mother's knowledge on routine vaccination with special focus on pentavalent vaccine and to identify the associated factors favoring the knowledge on pentavalent vaccine, immunization coverage, and reasons in case of delay in immunization.

Materials and Methods: Community-based cross-sectional study was conducted in four areas of urban field practice area of JIPMER, Puducherry, during February to March 2013. By proportionate stratified sampling, mothers of children aged younger than 5 yr were selected from the records maintained in the urban center. Mothers were interviewed regarding knowledge and schedule for routine vaccines and sociodemographic details. Status of vaccine administration was cross-checked with the immunization card of the child.

Results: Mean age of the 215 mothers interviewed was 27 ± 3.7 yr and their children was 23.7 ± 16.7 mo. Among these 215 mothers, 36.7% had knowledge about pentavalent vaccine. Vaccine knowledge was higher for polio (94.4%), followed by measles and DPT (77–79%). Mothers of children who had received the pentavalent vaccine were significantly more aware of this vaccine compared with mothers whose children did not receive it ($P = 0.0004$). Multivariate logistic regression analysis showed that mother's education, occupation, and age of the children to be the significant factors favoring their knowledge.

Conclusion: On introduction of a new vaccine in the health system, health workers should remind the mothers regarding next schedule, especially the illiterate, housewives, and mothers aged more than 30 yr.

KEY WORDS: Awareness, children, combined vaccines, Immunization, knowledge, mother, slum

Introduction

Vaccination is one of the mile stone achievements in the field of public health. Estimated 2.5 millions are saved each year from vaccine-preventable diseases.[1] At the end of 2010, around 23 million children younger than 12 months had failed to receive all primary vaccinations.[1] According to recent Central Bureau of Health Intelligence (CBHI) report on national health profile, in 2011 alone, 734 neonatal tetanus, 4,233 diphtheria, 40,508 pertussis, 33,634 measles, 89,150 viral hepatitis, and 715,888 pneumonia cases occurred in India, which are largely preventable by routine vaccines.[2] In India, even though overall coverage of immunization has improved a lot, disparities among deprived remains the same.[3]

Maternal age, education, urban environments, and easy access to health care were found to be favorable factors for immunization.[4–6] Literature shows that distance from health facilities, child sex, neglect, lack of awareness, and family size were found to be associated with delayed immunization.[7–12] Knowledge of immunization is a primary factor for immunization coverage regardless of socioeconomic categories. In India, primary care giver is always the mother, except in few cases. Study from South India had reported 85% concordance on immunization detail between mother's information and immunization card.[13]

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Introduction of any newer vaccine into the community needs lot of efforts in disseminating the knowledge to the community and getting their consent for appropriate implementation.[14] As per National Technical Advisory Group on Immunization (NTAGI) plan, pentavalent vaccines are introduced in phased manner initially for 10 states.[15] In Puducherry, pentavalent vaccine was introduced under Universal Immunization Programme during February 2013.

In this context, this study was planned to assess mother's knowledge on routine vaccination with special focus on pentavalent vaccine and the extent to which mothers have been informed regarding the newer pentavalent vaccine. This study also tried to identify the associated factors favoring the knowledge on pentavalent vaccine, immunization coverage for the routine vaccinations, including the newly introduced pentavalent vaccines, and reasons in case of delay in immunization.

Materials and Methods

This study is a community-based cross-sectional survey conducted in urban field practice area of medical college from Puducherry during the period of February to March 2013. This field practice area caters to the population of 9,667 from four areas near coastal region of urban Puducherry, namely *Kurichikuppam*, *Vazhaikulum*, *Vaithikuppam* and *Chinnaiyapuram*. Urban center has records for each household with all sociodemographic details. These records are updated periodically. Well-baby clinics are held every Tuesday afternoon. All routine immunization, counseling regarding infant and young child feeding (IYCF), and growth monitoring services are provided in this well-baby clinic. This field practice area had total of 611 children aged younger than 5 yr during the study period.

Sampling: Study from Ahmedabad, India, had quoted mothers' knowledge on immunization varying from 15% for hepatitis vaccine to 83% for polio vaccine.[16] Taking the prevalence of 15% and 5% absolute precision and 10% of estimated nonresponse, the sample size was calculated to be 215. Mothers of all children aged younger than 5 yr were identified from the records. Number of mothers from each area was calculated by proportionate sampling. This sampling strategy had yielded 83, 62, 42, and 28 households, respectively, from each of the four areas. In each area, houses were selected by stratified sampling to get adequate representation from all the streets. In each street, fixed number of mothers was selected randomly from the records. Totally, 238 children aged younger than 5 yr were present in these 215 selected households. In households where more than two children aged younger than 5 yr were present, vaccination details was obtained for the younger one. With pretested interview schedule, mothers were interviewed regarding the knowledge on routine vaccines (BCG, DPT, measles, hepatitis B, Hib, and pentavalent vaccines). Mothers were asked whether they know how many vaccines their child has to receive in first year, when to take the child for immunization, whether they have been informed by the health worker regarding possible side effects of vaccines, and when to bring their child for next vaccination. Status of vaccine administration was cross-checked with the immunization card of the child.

At every immunization visit, it is the responsibility of the health worker to inform about the vaccines, disease prevented by the vaccines, probable adverse effects, and the date for the next visit. With the assumption that mothers of the children aged younger than 5 yr who had received the vaccine should have been informed about these aspects by the health workers, we further analyzed our data on vaccine awareness among the eligible children. Of 215 children, 215, 192, 162, and 110 children were eligible to receive BCG, DPT, measles, and MMR vaccine, respectively.

Since pentavalent vaccine was introduced in Puducherry during February 2013, children born from January 2013 were considered to be eligible to receive this vaccine.

Knowledge on vaccination, vaccine preventable diseases, and vaccine schedules were reported as percentages. Delayed immunization was operationally defined as exceeding the grace period of 1 month from the scheduled date. This definition corresponds with the EPI definition and evidences from the previous literature.[17] Association of various factors and awareness on pentavalent immunization were analyzed by cross-tabulations with χ^2 or Fischer exact test, whichever was appropriate using SPSS (version 16.0). Significant factors on bivariate analysis were entered in logistic regression. Results are reported as odds ratio with 95% confidence interval.

Results

Sociodemographic Characteristics of the Children and Their Mother: Mean age of the mothers was 27 ± 3.7 yr. Regarding education, 19.1% and 32.6% of the mothers had less than primary and more than higher secondary level of education, respectively. Father's education also was nearly the same. Among these 215 mothers, 23 (10.7%) were working and remaining were homemakers. Most of the fathers were involved in unskilled work (34.4%), followed by professional work (23.3%). Mean per capita income of these households was Rs. 1,867.8 ± 1,384 (median, Rs. 1,500; range, Rs. 400–8,000).

Mean age of the children was 23.7 ± 16.7 months. Of these 215 children, 36.7% of them were infants. Majority of the children (93.5%) were of first- or second-birth order.

More than 70% of mothers had heard about the routine vaccines under national immunization schedule. Vaccine knowledge was higher for polio and least for MMR. Except Polio and measles, more than two-third of the mothers did not know for which disease the child was vaccinated or was going to be vaccinated. Regarding pentavalent vaccine, mothers of children who had received the vaccine were significantly more aware compared with mothers whose children did not receive it in the past (P = 0.0004) (Table 1).

Table 1: Awareness on Vaccine Preventable Diseases

Name of the Vaccine	Comprehensive Knowledge on Vaccine (n = 215)	Awareness Among Mothers Whose Children Had Received the Vaccine	Awareness on Diseases Prevented by Vaccines
BCG	154 (71.6)	154 (71.6)	84 (39.1)
DPT	166 (77.2)	148 (77.1)	73 (34)
Polio	203 (94.4)	180 (93.8)	169 (78.6)
Measles	170 (79.1)	127 (78.4)	130 (60.5)
MMR	58 (27)	26 (23.6)	26 (12.1)
Hep B	139 (64.7)	126 (65.6)	109 (50.7)
Hib	33 (15.3)	27 (14.1)	15 (7.0)
Pentavalent	79 (36.7)	7 (53.8)	13 (6.0)

Awareness of the number of doses and age at which the child should receive that particular vaccine was low in this community. Fever was invariably reported by mother as adverse effect following immunization (Table 2).

Even though mothers had poor knowledge on the schedule of the vaccines, of 215 mothers 172 of them knew when to take their child for next immunization. One mother explained as "I don't know how many vaccines or which month she has to get her vaccines, whenever sister (ANM or public health nurse) reminds me, I take her to hospital on Tuesday afternoon."

Of 215 mothers, 96.3% of them had received immunization for their children from government health center, most commonly (80%) from urban health center, and 3.7% had received from private hospitals. Of 79 people who knew about pentavalent vaccine, 51 and 38 got the information from health workers and media, respectively. Pamphlets, hoardings, and newspapers are few other sources listed by participants, which showed information on pentavalent vaccine.

Coverage for all primary vaccines under national immunization schedule was complete. Yet, applying the definitions for delayed immunizations, the immunization coverage for BCG, DPT III, measles, Hep B, and pentavalent vaccines was 99.5%, 98.1%, 95.8%, 99.5%, and 100%, respectively. Migration was the main factor for delayed immunization.

Table 2: Awareness on Vaccine Schedule and Dose

Name of the Vaccine	No. Doses (n = 215)	Age at Vaccination	Adverse Effects
BCG	39 (18.1)	22 (10.2)	Fever: 32, pain: 12, cold: 1
DPT	28 (13.0)	20 (9.3)	Fever: 30, diarrhea: 1, pain: 6
Polio	31 (14.4)	20 (9.3)	Diarrhea: 2, fever: 17, paralysis: 2
Measles	30 (14.0)	18 (8.4)	Fever: 16, pain: 1
MMR	14 (6.5)	13 (6.0)	Fever: 7, pain: 1
Hep B	15 (7.0)	12 (5.6)	Fever: 7
Hib	9 (4.2)	12 (5.6)	—
Pentavalent	(10.2)	25 (11.6)	Fever: 5

Mothers belonging to age group of 26–30 yr, having more than primary school education, who were working, having spouse with professional occupation, and having children younger than 1 yr of age were found to have significantly higher awareness of immunization (Table 3). After adjusting for other factors, mother's education and occupation and age of the children were significant factors affecting their awareness on pentavalent vaccine (Table 4).

Discussion

Introduction of newer vaccines proposed to create more awareness and demand among parents. Advocacy and social mobilizations are the key steps in implementing the introduction of newer vaccines in the community in the pre-implementation and planning phases. One of the vaccine postintroduction evaluation indicator in the field is to assess the community acceptance of newer vaccines and how far the family is able to name the vaccine and diseases it prevents.[14]

In the postintroduction phase of pentavalent vaccine, in this study, totally 36.7% and 6% mothers were aware on pentavalent vaccine and diseases prevented by it, respectively. Because there was no prior literature available in this regard, consistency across studies could not be made. Sufficient time to pass information may increase the knowledge on pentavalent vaccine in future among mothers.

More than 70% mothers had heard about the routine vaccines under national immunization schedule. Awareness level was low for recently introduced vaccines, namely MMR (26%), Hib (15.3%), and pentavalent vaccine (36.7). This study revealed considerably high awareness on vaccines but low level of awareness on diseases prevented by those vaccines and the age at which the child should get vaccinated. This difference of higher knowledge of vaccines and vaccine preventable disease compared with doses and schedule of the vaccine was also observed in previous studies.[18]

Awareness on vaccine-preventable diseases for vaccines in which the name of the disease is reflected such as measles, Hep-B, and polio were more compared with other combined vaccines such as MMR, DPT, and pentavalent. Recent study by Population Council of India in Uttar Pradesh also reported 70% awareness on polio compared to 20–30% awareness on diphtheria and pertussis.[19] Study by Shah et al. from Ahmedabad also showed increased knowledge about polio and BCG compared with DPT and measles.[18] A recent study from Karnataka had reported 100% awareness on polio.[20]

Of the 215 mothers, only 3.7% had immunization for their child from private compared with the national figure of 9%.[21] Studies have also reported that, rather than the overall knowledge on immunization, insisting the message on when to bring the child for the next dose create a demand for immunization, especially among the mother of urban slums. A recent randomized trial from Pakistan had shown

Table 3: Bivariate Analysis of Factors Influencing Awareness on Pentavalent Vaccine

Factors	Awareness on Pentavalent Vaccine		P Value
	Yes	No	
Child sex			
Male (n = 118)	40 (33.9)	78 (66.1)	0.34
Female (n = 97)	39 (40.2)	58 (59.8)	
Birth order			
First (n = 106)	45 (42.5)	61 (57.5)	0.09
Second or above (n = 109)	34 (31.2)	75 (68.8)	
Income category (in Rs)			
Up to 1,000 (n = 81)	21 (25.9)	60 (74.1)	**0.009**
1,001–2,000 (n = 71)	26 (36.6)	45 (63.4)	
More than 2000 (n = 63)	32 (50.8)	31 (49.2)	
Mother's occupation			
Homemakers (n = 192)	61 (31.8)	131 (68.2)	**0.0001**
Working mothers (n = 23)	18 (78.3)	5 (21.7)	
Father's occupation			
Unskilled (n = 74)	19 (25.7)	55 (74.3)	**0.0004**
Semiskilled (n = 46)	19 (41.3)	27 (58.7)	
Skilled (n = 45)	13 (28.9)	32 (71.1)	
Professional (n = 50)	28 (56)	22 (44)	
Mother's education			
⩽Fifth standard (n = 41)	7 (17.1)	34 (82.9)	**0.014**
Sixth to 12th (n = 104)	42 (40.4)	62 (59.6)	
More than higher secondary (n = 70)	30 (42.9)	40 (57.1)	
Father's education			
⩽Fifth standard (n = 39)	11 (28.2)	28 (71.8)	0.18
Sixth to 12th (n = 102)	35 (34.3)	67 (65.7)	
More than higher secondary (n = 74)	33 (44.6)	41 (55.4)	
Mother's age (yr)			
⩽25 (n = 84)	32 (38.1)	52 (61.9)	**0.001**
26–30 (n = 96)	43 (44.8)	53 (55.2)	
⩾31 (n = 35)	4 (11.4)	31 (88.6)	
Eligible to receive pentavalent vaccine			
Yes (n = 192)	69 (35.9)	123 (64.1)	0.48
No (n = 117)	10 (43.5)	13 (56.5)	
Awareness for all primary vaccines			
Yes (n = 98)	43 (43.9)	55 (56.1)	**0.047**
No (n = 117)	36 (30.8)	81 (69.2)	
Place of immunization			
Government (n = 207)	74 (35.7)	133 (37.5)	0.12
Private (n = 8)	5 (62.5)	3 (37.5)	
Child age			
Infant (n = 79)	38 (48.1)	41 (51.9)	**0.001**
More than 1 yr of age (136)	36 (26.5)	100 (73.5)	

that, even among the less literate mothers, simple schematic pictorial educational interventions had helped in immunization coverage.[22] Forums such as village health nutrition day, children's day, and Anganwadi centers should be used to spread the knowledge, especially among the vulnerable mothers such as housewives and women more than 30 years, illiterate, and of low socioeconomic status.

In this study, mother's with more than primary education, working outside, and having children younger than 1 yr of age were significant factors affecting their awareness on pentavalent vaccine. There are several reasons mentioned for the poor performance of immunization program such as lack of perceived risk on VPDs, lack of knowledge about vaccine and the source of vaccination, lack of accessibility in terms of

Table 4: Multivariate Analysis on Determinants of Mother's Awareness on Pentavalent Vaccine

Factors	Odds Ratio	95% CI	Significance
Mother's age (in yr)			
⩽25	1.00		
26–30	1.31	0.64–2.68	0.45
>30	0.18	0.05–0.66	**0.009**
Mother's education			
Up to primary	1.00		
Sixth to 12th	3.7	1.31–10.5	**0.01**
More than higher secondary	3.25	1.05–10.04	**0.04**
Mother's occupation			
Homemakers	1.00		
Working mothers	5.73	1.72–19.1	**0.004**
Father's occupation			
Unskilled work	1.00		
Semiskilled work	2.31	0.92–5.81	0.08
Skilled work	1.39	0.53–3.61	0.5
Professional	4.28	1.60–11.42	**0.004**
Income			
Up to 1,000	1.00		
1,001–2,000	2.22	0.99–4.99	0.05
>2,000	2.12	0.89–5.07	0.091
Age of the children			
⩽12 months			
>12 months	0.30	0.15–0.61	**0.001**

Adjusted R^2 = 0.361.

geographical and cultural contexts, and programmatic challenges.[23] In South India, caregivers from nuclear families were found to have less knowledge on immunization.[24] Of all these factors, lack of awareness on vaccines seems to be the major reason cut across all the states.[5,6,21] Previous evidences showed more than 30% of the partial immunization or nonimmunization occurs because of lack of awareness, including the recent coverage evaluation report.[8,10,21]

Limitations: Immunization coverage was presented as reported by the mother. Since only 56% of the immunization cards were available during the survey, reliability of the mother's reports could not be ensured. However, past studies have ensured more than 80% agreement between mother's report and immunization card.[13] Hence, mother's report can be taken as a proxy indicator. However, coverage evaluation of individual vaccines is beyond the scope of this study.

Because the most common source of information was mass media, target audience should be attracted with a focused message using popular media. Despite the low level of awareness on vaccine preventable diseases among mothers, it did not affect the immunization status because of program support, intensive monitoring, and wide accessibility. These impending barriers on knowledge need attention before they progress to become barriers of immunization.

Conclusion

Knowledge of vaccines under national immunization schedule among mothers of children aged younger than 5 yr varied between 27% and 95%. Only one-third of the mothers were aware about pentavalent vaccine. This knowledge on pentavalent vaccine was significantly low among illiterate, housewives, and women aged older than 30 yr and who had children older than 1 yr of age. As the knowledge on newly introduced pentavalent is low in this community, health workers should remind the mother about next due of immunization and clarify the misconceptions on adverse effects and contraindications of vaccine, especially when the newer vaccine is being introduced in the health system.

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