#### **Original Article**



# A Cross-Sectional Study for Assessment of Knowledge, Attitude and Practice of Rubella Vaccination Among Young Adults in Central India

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#### ABSTRACT

Rubella is a vaccine-preventable infection with severe risks during pregnancy, yet awareness and vaccination uptake remain inadequate in many regions. This study assesses the knowledge, attitudes, and practices (KAP) regarding rubella vaccination among young adults in Central India. It is a cross-sectional, validated online questionnaire-based study which was conducted among 200 young adults aged 18–25 years. The questionnaire assessed socio-demographic data, knowledge of rubella, attitudes toward vaccination, and actual immunization practices. Statistical analysis was performed using the Chi-square test. It was found that among 200 participants, 63% were aware of rubella, 61.5% knew it was contagious, and 54% knew it was infectious. Only 35% knew the correct vaccination schedule, and 44.5% knew it should be given before 14 years. Vaccination status was confirmed by only 11%, while 46.8% were unsure. Chi-square analysis showed significant associations between knowledge and educational background ( $\chi^2$  = 45.38, p < 0.00001). Parental education significantly influenced knowledge ( $\chi^2$  = 20.69, p = 0.00003) and vaccination ( $\chi^2$  = 17.45, p = 0.00002). However, no significant association was found between gender and vaccination status ( $\chi^2$  = 1.11, p = 0.29) or religion and knowledge ( $\chi^2$  = 4.75, p = 0.09). Concluding that significant gaps exist between awareness, attitudes, and vaccination practices. Strengthening public education, integrating rubella awareness in schools and workplaces, combating misinformation, and improving vaccine accessibility through digital tracking and targeted outreach are crucial for achieving rubella elimination in India.

Keywords: Rubella, Congenital Rubella Syndrome, MMR, Vaccination.

#### **1. INTRODUCTION**

ubella, or German measles, is a contagious viral infection mainly affecting children and young adults. It is usually mild, causing a maculopapular rash, lowgrade fever, headache, muscle pain, joint discomfort and swollen lymph nodes<sup>1</sup>. The rash typically starts on the face and spreads downward to the rest of the body, lasting for about three days. Many rubella cases are not recognized, as the rash resembles many other illnesses and up to half of all infections may be subclinical<sup>2</sup>. However, infection during the first trimester of pregnancy can lead to miscarriage, stillbirth, or congenital rubella syndrome (CRS), causing lifelong disabilities like heart defects, cataract, hearing loss, and intellectual impairments. CRS remains a global health concern, affecting over 100,000 infants annually<sup>3,4</sup>. In India, CRS is estimated to occur in 120-130 children per 100,000 live births<sup>5</sup>.

Immunization of childbearing females not only protects her but also the fetus against infections that have greater morbidity and mortality in this population, compared with the general population<sup>6</sup>. To combat rubella, vaccination has become the primary method of prevention. The rubella vaccine, typically administered in combination with measles and mumps as the MMR vaccine, is highly effective. A single dose of the rubella-containing vaccine provides long-lasting immunity in over 90% of recipients. In India, the rubella vaccine was introduced in the national immunization program in 2017 as part of the measles-rubella (MR) vaccine<sup>7</sup> which recommends two doses of the MR vaccine/MMR Vaccine, the First Dose between 9 and 12 months of age and a Second Dose Between 16 and 24 months of age<sup>8</sup>.

India has made substantial progress in controlling rubella through mass immunization campaigns. The country had adopted the goal of eliminating both measles and rubella by 2023, associated with the World Health Organization's (WHO) targets for the South-East Asia Region<sup>4</sup>.Between 2017 and 2021, rubella cases declined by 48%, marking significant progress in disease control. However, despite this reduction, rubella remains a persistent threat in certain regions, where transmission continues<sup>7</sup>. Low vaccination rates, particularly in rural areas, are driven by poverty, lack of education, misinformation, and gender biases, which often result in the neglect of female children's healthcare. Many parents remain unaware of the benefits of vaccination or fear potential side effects, leading to vaccine hesitancy. Additionally, religious and cultural beliefs contribute to distrust in modern medicine, further hampering immunization efforts<sup>9</sup>. The COVID-19 pandemic further disrupted vaccination programs, causing a



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temporary decline in immunization rates and increasing the risk of future outbreaks<sup>10</sup>.

Even in urban areas, vaccination rates fall short of optimal levels due to busy lifestyles, misinformation, and growing vaccine scepticism. Some higher-income families are also influenced by anti-vaccine narratives, leading to delays or refusals in immunization. To overcome these barriers, comprehensive awareness campaigns, targeted health education, and collaborative efforts involving health authorities, policymakers, and community leaders are essential to ensure widespread and timely immunization<sup>11</sup>.

This study aims to strengthen routine immunization programs and raise awareness among young adults, who will play a crucial role in shaping India's future healthcare system. By equipping them with accurate knowledge about rubella and the importance of vaccination, we seek to bridge the gap in vaccine coverage, promote informed health decisions, and move closer to the goal of rubella elimination in India.

#### 2. MATERIALS AND METHODS

The study was conducted at tertiary hospital in a state in central India. Participants were selected using random sampling methods. The inclusion criteria targeted young adults aged 18-25 years of all professions who gave consent for the study. However, individuals who did not submit the required forms or failed to provide consent were excluded from the study. These criteria ensured a well-defined and ethically sound participant group for the research.

#### 2.1. Study design

The current study was a cross-sectional, online, questionnaire-based, conducted among young adults in a state in central India. The study was based on a prevalidated questionnaire and encompassed four key components:

**Section 1:** Collected socio-demographic data, including sex, age, religion, educational background (medical and other professional), source of knowledge, socioeconomic status, background and parents education.

**Section 2**: Aimed to evaluate participant's knowledge regarding rubella. This included questions about the signs, symptoms, and modes of transmission of rubella, as well as the respondents history of rubella, knowledge regarding effects of rubella during pregnancy.

In this section, participants were asked to choose only one answer for each question, with options including 'yes,' 'no,' or 'maybe'. A correct answer earned one point, and zero point for a wrong or uncertain response answer. Therefore, the total knowledge score would range from 0 to 21 points. Based on the score, participants' knowledge was categorized into three levels: low, moderate, and high. The cutoff points for these categories were as follows: low (0–7 points), moderate (8–14 points) and high (15–21 points).

**Section 3**: Focused on the respondent's history of MMR vaccination and their attitude toward vaccination, including

their willingness to vaccinate themselves or their children in the future.

**Section 4:** Provided detailed information regarding the participant's vaccination status.

### 2.2. Data collection and ethical consideration

Ethical approval for the study was obtained from the Institutional Ethics Committee (IEC) prior to its commencement (IEC approval number: 2227-28/2024). Data collection began in July 2024.

Young adults aged 18–25 years, from any profession and of either sex, were provided with questionnaire. Their responses, which form the basis of the results, were considered for analysis. Potential participants were approached through social media platforms such as WhatsApp and other channels. A validated Google Form questionnaire was distributed to participants via email and social media, with a request to complete and submit it. The first page of the form included the consent information, outlining the study's objectives, ensuring the confidentiality of participant's personal information, and informing them of their right to withdraw from the study at any time.

# 2.3. Sample size

The sample size calculation for frequency in a population was performed using OpenEpi software, Version 3. To determine the sample size, we assumed the total population and estimated that the outcome of interest would occur in 50% of the population. We set a margin of error at 7% and used a design effect of 1, assuming a simple random sampling method. Based on a 95% confidence level, the required sample size was 196. To make calculations easier and account for possible dropouts, we rounded up to 200 participants.

# 2.4. Statistical analysis

Data was coded and presented in the MS Excel spreadsheet application. Descriptive statistics were elaborated in the form of frequencies for categorical variables. Data was presented wherever befitting data visualization utilizing column graphs for continuous data and bar charts/pie charts for categorical data. A Chi-square evaluation was useful for group comparisons in the case of categorical data. The statistical value was retained at P < 0.05.

# **3. RESULTS**

#### Socio-Demographic Data

The study included young adults 54.5% aged 18–21, 45.5% aged 22–25 (table 1). As mentioned in Figure 1 the Gender distribution among medical and other professionals was similar (males: 27% and 26.5%, females: 23% and 23.5%). Educationally, 57% were undergraduates, and 43% were postgraduates/graduates. It was seen that 69% had parents educated above high school, and 85% belonged to the middle class. Out of the total participants, 61% were Hindus, 20% were Muslims, 7% followed Buddhism, and 12% belonged to other religion.



Table 1: Socio-demographic profile of participant's in KAP



Figure 1: Gender Distribution

#### Knowledge

Table 2 summarizes participant's rubella knowledge. While 63% already knew about rubella, awareness of transmission (50.5%), causative agent (44%), symptoms (50.5%), and prevention (56%) suggesting moderate knowledge. For vaccination, 64.5% had heard of the rubella vaccine, 54% knew it was in the national immunization schedule, and 53% recognized the MMR vaccine. However, only 35% knew the correct vaccination age, and 45% knew where to get vaccinated. With an average score of 8.24, participants demonstrated moderate knowledge, underscoring the need for enhanced education and awareness campaigns.

Age Grou	qu	Number (n)	Percentage (%)					
18-21 Yea	rs	109	54.5					
22-25 year	ſS	91	45.5					
Religion								
Hindu		122	61					
Others		78	39					
	Ed	ucation						
12th		114	57					
Graduatio	n	73	36.5					
Post-Gradua	tion	13	15.5					
	Educat	ion Parents						
Below High school 62 13								
Above High So	chool	138	69					
	St	tream						
Medical Profes	sional	100	100					
Other Profess	ional	100	100					
S	ource C	f Knowledg	е					
Social media		67	33.5					
Other source		133	66.5					
	Bac	kground						
Urban 168 84								
Rural		32	16					
Socioeconomic Status								
Upper		10	5					

170

20

85

10

Middle

Lower

Sr. No	Questions	Yes (%)	NO (%)	MAYBE (%)
1	Do you know what is rubella ?	63	30	7
2	Have you ever had rubella?	12	85	3
3	Did rubella infect any of your family member, relative or friend?	4	75.5	20.5
4	Is Rubella Infectious?	54	14	32
5	Do you know the Mode of Transmission of Rubella?	49.5	50.5	0
6	Are you aware of Causative agent of rubella infection?	49.5	50.5	0
7	Do you know about symptoms of Rubella infection?	45.5	43	11.5
8	Do you know that rubella is a preventable disease?	55	32.5	12.5
9	Have you heard of rubella vaccination ?	64.5	32	3.5
10	Is rubella a part of National Immunisation schedule ?	54	21	25
11	Are You Aware About MMR / R-Vac ?	53.5	39.5	7
12	Do you know that MMR consists of 3 vaccines ?	44.5	55	0.5
13	Do you know when to give rubella vaccination MMR 1, MMR2 and MMR Booster as per national immunisation schedule ?	32.5	58.5	9

Table 2: Knowledge questionnaire on rubella infection

Study

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14	Do you know that R-Vac vaccination can be given before 15 years of age ?	35	44.5	20.5
15	Are you aware of the possible adverse drug reactions of rubella vaccination ?	22.5	64.5	13
16	Do you know where the vaccination is available ?	50	41.5	8.5

#### Knowledge Regarding Rubella Infection During Pregnancy A

Awareness of rubella during pregnancy varied, with 68% recognizing congenital rubella syndrome, while 26.5% were unaware as seen in Figure 2. Only 26% had identified rubella as a 'TORCH' group of infection, and 69% lacked knowledge of high-risk pregnancy weeks. Awareness of fetal complications, including eye, heart, and brain defects, was limited to 31.5%, while 53% were unaware. Additionally, only 24.5% knew rubella could cause abortion, while 27.5% disagreed and 48% were uncertain. These findings revealed substantial knowledge gaps regarding rubella's risks in pregnancy.



#### Attitude

The data in table 3 indicates a generally positive attitude toward rubella and vaccination. Over half (54.5%) viewed rubella as a problematic disease, while 29% were uncertain. Willingness to vaccinate was high, with 70% open to personal vaccination and 68% supporting it for their children. Additionally, 72% sought more information. Despite costs, 65.5% would still get vaccinated, while 17.5% were unwilling and 17% were unsure. Most participants (66.5%) considered vaccination the best preventive measure, though 12% disagreed, and 76.5% deemed it necessary, with 9% opposing it thus highlighting the need for further awareness efforts.



Sr. No		YES (%)	NO (%)	MAY BE (%)
1	Do you consider rubella to be problematic disease?	54.5	16.5	29
2	Do you feel that it is necessary to get vaccinated ?	76.5	9	14.5
3	Is vaccination is the most efficient way to prevent disease?	66.5	12	21.5
4	Are you willing to vaccinate yourself?	70	14	16
5	Are you willing to vaccinate your children as per immunisation schedule ?	68	14.5	17.5
6	Do you wish to get more information about rubella infection and rubella vaccination?	72	14	14
7	Will you take vaccine even if you have to pay for it?	65.5	17.5	17

#### Table 3: Attitude questionnaire on rubella infection

#### Practices

Figure 3 reveals low awareness and action regarding rubella vaccination. Only 37% knew their MMR or R-Vac status, while 49.5% were uncertain. Awareness of MMR1 and

MMR2 was even lower at 24.5% and 19.5%, with over 63% unaware. A striking 98% had not received R-Vac, highlighting major vaccination gaps. Overall, only 11% reported being vaccinated, 29.2% were not, and 46.8% were unsure. Lack of awareness was a key reason for non-vaccination.



#### Comparison of Knowledge Attitude, and Practice

The figure 4 highlights significant disparities in knowledge, attitude, and practice (KAP) regarding rubella prevention, between medical and particularly non-medical professionals. Medical professionals had significantly higher knowledge (55.45% vs. 14.61%) and a more positive attitude toward vaccination (87% vs 48.14%), reflecting the impact of specialized education. However, a gap remained between attitude and practice, with only 38.4% of medical professionals and 9.6% of non-medical individuals reporting actual vaccination. These findings underscore the urgent need for targeted education and improved vaccine accessibility to bridge the gap between awareness, intent, and practice for effective rubella prevention and control.



# Association Between socio-demographic characteristics , level of knowledge and level of practice towards MMR Vaccinations

Statistical analysis using the Chi-square test demonstrated significant associations between socio-demographic factors, knowledge, and MMR vaccination practices, as shown in Table 4. Age was a key determinant, with older individuals demonstrating significantly higher awareness ( $\chi^2 = 32.44$ , p < 0.00001) and better adherence to vaccination ( $\chi^2 = 16.16$ , p = 0.00005). In contrast, gender and religion had no significant influence on rubella knowledge ( $\chi^2 = 1.26$ , p = 0.53;  $\chi^2 = 4.75$ , p = 0.09) or vaccination practices ( $\chi^2 = 1.11$ , p = 0.29;  $\chi^2 = 0.16$ , p = 0.68), indicating similar levels of awareness and immunization behavior across these groups.

A strong correlation was observed between educational background and rubella knowledge ( $\chi^2 = 93.05$ , p < 0.00001), with medical students exhibiting significantly higher awareness than their non-medical counterparts. Similarly, vaccination adherence varied by educational background, with medical students showing greater compliance ( $\chi^2 = 45.38$ , p < 0.00001). Parental education also played a crucial role, as individuals from highly educated families demonstrated better knowledge ( $\chi^2 = 20.69$ , p = 0.00003) and were more likely to be vaccinated ( $\chi^2 = 17.45$ , p = 0.00002). The source of rubella information had a significant impact on awareness and vaccination behavior. Those who relied on social media for health information exhibited lower knowledge levels ( $\chi^2 = 9.19$ , p = 0.01) and were less likely to be vaccinated ( $\chi^2 = 4.43$ , p = 0.03).

Table 4: Association Between socio-demographic characteristics, level of knowledge and level of practice towards MMR	
Vaccinations using Chi Square test	

Variables	Level of Knowledge of Rubella and its vaccination			X2	P-Value	Level of Practice of MMR Vaccination		Х <sup>2</sup>	P-Value
	Low (n)	Moderate (n)	High (n )			Good (n)	Poor (n)		
Age Group*									
18-21 years	33	49	27	32.44	<0.00001	54	55	16.16	0.00005
22-25 years	61	11	19			20	71		
Gender									
Male	54	31	22	1.26	0.53	36	71	1.11	0.29
Female	40	29	24			38	55		
Stream*									
Medical	13	48	39	93.05	<0.00001	60	40	45.38	<0.00001
Others	81	12	7			14	86		
Religion									
Hindu	87	49	42	4.75	0.09	65	113	0.16	0.68
Others	7	11	4			9	13		
Parents Education*									
Below High School	62	19	17	20.69	0.00003	22	76	17.45	0.00002
Above High School	32	41	29				52	50	
Source of									
Knowledge*									
Social Media	38	22	7	9.19	0.01	18	49	4.43	0.03
Others	56	38	39			56	77		

\*Significant at P < 0.05



#### 4. DISCUSSION

Rubella, or German measles, is a vaccine-preventable viral infection with serious risks, particularly for pregnant women. However, awareness and vaccination practices vary across regions. This study analyzes findings from similar research to identify common trends, gaps, and opportunities to enhance rubella prevention strategies.

Knowledge about rubella and its risks remains inconsistent. In our study, 63% of young adults had heard of rubella, 54% recognized it as infectious, but only 44% correctly identified its causative agent. Awareness of congenital rubella syndrome (CRS) was particularly low (31.5%), which revealed widespread misconceptions about transmission, symptoms and risks also shown in previous studies <sup>3,12</sup>.

Understanding rubella's impact on pregnancy remains a concern. While 68% of participants had heard of CRS, only 26.5% understood 'TORCH' group of infections. A study reported even lower awareness (13.02%) among adolescent girls, underscoring the need for targeted health education, especially for women of reproductive age<sup>13</sup>. Despite these gaps, attitudes toward rubella vaccination were largely positive. In our study, 70% were willing to vaccinate themselves, and 68% supported vaccinating their children. These trends align with findings from previous two studies, where over 65%<sup>3</sup> and 82.5%<sup>12</sup> of participant's, respectively, acknowledged rubella as a health concern. However, barriers to vaccination persist. In our study, 17% were uncertain about its necessity. Similar concerns were noted in a study , where 52.08% of adolescent girls deemed vaccination unnecessary, and 32.5% of female medical professionals expressed doubts<sup>14</sup>. Common obstacles included cost and misinformation, preventing positive attitudes from translating into action.

Vaccination coverage remained critically low across studies. Only 37% of our participants knew their vaccination status, and only 37% confirmed receiving the rubella vaccine. Similar trends were observed where just 12.5% knew their status<sup>12</sup>. A previous study found that only 49.4% were vaccinated while 41.6% of medical students were unaware of their MMR vaccination status, and 10% were completely unimmunized<sup>15</sup>. Despite their medical background, limited vaccine availability and lack of awareness were identified as key barriers. A study found that only 42.1% of medical professionals were vaccinated<sup>3</sup>, while in other study, none of the participants had received the vaccine<sup>13</sup>. Non-serious attitudes (44.4%) and time constraints (23.1%) as major vaccination barriers among healthcare workers was seen in previous study<sup>14</sup>.

Medical professionals exhibited greater knowledge (55.45%) and positive attitudes (87%) compared to nonmedical professionals (14.61% knowledge; 48.14% positive attitudes). However, the gap between attitude and practice remained significant, with vaccination rates of 38.4% among medical professionals and only 9.6% among non-medical individuals. These trends align with findings from previous

studies<sup>3,14</sup>, highlighting the need to strengthen vaccination adherence among healthcare workers.

Younger individuals (18-21 years) demonstrated higher awareness and proactive immunization behaviors compared to those aged 22-25 years, suggesting greater receptiveness to vaccination-related information. Additionally, academic background significantly influenced awareness, with highly educated parents positively impacting vaccination rates. In contrast, gender and religion had no notable effect on immunization behaviors. These findings emphasize the critical role of education and reliable information in improving MMR vaccination awareness and uptake. These findings reveal systemic challenges such as inadequate access, logistical issues, and gaps in vaccine awareness. Addressing these barriers requires robust public health campaigns, improved vaccine accessibility, and effective communication strategies to enhance compliance and bridge the gap between knowledge and practice.

### **5.LIMITATIONS**

Self-reporting bias may lead to inaccurate responses about rubella vaccination. A low response rate may be there due to limitations of internet access, web based questionnaires, social media use, language barrier and voluntary reporting.

#### 6. RECOMMENDATIONS

Significant gaps in rubella vaccination knowledge, attitudes, and practices persist despite moderate awareness, highlighting the need for targeted public health interventions. Strengthening educational campaigns, especially on rubella risks in pregnancy and immunization benefits, is essential. Targeted focus on schools, colleges, and workplaces should promote awareness to ensure informed decisions. Misinformation and vaccine hesitancy, particularly on social media, must be countered through strategic communication by healthcare professionals and policymakers. Collaboration with community leaders and influencers can promote accurate information.

Improving vaccine uptake requires better accessibility through mobile units, subsidies, and workplace drives. Digital health records and SMS reminders can boost compliance, especially among young women's who need pre-marital counseling. Policies linking vaccination to school admissions or employment can further increase coverage. Rubella elimination in India demands a multi-sectoral approach involving government, NGOs, and technologydriven initiatives. Strengthening public trust, healthcare infrastructure, and outreach strategies is key to sustainable immunization.

#### 7. CONCLUSIONS

This cross-sectional study highlights gaps in knowledge, attitudes, and practices regarding rubella vaccination among young adults in Central India. While awareness is moderate, misconceptions persist, particularly about rubella's risks during pregnancy and the need for timely immunization. Despite positive attitudes, vaccination rates remain low, revealing a disconnect between awareness and



action. Addressing these gaps requires educational initiatives, improved vaccine accessibility, and strategies to combat misinformation.

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