

Parental attitudes towards influenza vaccination for children in South India

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Background: The rate of influenza vaccination is low for children in India. The purpose of this study is to assess parental attitudes towards influenza vaccination in South India.

Methods: Participants were parents who brought their children to the Well Baby Clinic of Christian Medical College Hospital, Vellore, India for routine immunization. Participants answered questions by written survey while waiting for their children's vaccination.

Results: A total of 456 surveys were completed (403 parents did not opt for trivalent influenza vaccination and 53 opted for influenza vaccination). The majority (53.60%) of those parents who did not accept influenza vaccination identified the lack of a doctor's recommendation as the main reason. When asked separately, many non-acceptors (44.91%) indicated that they did not believe or were not sure that the influenza vaccine was effective. Nearly all non-acceptors (92.56%) stated that they would opt for influenza vaccination if a doctor recommended it.

Conclusions: The most common reason that parents not opting for influenza vaccination for their children was the lack of recommendation by a doctor. The results of this study suggest that recommendation by a doctor is a more important factor than belief in efficacy, cost, or convenience in parental decision-making regarding childhood influenza vaccination in India, unlike the United States where parents are less likely to follow recommendations.

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Introduction

The burden of pediatric influenza in India is severe yet often underestimated. In the past, there was sparse data on influenza in India, especially among children; limited data in the 1990s showed the significant proportion of influenza related lower respiratory infections in children in India.^[1] More recent reports show that influenza alone can cause severe disease, hospitalization, and death.^[2-4] Respiratory viral infections including influenza are prevalent in India^[2,3] and are significant causes of hospitalizations and morbidity in pediatric populations especially for children under the age of five years old.^[4] As is typical for tropical regions, influenza is prevalent year round in India.^[5,6] Recent surveys showed that 11% of acute lower respiratory infections admitted in hospitals in young children in India were due to influenza.^[7] Among rural communities in India, which account for approximately 70% of the population, and throughout South Asia, influenza is a significant cause of acute respiratory infection among children.^[8-10]

Despite the prevalence of influenza, vaccination rate in India is low. No pediatric vaccination rate for influenza has been formally calculated but recent reports showed that influenza vaccination campaigns had very low coverage in India even among healthcare workers,^[11] university students,^[12] and pregnant women, a high-risk group,^[13,14] due to skepticism of the importance and efficacy of influenza vaccination, ignorance of vaccine availability, belief of not being at risk, or lack of recommendation by a doctor.^[11-14] For pregnant women in India, a recommendation specifically from an obstetrician was the greatest determinant for influenza vaccination acceptance.^[13]

There are five reasons that parents in India may not opt for influenza vaccination. First, parents may believe that "flu" is a mild disease not requiring vaccination. Limited lab surveillance and virologic data in India may

lead both physicians and parents to falsely assume a low burden of influenza. Second, they may believe influenza vaccination is inconvenient because there are already too many vaccinations recommended by the Indian Academy of Pediatrics.^[15] Third, while many children in India have access to recommended vaccinations, influenza vaccination is not provided by the government and must be purchased privately, raising an economic barrier. Fourth, perhaps parents do not believe in the influenza vaccine's efficacy. Although there are no published trials among children in India, efficacy in the United States has been reported to be between 60% to 72% for children aged 6 months to 17 years.^[16-18] Efficacy trials are ongoing in India.^[19] Lastly, doctors often do not recommend the vaccination. The Indian Academy of Pediatrics designates the vaccine as optional;^[15] it is not surprising that many physicians do not recommend it.

The current study sought to assess parental attitudes and identify the potential barriers to childhood influenza vaccination. Although this research may aid in steering recommendations, immunization campaigns, and legislature in the future, the focus of this study is to solely assess attitudes amongst parents. To our knowledge, no such previous study has been conducted in India.

Methods

Study design

Participants answered questions regarding attitudes towards both the recommended routine vaccinations as well as the optional trivalent influenza vaccination, containing both seasonal and pandemic strains, on a questionnaire while waiting for their children's immunization at the Well Baby Clinic, Christian Medical College Hospital in Vellore, South India. Data were collected in September and October 2012, the local peak influenza season.^[20]

The study analyzed two groups of parents, each answering a separate form. Those parents of children receiving routine vaccinations but not opting for influenza vaccination, the non-acceptors, answered Questionnaire Form A and those parents of children receiving both routine, recommended vaccinations as well as optional influenza vaccination, the acceptors, answered Questionnaire Form B. The two forms were identical with the exception that Questionnaire Form B contained questions regarding motives to influenza vaccination but lacked questions regarding deterrents to vaccination and hypothetical situations regarding vaccination that were included in Form A (vaccine non-acceptors).

The main objective of the study is to analyze existing attitudes among parents in South India. Understanding parental attitudes will help to understand any existing, potential barriers to influenza vaccination.

Ethics approval

The study was approved by the Institutional Review Board of Christian Medical College, Vellore (ER4-17-10-2012). Participant confidentiality was preserved by replacing participant names with identification numbers. All patients were consented.

Analysis

Assuming a 10% influenza vaccination rate, a sample size of 400 subjects was calculated using the equation (4pq/d²) with an absolute precision of $\pm 3\%$ and an alpha error of 5%. Statistical comparisons between the non-acceptors and the acceptors as well as within each group were analyzed using chi-squared (χ^2) tests to compare proportions. Statistical significance for all analyses was set at $P < 0.05$. Analyses were performed using the Statistical Package for Social Sciences (SPSS), version 20.0 and Microsoft Excel.

Participants

The 456 participants were the children's caregivers including mothers, fathers, and grandparents who brought their children to the Well Baby Clinic of the Christian Medical College Hospital. Most children had seen the practitioner before as a continuation of their primary care. Only those participants with children aged six months to fifteen years were surveyed. One parent or guardian was instructed to fill out the questionnaire for the family. Participants were required to be both fluent and literate in either English or Tamil to complete the survey. There was no socio-economic requirement for participation.

Data collection

The questionnaires were distributed to parents in the Well Baby Clinic. Questionnaire Form A for non-acceptors contained 24 questions and Questionnaire Form B for acceptors contained 21 questions. Each participant filled out the appropriate form, which took five to ten minutes to complete. Each question could be answered only with one selection.

Measures

Both non-acceptors and acceptors were questioned on the following attitudes towards immunization: *motivations for vaccination* (e.g., Why have you brought your child for immunization?), *perceived vaccine efficacy* (e.g., Do you believe the influenza vaccination is effective/works well?), *recall of a doctor recommendation for vaccination* (e.g., Has a doctor recommended the influenza vaccination?), and *perceived protection against pandemic influenza* (e.g., Do you believe the influenza vaccination will protect your child?).

Both non-acceptors and acceptors were asked questions on demographic information including parent's occupation, education level, monthly income, age of child, sex of child, and birth order.

Non-acceptors additionally were questioned on *perceived likelihood for influenza vaccination* in hypothetical situations (e.g., Would you choose to vaccinate your child for influenza if it were free?) and *perceived barriers to influenza vaccination* (e.g., Why did you choose NOT to vaccinate your child for influenza?).

Results

A total of 456 respondents participated in the study, of which 403 (88.34%) were non-acceptors who completed Questionnaire Form A and 53 (11.62%)

were acceptors who completed Questionnaire Form B. Demographic information is listed in Table 1.

Demographic data

Most children in this study were the first-born children of the family. There were more college-educated parents and professionals with higher income (greater than Rs 10 000 or 160 US dollars per month) than for a standard distribution in India, in which the average income is about Rs 2500 or 50 US dollars per month.^[23]

There were no significant differences found between non-acceptors and acceptors in the parent's level of education, occupation, nor for sex or birth order of the child. The only significant differences between the groups were income of parents and age of child. Acceptors had a higher proportion of high income families than non-acceptors (χ^2 test, $P=0.02$) as well as a higher proportion of younger children than non-acceptors (χ^2 test, $P=0.003$) (Table 1).

There was no significant interaction found between demographic variables (the level of education, type of occupation, income level, age of child, sex of child, and birth order of child) and reasons for not vaccinating for influenza, perceived vaccine efficacy, recall of recommendation by doctor, or perceived likelihood of influenza vaccination.

Factors influencing influenza vaccination among non-acceptors

The primary factor for most non-acceptors was "the doctor did not recommend it" [53.60%; 95% confidence interval (CI): 48.72%-58.41%]. Other factors in order of importance were "worried of reported side effects/it makes my child sick" (9.92%, 95% CI: 7.37%-13.23%) and "there are already so many routine vaccinations—it is too expensive/inconvenient" (8.93%, 95% CI: 6.52%-12.12%), "it is not necessary—it is a mild illness/does not require vaccination" (5.71%, 95% CI: 3.83%-8.42%), "no one else is getting vaccinated for influenza" (4.96%, 95% CI: 3.23%-7.54%), and "not convinced that the vaccine works" (1.74%, 95% CI: 0.84%-3.54%). The question was skipped by 34 respondents (8.44%, 95% CI: 6.10%-11.56%) of participants. Many participants did not identify a specific influencing factor and answered, "I do not know" or "other" with no specified answer (6.45%, 95% CI: 4.44%-9.29%) (Fig. 1).

The most common secondary factor identified by parents after the primary factor was "doctor did not recommend it" (30.77%, 95% CI: 26.46%-35.44%) followed by "there are already so many routine vaccinations. It is too expensive/inconvenient" (12.90%, 95% CI: 9.98%-16.53%) and "worried of reported side effects/ it makes my child sick" (11.17%, 95% CI: 8.45%-14.61%) being the most commonly reported.

Table 1. Demographic characteristics of participants

Variables	Group A (n=403)	Group B (n=53)	P_2 value (χ^2 test)
Education of parent/guardian (highest level completed)			0.30
No schooling	12 (2.9%)	0 (0.0%)	
Primary	24 (6.0%)	1 (1.8%)	
Middle	93 (23.1%)	10 (18.9%)	
College	256 (63.7%)	37 (69.8%)	
Occupation of parent			0.10
Daily wage	108 (26.9%)	7 (13.2%)	
Skilled laborer	71 (17.7%)	10 (18.9%)	
Professional	193 (48.0%)	31 (58.4%)	
Income of family per month			0.02
<Rs. 3000	55 (13.7 %)	0 (0.0%)	
Rs. 3000-5000	100 (24.9%)	12 (22.6%)	
Rs. 5000-10 000	90 (22.4 %)	13 (24.5%)	
>Rs. 10 000	128 (31.8%)	23 (43.3%)	
Age of child			0.003
6-10 mon	81 (23.3%)	19 (36.5%)	
11-15 mon	72 (20.7%)	10 (19.2%)	
16-18 mon	54 (15.6%)	0 (0.0%)	
19 mon-2 y	119 (34.2%)	12 (23.1%)	
3 y-5 y	21 (6.0 %)	2 (3.77%)	
6 y-10 y	42 (10.44%)	1 (1.9%)	
11 y-15 y	14 (3.48%)	0 (0.0%)	
Sex of child			0.25
Boy	194 (48.3%)	29 (54.7%)	
Girl	191 (47.5%)	20 (37.7%)	
Order of child in family			0.61
1 st	240 (59.6%)	36 (67.9%)	
2 nd	122 (30.3%)	12 (22.6%)	
3 rd	19 (4.7%)	1 (1.9%)	
4 th	3 (0.7%)	0 (0.0%)	
5 th	1 (0.2%)	0 (0.0%)	
6 th or older	5 (1.1%)	0 (0.0%)	

Group A: no influenza vaccine; Group B: influenza vaccine accepted. For each demographic category with the exception of age of child for Group A, there are missing data. A number of participants did not complete the questionnaire. If there are missing data, it will not add to a total of 403. For example, "education of parent/guardian" for Group A adds to a total of 385, because 18 participants omitted the question.

Factors influencing influenza vaccination among acceptors

The primary motivation for influenza vaccination for acceptors was "it was recommended by the doctor" (39.62%, 95% CI: 27.59%-53.06%). Other factors in order of importance were "because of a recent epidemic/media alerts, frenzy" (16.98%, 95% CI: 9.20%-29.22%) and "it is good for the health of my community" (16.98%; 95% CI: 9.20%-29.22%).

Secondary motivations for influenza vaccinations for acceptors were identified as "it is good for the health of my community" (37.74%; 95% CI: 25.94%-51.19%) and "it was recommended by the doctor" (20.75%; 95% CI: 12.00%-33.46%).

Nearly all acceptor participants who opted for the influenza vaccination identified their doctor as the source of their recommendation (79.24%; 95% CI: 66.54%-88.00%). Other sources of recommendation were family member (7.55%, 95% CI: 2.97%-17.86%), media (3.77%, 95% CI: 1.04%-12.75%), and friend (3.77%, 95% CI: 1.04%-12.75%). The remainder did not respond to this question.

The major motivation for routine vaccination for both acceptors and non-acceptors taken together was "it is good for my child's health" (77.85%, 95% CI: 73.82%-81.42%). The other motivations in order of importance are "the vaccine is mandatory/recommended by the doctor" (8.55%, 95% CI: 6.32%-11.48%), "it is good for the health of my community" (4.61%, 95% CI: 3.03%-6.94%), "it is convenient and affordable" (1.32%, 95% CI: 0.60%-2.84%), and "everyone else is getting vaccinated" (0.22%, 95% CI: 0.04%-1.23%).

Perceived efficacy of influenza vaccination

The belief in efficacy of the influenza vaccine was significantly lower for non-acceptors (44.91%, 95% CI: 40.13%-49.79%), than acceptors (88.68%, 95% CI: 77.42%-94.71%) (χ^2 test, $P<0.001$).

Additionally, for non-acceptors the belief in efficacy was significantly lower for influenza vaccine (44.91%, 95% CI: 40.13%-49.79%) than it was for routine vaccination (95.04%, 95% CI: 92.46%-96.76%) (χ^2 test, $P<0.001$).

Recommendation by doctor

Non-acceptors reported a significantly lower recall of doctor's recommendation for influenza vaccination (20.84%, 95% CI: 17.16%-25.08%) than acceptors (71.70%, 95% CI: 58.43%-82.03%) (χ^2 test, $P<0.001$).

For non-acceptors, the rate of recall for a doctor's recommendation for influenza vaccination (20.84%, 95% CI: 17.16%-25.08%) was also significantly lower than that of routine immunization (90.82%, 95% CI: 87.60%-93.27%) (χ^2 test, $P<0.001$) (Figure 2).

Non-acceptor parents' attitudes towards influenza vaccination based on hypothetical situations

Non-acceptors, unlike acceptors, were additionally asked a series of hypothetical questions regarding financial cost, societal pressure, vaccine efficacy, and doctor's recommendation: non-acceptors were significantly more likely to state that they would vaccinate for influenza if it were recommended by a doctor (92.56%, 95% CI: 89.57%-94.74%) than if it were free (53.35%, 95% CI: 48.47%-58.17%) (χ^2 test, $P<0.001$) or if everyone else was receiving vaccination (54.09%, 95% CI: 49.21%-58.90%) (χ^2 test, $P<0.001$). Non-acceptors were also significantly more likely to state that they would seek influenza vaccination if its efficacy was proven (88.34%, 95% CI: 84.84%-91.12%) than if it were free (53.35%, 95% CI: 48.47%-58.17%) or if everyone else was receiving vaccination (54.09%, 95% CI: 49.21%-58.90%) (χ^2 test, $P<0.001$) (Table 2).

Discussion

According to the Health Belief Model, overcoming perceived barriers is the most significant determining factor in health decision-making.^[21] Identifying and eliminating the perceived barriers to influenza vaccination are essential to increasing vaccination rates for children. The results of this study suggest that a doctor's recommendation is the most important factor for parents' decision making (Fig. 1). When recommended by doctors, parents opted for vaccination

Table 2. Non-acceptor parents' attitudes regarding influenza vaccination ($n=403$)

Questions	Yes	No	Not sure	No response
If free, would you get the influenza vaccine?	215 (53.35%)	77 (19.11%)	86 (21.34%)	25 (6.20%)
If everyone else was getting the influenza vaccine, would you also?	218 (54.09%)	96 (23.82%)	60 (14.89%)	29 (7.20%)
If you were certain that the vaccine would prevent influenza this season, would you choose to vaccinate your child for influenza?	356 (88.34%)	13 (3.23%)	20 (4.96%)	14 (3.47%)
If the doctor recommended the influenza vaccination, would you choose to vaccinate your child for influenza?	373 (92.56%)*	9 (2.23%)	9 (2.23%)	12 (2.98%)

*: Non-acceptor parents were significantly more likely to state that they would opt for influenza vaccination if it were recommended by a doctor (92.56%) than if it were free (53.35%) or if everyone else was receiving vaccination (54.09%) (χ^2 test, $P<0.001$).

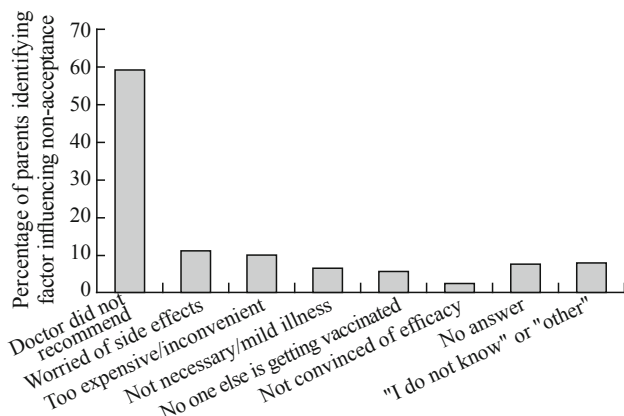


Fig. 1. Factors influencing non-acceptance of influenza vaccination.

but did not opt for vaccination when they were not recommended to do so. The lack of a doctor's recommendation was the main explanation for not opting for influenza vaccination (53.60%) and nearly all non-acceptor parents stated that they would opt for influenza vaccination if it were recommended (92.56%). Vaccination acceptors (71.70%) were recommended by a doctor to opt for influenza vaccination more often than non-acceptors (20.84%, 95% CI: 17.16%-25.08%). Doctors' failure to recommend influenza vaccination was critical; future studies should assess the knowledge and attitudes of doctors in India towards influenza and its vaccine.

Another important barrier to vaccination was low perceived vaccine efficacy. Although only a few non-acceptors identified "not [being] convinced that the vaccine works" as the primary reason not to vaccinate for influenza (2.14%), it is important to note that only 44.91% of non-acceptor parents believed in the efficacy of the vaccine. This is significantly less than non-acceptors' belief in efficacy of recommended, routine vaccination (95.04%, 95% CI: 92.46%-96.76%) (χ^2 test, $P<0.001$). Given certainty of the vaccine's efficacy, 92.56% of non-acceptors stated that they would opt for influenza vaccination. Additionally, the fear of side effects and getting sick was identified as the second most common reason to not opt for influenza vaccination (9.92%).

Cost of vaccine, social pressure, and education level of parents did not significantly impact attitudes towards vaccination for either acceptors or non-acceptors. Few non-acceptors identified "so many other vaccinations/it is too expensive/inconvenient" (8.93%) and "no one else is getting vaccinated for influenza" (4.96%) as the primary factors influencing vaccination. Furthermore, only 56.28% of non-acceptor participants stated that they would opt for influenza vaccination if it were "free" and only 56.28% of participants "if everyone

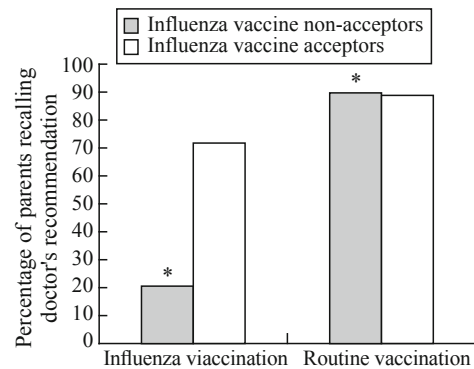


Fig. 2. Doctor's recommendation for influenza or routine vaccination is the most important decision making factor. *: $P<0.001$.

else was getting vaccinated" compared to 98.76% if the doctor recommended vaccination.

Non-acceptors and acceptors did differ in parent's income; there was a statistically higher percentage of high-income families among acceptors (43.3%) than non-acceptors (31.8%). This, however, does not necessarily imply that income was the influencing factor for vaccination. In fact, 31.8% of non-acceptor families had income above Rs. 10 000 per month and did not opt for influenza vaccination. Furthermore, although it may be suggested that those families with more education or higher status occupations would be more likely to be vaccinated for influenza than those with lower levels of education or lower status occupations, results did not support this: non-acceptors and acceptors had similar levels of education and occupations.

The doctor's recommendation was more influential than other commonly identified perceived barriers such as fear of side effects or perceived inefficacy. It is plausible that the lack of parental knowledge and awareness of influenza as a disease is responsible for the significant influence of the doctor's recommendation on parental attitudes. Although knowledge of influenza was not specifically assessed in the current study, a total of 14.98% of non-acceptors skipped the question entirely (8.44%) or answered, "I don't know", "I don't know about influenza", or "other" with an unspecified answer regarding major factors influencing influenza vaccination (6.54%). Perhaps parents in India, who may not be aware of influenza or its severity, rely more heavily on doctors' recommendations than their own personal attitudes because of a lack of awareness. Within the Health Belief Model, this lack of knowledge of influenza could lead to limited perceived susceptibility and severity of influenza. The doctor's recommendation, a cue to action, may be essential to initiating attitudes towards vaccination. Apparently parents in India are more willing to accept

the recommendations of pediatricians or of government policy than parents in the United States who often refuse vaccines despite being recommended by the pediatrician.^[22] The cultural norm in India is to follow the recommendation of the pediatrician.

Apart from children with chronic medical conditions and children of parents who requested for the vaccine, in line with the previously current IAP recommendation,^[15] younger children of affordable parents were also recommended influenza immunization by doctors in the Well Baby Clinic because of the reported high burden of severe disease in younger children. The Well Baby Clinic's policy towards recommendation of the optional influenza vaccine may thus have made some demographics such as younger children of wealthier parents more likely to be vaccinated.

In future vaccination campaigns, it will be essential to educate the public and doctors about the disease, outcomes in infants, vaccine safety, and its side effects. Such educational components will prove to be as important as recommendation by doctors; the greatest motivation for routine vaccination was not a doctor's recommendation but rather that the vaccination "is good for my child's health" (77.85%). Perhaps with greater awareness and understanding of the vaccine, parents may also feel that influenza vaccination is a healthy and necessary choice for their children.

This study has shown that although many factors can be considered in regards to parental decision-making about childhood vaccination, the most important factor is the recommendation by a doctor. As recent research in India has shown the substantial burden of influenza on children in India,^[1,5] pediatricians should have access to locally relevant data regarding influenza in Indian children^[5] and the role of routine influenza vaccination should be considered to prevent influenza and its consequences.

The study sample of parents visiting the private Well Baby Clinic of the Christian Medical College Hospital may not be representative of all communities or parents in India. Demographic information shows that this sample statistically includes more participants with college education, professional occupation, and higher income than the general population of South India. This study may be biased, as it examines only the attitudes of those who have opted for routine vaccination; the attitudes of those parents who did not opt for both routine and influenza vaccinations are not included in this study. The participant sample is also limited to a time period in September and October 2012, the beginning of influenza season, and is a relatively small sample size. Analysis of vaccine efficacy and proposed strategies for vaccination campaigns are not within the realm of this study.

To our knowledge, this is the first formal study assessing parental attitudes towards childhood influenza vaccination in India. Parents identified a doctor's recommendation as the most important factor in their decision-making processes. Recent research shows that influenza is common and can cause severe disease in India. Pediatricians should be informed of its burden as well as the major reasons why parents decide not to opt for vaccination.

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Competing interest: None.

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References

- 1 John TJ, Cherian T, Steinhoff MC, Simoes EA, John M. Etiology of acute respiratory infections in children in tropical southern India. *Clin Infect Dis* 1991;13 Suppl 6:S463-469.
- 2 Mazumdar J, Chawla-Sarkar M, Rajendran K, Ganguly A, Sarkar UK, Ghosh S, et al. Burden of respiratory tract infections among paediatric in and out-patient units during 2010-11. *Eur Rev Med Pharmacol Sci* 2013;17:802-808.
- 3 Yeolekar LR, Damle RG, Kamat AN, Khude MR, Simha V, Pandit AN. Respiratory viruses in acute respiratory tract infections in Western India. *Indian J Pediatr* 2008;75:341-345.
- 4 Broor S, Dawood FS, Pandey BG, Saha S, Gupta V, Krishnan A, et al. Rates of respiratory virus-associated hospitalization in children aged <5 years in rural northern India. *J Infect* 2014;68:281-289.
- 5 Chadha MS, Broor S, Gunasekaran P, Potdar VA, Krishnan A, Chawla-Sarkar M, et al. Multisite virological influenza surveillance in India: 2004-2008. *Influenza Other Respir Viruses* 2012;6:196-203.
- 6 Broor S, Krishnan A, Roy DS, Dhakad S, Kaushik S, Mir MA, et al. Dynamic patterns of circulating seasonal and pandemic A(H1N1)pdm09 influenza viruses from 2007-2010 in and around Delhi, India. *PLoS One* 2012;7:e29129.
- 7 Roy S, Patil D, Dahake R, Mukherjee S, Athlekar SV, Deshmukh RA, et al. Prevalence of influenza virus among the paediatric

- population in Mumbai during 2007-2009. *Indian J Med Microbiol* 2012;30:155-158.
- 8 Broor S, Parveen S, Bharaj P, Prasad VS, Srinivasulu KN, Sumanth KM, et al. A prospective three-year cohort study of the epidemiology and virology of acute respiratory infections of children in rural India. *PloS One* 2007;2:e491.
 - 9 Brooks WA, Goswami D, Rahman M, Nahar K, Fry AM, Balish A, et al. Influenza is a major contributor to childhood pneumonia in a tropical developing country. *Pediatr Infect Dis J* 2010;29:216-221.
 - 10 Henkle E, Steinhoff MC, Omer SB, Roy E, Arifeen SE, Raqib R, et al. Incidence of influenza virus infection in early infancy: a prospective study in South Asia. *Pediatr Infect Dis J* 2011;30:170-173.
 - 11 Bali NK, Ashraf M, Ahmad F, Khan UH, Widdowson MA, Lal RB, et al. Knowledge, attitude, and practices about the seasonal influenza vaccination among healthcare workers in Srinagar, India. *Influenza Other Respir Viruses* 2013;7:540-545.
 - 12 Suresh PS, Thejaswini V, Rajan T. Factors associated with 2009 pandemic influenza A (H1N1) vaccination acceptance among university students from India during the post-pandemic phase. *BMC Infect Dis* 2011;11:205.
 - 13 Bhaskar E, Thobias S, Anthony S, Kumar V, Navaneethan. Vaccination rates for pandemic influenza among pregnant women: An early observation from Chennai, South India. *Lung India* 2012;29:232-235.
 - 14 Koul PA, Bali NK, Ali S, Ahmad SJ, Bhat MA, Mir H, et al. Poor uptake of influenza vaccination in pregnancy in northern India. *Int J Gynaecol Obstet* 2014;127:234-237.
 - 15 IAP 2012, Immunization Schedule 0-6 years. <http://www.iapindia.org/immunisation/immunisation-schedule>. (accessed December 19, 2012)
 - 16 Santibanez T, Singleton J, Greby S, Kennedy E, Clark S, Gebremariam A, 2012. "National Early Season Flu Vaccination Coverage." Center for Disease Control. Available: <http://www.cdc.gov/flu/fluview/nifs-estimates-nov2012.htm> (accessed March 9, 2013).
 - 17 Rhorer J, Ambrose CS, Dickinson S, Hamilton H, Oleka NA, Malinoski FJ, et al. Efficacy of live attenuated influenza vaccine in children: a meta-analysis of nine randomized clinical trials. *Vaccine* 2009;27:1101-1110.
 - 18 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;210:674-683.
 - 19 Sullender W, Fowler K, Krishnan A, Gupta V, Moulton LH, Lafond K, et al. Design and initiation of a study to assess the direct and indirect effects of influenza vaccine given to children in rural India. *Vaccine* 2012;30:5235-5239.
 - 20 Chadha MS, Broor S, Gunasekaran P, Potdar VA, Krishnan A, Chawla-Sarkar M, et al. Multisite virological influenza surveillance in India: 2004-2008. *Influenza Other Respir Viruses* 2012;6:196-203.
 - 21 Janz NK, Becker MH. The health belief model: A decade later. *Health Educ Q* 1984;11:1-47.
 - 22 Szilagyi PG, Rodewald LE, Savageau J, Yoos L, Doane C. Improving influenza vaccination rates in children with asthma: a test of a computerized reminder system and an analysis of factors predicting vaccination compliance. *Pediatrics* 1992;90:871-875.

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