

Vaccine Hesitancy in Measles-Rubella Campaign in a Tertiary Care Hospital

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Abstract

Introduction: The government of India conducted a mass measles-rubella vaccination campaign, with phase-1 in 2017 in five states/union territories. But this campaign had met with resistance from the public with several rumors circulating in the media. Therefore, the present study was conducted to discover the perception of parents regarding the measles-rubella vaccine, the reasons for vaccine hesitancy, and the information sources used to make decisions regarding vaccination.

Methods: A cross-sectional study was conducted on parents/caretakers of 425 eligible children. Parents/caretakers of every fifth child were interviewed using a pretested semi-structured standardized questionnaire after written consent on alternate days for a period of four months. Descriptive statistics were used for calculating frequencies, chi-square test for comparing variables between vaccine compliant and vaccine-hesitant groups, and multivariate logistic regression to find the factors associated with hesitancy. A value of $p < 0.05$ was considered as significant.

Results: Among the 425 informants, 178 (41.8%) refused the vaccine initially out of which 88% ($n = 155$) reported a fear of side effects based on circulating rumors as the reason for initial vaccine hesitancy. Vaccine hesitancy had stemmed from the fear of side effects following immunization, which was generated from the wrong information circulated in social media, television, and by word of mouth from neighbors. Reassurance through interpersonal communication by school authorities and health care professionals later led to improved vaccine acceptance.

Discussion: Vaccine hesitancy stemmed from the fear of side effects generated by the misinformation circulated on social media and television about children getting hospitalized after the measles-rubella vaccine.

Keywords: Health Knowledge, Attitudes, Practice; Immunization Programs; India; Measles Vaccine; Rubella Vaccine; Surveys and Questionnaires; Vaccination Refusal/trends

Introduction

In 2013, India, along with other Southeast Asian regions, declared a commitment toward the elimination of measles and congenital rubella syndrome by 2020.¹ To this effect, the Ministry of Health and Family Welfare of India rolled out a mass measles-rubella vaccination drive in February 2017 in a phased manner for all children aged between 9 months and 15 years for high herd immunity. Phase 1 was conducted in five states/union territories of India, namely, Tamil Nadu, Karnataka, Puducherry, Goa, and Lakshadweep.² In Puducherry, it was conducted from February 6, 2017 to March 12, 2017. Children were vaccinated at schools, anganwadis, hospitals, sub-centers, and other fixed outreach sessions. It was initially planned only for February and then extended to March to improve the coverage since the initial response to the vaccine campaign was not very encouraging. Even before the campaign started, several rumors were circulated, especially on social media regarding the vaccine. There were many inquiries from concerned parents regarding why the measles-rubella vaccine had to be given despite prior measles, mumps, and rubella (MMR) vaccination. Taking written consent from parents which was not the case with other school vaccines fueled by circulating rumors raised doubts and fears regarding the safety of additional doses. Furthermore, the mass media coverage of adverse events following immunization had triggered uncertainty on vaccine efficacy.³ Such a delay in accepting a vaccine or refusing a vaccine is called vaccine hesitancy. Vaccine hesitancy

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among parents was reported to be 13% worldwide.⁴ Lancet reported in an editorial that there was a 30% rise in measles cases worldwide, even in the United States of America, where measles had been eradicated in 2000, prompting the World Health Organization to declare vaccine hesitancy as one of the 10 most significant threats to global health.⁵

The propagation of digital misinformation through social media or news media can be incredibly challenging, such as the one encountered in the measles-rubella vaccine phase 1 campaign. Mid-course corrective measures were undertaken during the campaign to achieve higher compliance and coverage. The present study was conducted to know the perception of parents regarding the measles-rubella vaccine, reasons for the vaccine hesitancy, and the information sources used to make decisions regarding vaccination. Learning from these trends will enable improvements in future campaigns.

Methods

A cross-sectional study conducted in a tertiary care center. The inclusion criteria were parents/caretakers of children aged 9 months to 12 years at the time of campaign who were willing to participate in the study. Since there was no previous prevalence for measles-rubella vaccine refusal, we assumed a prevalence of 50%, an allowable error of 10%, and a confidence interval (CI) of 95%, wherein the sample size was calculated as:

$$n = z^2 pq / d^2 = 3.84 \times 50 \times 50 / 25 = 384 + 10\% \text{ drop out rate} = 425.$$

Where:

n=sample size

z=1.96 (confidence level at 95%)

p is prevalence (50%)

q is (100-p)=50%

d2 is precision or allowable error (5%).

The participants were recruited from the pediatric outpatient department that caters to children ranging from newborns to those who are 12 years of age. Using systemic random sampling, the parents/caretakers of every fifth eligible child satisfying the inclusion criteria were selected from the outpatient department on alternate days for a period of four months from December 2018 to March 2019. The participants were interviewed using a pretested semi-structured standardized questionnaire that was adapted from the strategic advisory group of experts (SAGE) working model.⁵ A pilot study was also conducted on 20 participants to check the face validity of the questionnaire, whose

internal consistency was good, with a Cronbach alpha value of 0.82. The questionnaire included demographic data, prior measles, mumps, and rubella vaccination status, willingness for measles-rubella vaccine at the time of campaign, reasons for vaccine hesitancy if any, and information sources that were used for the measles-rubella vaccine. Where feasible, their immunization card was used for obtaining information on vaccination. If not available, the participants were then asked to recall. Informed written consent was obtained from all of them with due care to maintain strict confidentiality throughout the study.

Descriptive statistics were used for frequencies (%), mean and standard deviation (SD). Based on their vaccine decision, the participants were divided into two groups: vaccine compliant and vaccine hesitant. The chi-square test and Fisher's exact test were used to compare the socio-demographic characteristics, knowledge about the campaign and vaccine, their exposure to rumors, the medium of such exposure, and their self-reported influence of such information on vaccine acceptance between the vaccine compliant and vaccine-hesitant groups. Univariate analysis was performed on those variables that were significant on chi-square analysis. Keeping these significant variables from univariate analysis as independent variables and a vaccine decision of compliance or hesitancy as a dependent variable, multivariate logistic regression was done to find factors significantly associated with vaccine hesitancy if any. A $p < 0.05$ was considered statistically significant. For statistical analysis, coGuide version V.1.0 was used.⁶

Results

There was a total of 425 participants. Among these participants, 340 were the children's mother (80%), 63 were their father (14.8%), and 22 were their relatives such as grandparents or aunts (5.2%). Their mean age was 32.2 ± 6.5 years. The mean age of the children was 6.6 ± 3.0 years. Routine immunization was up to date in 423 children (99.5%). One dose of a prior MMR vaccine was received by 149 children (35.1%) and two doses by 14 children (3.3%). Other socio-demographic details such as the gender distribution of the children, parental education status, their socio-economic status, and religion are displayed in Table 1.

All of the informants were aware of the measles-rubella campaign at the time it was conducted ($n = 425, 100\%$). However, only 12.9% ($n = 55$) participants were aware of the reason behind the campaign and of the benefits of

the vaccine. Information sources regarding the conduct of the campaign were mainly schoolteachers (n = 240, 56.5%) and health care providers (HCP) (n = 137, 32.2%). Other information sources were television (n = 15, 3.5%), social media (n = 13, 3.1%), family members (n = 8, 1.9%), friends (n = 7, 1.6%), and neighbors (n = 5, 1.2%).

As many as 312 informants (73.5%) were exposed to rumors or negative vaccine messages regarding the safety of the vaccine. The various sources of messages generating doubts or fear regarding the vaccine as reported by informants are depicted in Table 2. Of the

425 informants, 178 were not willing to administer the measles-rubella vaccine to their child initially (41.9%). Among those who refused initially, 155 (88%, 36.5% of the total) reported a fear of side effects from the vaccine due to the circulated rumors. Other reasons reported for the initial hesitancy was they felt the vaccine was not needed (n = 10, 5.6%), had already given the measles, mumps, and rubella vaccine to the child (n = 7, 3.9%), fever in the child (n = 2, 1.1%), awareness of the campaign but not aware of the reason behind it (n = 1, 0.6%), and the parent felt their child was too young (n =

Table 1. Socio-demographic characteristics of the vaccine hesitant and vaccine compliant

Variable	Vaccine hesitant (n = 178) n (%)	Vaccine compliant (n = 247) n (%)	Total (n = 425) n (%)	Chi-square test	p value
Parental age					
< 35 years	132 (74.2)	185 (74.9)	317 (74.6)	0.036	0.850
> 35 years	46 (25.8)	62 (25.1)	108 (25.4)		
Child age					
< 15 months	26 (14.6)	48 (19.4)	74 (17.4)	2.713	0.337
15 months - 4.5 years	66 (37.1)	79 (32.0)	145 (34.1)		
> 4.5 years	86 (48.3)	120 (48.6)	206 (48.5)		
Child gender					
Male	87 (48.9)	132 (53.4)	219 (51.5)	0.863	0.353
Female	91 (51.1)	115 (46.6)	206 (48.5)		
Parental education					
Illiterate	6 (3.4)	18 (7.3)	24 (5.7)	3.490	0.175
School	143 (80.3)	184 (74.5)	327 (76.9)		
College	29 (16.3)	45 (18.2)	74 (17.4)		
Socioeconomic status					
Upper (class 1 and 2)	35 (19.7)	60 (24.3)	95 (22.3)	1.277	0.528
Middle (class 3)	56 (31.5)	73 (29.5)	129 (30.4)		
Lower (class 4 and 5)	87 (48.8)	114 (46.2)	201 (47.3)		
Religion					
Hindu	165 (92.7)	235 (95.1)	400 (94.1)	1.117	0.291
Others	13 (7.3)	12 (4.9)	25 (5.9)		

Table 2. Knowledge of measles-rubella vaccine and related rumor between hesitant and compliant group

Variable	Vaccine hesitant (n = 178) n (%)	Vaccine compliant (n = 247) n (%)	Total (n = 425) n (%)	Chi-square test	p value
Knowledge about reason behind campaign	21 (11.8)	34 (13.8)	55 (12.9)	0.355	0.551
Knowledge of side effects of the vaccine	45 (25.3)	31 (12.6)	76 (17.9)	11.417	0.001
Awareness in person of someone who developed AEFI in the campaign	26 (14.6)	19 (7.7)	45 (10.6)	5.224	0.022
Exposure to rumor/vaccine misinformation	166 (93.3)	146 (59.1)	312 (73.4)	61.806	0.000
Medium of exposure to rumor					
Neighbors	51 (28.7%)	58 (23.5%)	109 (25.6%)	5.311	0.257
Social media	60 (33.7%)	36 (14.6%)	96 (22.6%)		
Television	45 (25.3%)	43 (17.4%)	88 (20.7%)		
Friends	7 (3.9%)	6 (2.4%)	13 (3.1%)		
Family	3 (1.7%)	3 (1.2%)	6 (1.4%)		
Reported influence on decision making					
Autonomous	18 (10.1)	179 (72.5)	197 (46.4)	301.406	0.000[#]
HCP + schoolteacher	2 (1.1)	55 (22.3)	57 (13.4)		
Social media	60 (33.7)	2 (0.8)	62 (14.6)		
Television	44 (24.7)	4 (1.6)	48 (11.3)		
Neighbors and friends	54 (30.3)	7 (2.8)	61 (14.4)		

AEFI - adverse events following immunization; HCP - health care provider.
[#] Fisher's exact test.

1, 0.6%). The reported information sources that affected their decision making are shown in Table 2.

Subgroup analysis of the vaccine hesitant and vaccine compliant group was done and is displayed in Tables 1 and 2. Child age and gender, age of the parent, their education status, socio-economic status, or religion were not significantly associated with vaccine hesitancy (Table 1). However, awareness about the adverse events following immunization (AEFI), knowing someone personally who developed it at the time of the campaign, and exposure to rumors were significantly associated with vaccine hesitancy (Table 2). The univariate analysis of these three factors was significantly associated with hesitancy and is displayed in Table 3. Using vaccine willingness or hesitancy as a dependent variable and these three factors namely awareness about adverse events following immunization, knowing someone in person who developed adverse events following immunization at the time of campaign, exposure to rumors as independent variables, and multivariate logistic regression was done. After multivariate analysis, exposure to vaccine related rumors and having knowledge of vaccine adverse events were two factors that remained significantly associated with the hesitancy (Table 4).

Among the vaccinated children from the two groups, 27 children (6.4%) had adverse events following the vaccine in the form of fever (n = 18, 4.3%). No anaphylaxis or death was reported. A total of 197 informants (46.4%) expressed their opinion that the government could have provided more information regarding the vaccine and campaign. Only 14 (3.3%) reportedly posted anything about the vaccine in social media.

Discussion

In our study, 87.1% of the participants were lacking precise knowledge on the safety of the vaccine and were unaware of the reason behind the vaccine campaign. Rumors about the vaccine leading to misinformation especially through social media and television have significantly influenced the vaccine hesitancy ($p < 0.001$). The vaccine coverage in our tertiary care hospital was 83.3%, which was lower than the measles-rubella campaign national coverage (97%) in the five states.⁷ This may be because it is a hospital-based sample and finger marking could not be verified as the study was conducted later. Similarly, in a study in Jharkhand in 2012, the reported survey coverage in a measles campaign was 61% while the administrative coverage reported was 91.6%.⁸ Likewise, low performance (83%) was reported in a campaign in Bangladesh and a coverage of 77% in a study in Hong Kong, whereas higher coverage of more than 97% was reported in Vietnam (99%) and Bhutan (98%-99%) in similar campaigns.⁹⁻¹² Our study found no association between child's age and gender with vaccine coverage. Similarly,¹³ another study found no gender association, whereas some observed more vaccine coverage among girls than in boys.⁹ Parental/caretaker education status and vaccine coverage were not significantly associated in our study, unlike what has been reported by other authors, where parental education was associated with higher vaccine coverage.⁹

The leading cause for not vaccinating children in our study was fear of adverse events, which was primarily due to the spread of rumors (36.5%), unlike other authors who reported sickness in children as a leading cause for non-participation.^{9,12} It was also reported that the parent/caretakers were not aware of such a

Table 3. Univariate analysis of the factors associated with vaccine hesitancy

Variable	Coefficient	Standard error	Wald	p value	Odds ratio	95% CI
Knowledge of AEFI	0.858	0.258	11.039	0.001	2.358	1.421 - 3.910
Knowing someone in person who developed AEFI in campaign	0.719	0.319	5.067	0.024	2.053	1.097 - 3.839
Exposure to rumor	2.259	0.326	48.076	0.000	9.570	5.054 - 18.120

AEFI - adverse events following immunization; CI - confidence interval.

Table 4. Multivariate logistic regression analysis of the factors associated with vaccine hesitancy

Variable	Coefficient	Standard error	Wald	p value	Odds ratio	95% CI
Knowledge of AEFI	0.612	0.277	4.868	0.027	1.843	1.071 - 3.174
Knowing someone in person who developed AEFI in campaign	0.308	0.338	0.831	0.362	1.361	0.702 - 2.639
Exposure to rumor	2.177	0.328	44.043	0.000	8.820	4.637 - 16.776

AEFI - adverse events following immunization; CI - confidence interval.

campaign being conducted (17.1%) as another reason for not being vaccinated.⁹ Similarly, in the Jharkhand study, the leading cause of non-participation was that mothers (51.5%) were not aware of the campaign.⁸ This is in sharp contrast with our study where 100% of those enrolled for the study were aware of the campaign at the time that it was conducted as the participants were a hospital-based sample. 87.1% of the participants, although aware of the campaign, reported a lack of awareness of the reason why the campaign was conducted.

The information sources for the vaccine campaign in our study were mainly school authorities and health care providers, but information sources regarding vaccine side effects were mostly media (social media and mass media) and word of mouth. This is similar to the observation made in other studies,^{8,14} where the latter documented that the most common source of information for the vaccine was the health care provider and the most common source of information about vaccine side effect was mass media. Another study¹⁴ reported that television created adverse publicity regarding vaccination, and exposure to wide media coverage about the measles, mumps, and rubella vaccine was one of the causes for vaccine hesitancy. Similarly, it was documented in a study that fear of side effects, which they became aware of from rumors and word of mouth, were the most common reasons for vaccine refusal.¹⁵ Social media also contributed a significant negative role in our study regarding the vaccine decision. Several studies have highlighted the negative role of social media in vaccine hesitancy.^{16,17} A study from Northern Italy among schoolteachers showed that new media was more frequently associated with a negative attitude toward vaccination.¹⁸ In effect, digital misinformation is recently considered as one of the leading social threats. No anaphylaxis or death was reported by the participants in our study, as observed in other studies.¹²

During the campaign, health personals, including public health authorities, reassured the public regarding vaccine safety. A newspaper reported on how the health care providers educated the people regarding the misconceptions circulated through social media.¹⁹ There were reports from other states on how public health authorities reassured people on vaccine safety.^{20,21} After allaying such unfounded fears, vaccine coverage improved. During such adverse publicity, interpersonal communication by schoolteachers and health care providers helped many of those who were initially hesitant to receive the vaccine. A similar situation was documented in a campaign in China in 2009, where there

were rumors about severe reactions that might follow the vaccination impeded the progress of the campaign. In addition, mass media coverage of adverse reactions following vaccination increased people reservations about the vaccination.²²

People were aware of the mass measles-rubella campaign but lacked awareness regarding the benefits and safety of the vaccine campaign. Vaccine hesitancy stemmed from the fear of side effects following immunization, generated with wrong information circulated in social media, television, and by word of mouth from the neighborhood. Critical problem areas were inadequate reliable pre-campaign information, education and communication, unchecked vaccine misinformation, inadequate sensitization of the people regarding vaccination well in advance, inadequate preparedness to handle digital misinformation, and inefficient mass media management protocol.

This study has some limitations. It was a hospital-based study. Recall bias is another drawback because of the time-lapse since vaccination. The results may not be generalizable to the community at large or different geographical locations of measles campaigns in India, but the trends observed can help in future campaigns.

WHAT THIS STUDY ADDS

- Our study presents the reasons for hesitation toward the measles-rubella vaccine in parents of various socio-economic backgrounds visiting a tertiary center.
- This allows the researchers to understand the various taboos involved in the community further guiding the design of health education programs to eliminate them and promote vaccine education.

Conflicts of Interest

The authors declare that there were no conflicts of interest in conducting this work.

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Protection of human and animal subjects

The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Provenance and peer review

Not commissioned; externally peer reviewed

Confidentiality of data

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

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Hesitação em Campanha Vacinal Contra Sarampo e Rubéola num Hospital Terciário**Resumo:**

Introdução: O governo da Índia realizou uma campanha de vacinação em massa contra o sarampo e rubéola, com a fase 1 em 2017, em cinco estados / territórios do país. No entanto, a campanha encontrou resistência por parte da população, com rumores diversos nos mídia. Assim, este estudo foi realizado para conhecer a percepção dos pais em relação à vacina contra o sarampo e rubéola, os motivos da hesitação vacinal e as fontes de informação utilizadas para a tomada de decisão quanto à vacinação.

Métodos: Estudo transversal com pais e cuidadores de 425 crianças elegíveis. Os pais e cuidadores de cada cinco crianças foram entrevistados em dias alternados durante um período de quatro meses, usando um questionário padronizado semiestruturado e testado previamente, após consentimento por escrito. Foram usadas estatísticas descritivas para calcular as frequências, teste de qui-quadrado para comparar variáveis entre os grupos de acordo com a vacina e hesitante e regressão logística multivariada para identificar fatores associados à hesitação. Foi

considerado um nível de significância de $p < 0,05$.

Resultados: Entre 425 pais e cuidadores, 178 (41,8%) recusaram a vacina inicialmente. Destes, 88% ($n = 155$) relataram receio de efeitos colaterais com base em rumores como a razão para a hesitação. A hesitação vacinal resultou do receio de efeitos secundários após a imunização, gerado a partir de informações incorretas veiculadas nas redes sociais, televisão e boca a boca entre vizinhos. A comunicação pelas autoridades escolares e profissionais de saúde levou a maior tranquilidade e melhor aceitação da vacina.

Discussão: A hesitação vacinal resultou do receio de efeitos secundários e foi gerada por informação incorreta, veiculada em redes sociais e televisão sobre crianças a serem hospitalizadas após terem recebido a vacina contra o sarampo e rubéola.

Palavras-Chave: Conhecimentos, Atitudes e Prática em Saúde; Índia; Inquéritos e Questionários; Programas de Imunização; Recusa de Vacinação/tendências; Vacina contra Rubéola; Vacina contra Sarampo