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Epidemiological study of rubella outbreaks in Rajasthan, India

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ABSTRACT

Background: Rubella is one of the major causes of significant morbidity and congenital deformities in India. Rubella immunization is yet to be formally introduced in National Immunization schedule across the country. Strong surveillance system for rubella is the key for prevention and control of congenital rubella syndrome. The outbreaks of rubella in Rajasthan in 2014 were investigated. The objective was to study the socio demographic profile of rubella outbreak in Rajasthan

Methods: The data of the AFP cum measles and rubella surveillance project of Rajasthan was used for analysis. This is an analytical, cross sectional study where 2 districts of Rajasthan having confirmed rubella outbreak in 2014 were included. A total of 101 laboratory plus epidemiologically linked rubella cases were considered. Statistical analysis: Percentages, proportions and Chi square test were applied.

Results: In three outbreaks, 101 cases were of rubella (laboratory confirmed + epidemiologically confirmed). Maximum numbers (around 53%) of cases were from the age group 1-4 years and 54.5% male child. The disease starts in early age (4 months) and affected up to the age group of 27 years.

Conclusions: There was an outbreak of rubella cases in one district and mixed outbreak in second one. Currently rubella vaccination coverage is zero. Considering the currently available knowledge and reports, it is well justified that CRS can be controlled by effective immunization program and inclusion of rubella vaccination in the national immunization program of India is much awaited. Rubella vaccination is a cost effective measure and it can very easily piggy back Measles vaccine.

Keywords: Rubella outbreak, Rubella epidemic, Rubella in India, Epidemiologically confirmed rubella, Surveillance, Rubella IgM, Rubella IgM, Immunization

INTRODUCTION

Rubella is an acute, contagious viral infection. It is also referred to as "Three days Measles". Rubella is sometimes called "German measles," but the rubella virus is not related to the measles virus. The rubella virus is transmitted by airborne droplets by sneezing and cough of the infected people. In children, illness from rubella infection is usually mild. Complications from rubella are more common in adults than children, and include arthritis, encephalitis, and neuritis. It has serious consequences in pregnant women causing fetal death or

congenital defects known as congenital rubella syndrome (CRS) which includes deafness, cataracts, heart defects, intellectual disabilities, liver and spleen damage, Low birth weight, Skin rash at birth.² Rubella causes a huge socio-economic burden on the families and society as a whole.³

In 2010, an estimated 1,03,000 children were born with CRS (Congenital Rubella Syndrome) globally, of which around 47,000 children, i.e. 46% were in South-East Asia region and about 40,000 in India.^{3,4} When a woman is infected with the rubella virus early in pregnancy, she has

a 90% chance of passing the virus on to her fetus. This can cause miscarriage, stillbirth, premature birth or severe birth defects as CRS. Infants with CRS may excrete the virus for a year or more.⁵ Almost all studies on sero-prevalence of rubella amongst Indian females revealed that 10-30% of adolescent girls and 12-30% of women in the reproductive age-group are susceptible to rubella infection.⁶

There is no specific treatment for rubella but the disease is preventable by a cost effective strategy of vaccination. A single dose gives more than 95% long-lasting immunity, which is similar to that induced by natural infection.⁵ In outbreak situations, the effectiveness of different rubella vaccines has been estimated to be 90-100%. Protection was attained 2-3 weeks after immunization.⁷ The Rubella was introduced in Australia in 1970 as school based program to cover adolescent girls. The number of World Health Organization (WHO) member states using rubella-containing vaccine (RCV) in their national childhood immunization schedule increased from 83 in 1996 to 149 in 2016; 14 countries have planned introduction of MR vaccine in 2017. In April 2015, the WHO region of the Americas became the first in the world to be declared free of endemic transmission of rubella.5

CRS rates are highest in the WHO African and South-East Asian regions where vaccine coverage is lowest. ⁵ There were 202 Rubella outbreaks in India in 2016 with 6295 rubella cases and 1500 mixed cases of Rubella and Measles in mixed outbreaks. ¹⁰ To push the rubella vaccination drive, the measles and rubella initiative (M&R initiative) was launched in 2001 which is a global partnership led by the American Red Cross, United Nations Foundation, Centers for disease control and prevention (CDC), UNICEF and WHO. The M&R Initiative is committed to ensure that no child dies from rubella or is born with congenital rubella syndrome; reducing rubella deaths by 95% by 2015; and achieving measles and rubella elimination in at least five WHO regions by 2020. ¹¹

Going one step ahead with its commitment for Rubella elimination, the Government of India in February 2017 Launched a massive vaccination campaign in five states/union territories - Karnataka, Tamil Nadu, Puducherry, Goa and Lakshadweep covering nearly 3.6 crore children, the campaign is targeted at vaccinating more than 41 crore children in the age group of nine months to less than 15 years in four phases over the next two years across the country. 4,9 Both viruses can be eliminated if their transmission is hindered. For that to happen, the vaccine coverage has to be over 95% during the campaign and in the immunization program that follows it. 4 But reports from Tamil Nadu indicate that the coverage is around 79%. 12 So more efforts will be required to attain the objectives and goal for rubella elimination.

But as of today, India is still burdened with rubella outbreaks and cases of CRS, investigations of the rubella outbreak are important tools to further know about the disease pattern, socio- cultural and geographical factors affecting disease occurrence and robustness of the surveillance system for early identification and control of outbreak. The present study was undertaken to understand the various aspects determining the disease outbreak.

METHODS

Study area

The study background was in the state of Rajasthan (India). All 33 districts of Rajasthan were under the Rubella surveillance and only 02 districts having confirmed/mixed rubella outbreak were included in the study.

Study design

Community based, analytical, cross sectional study. The data of the cases collected in acute flaccid paralysis (AFP) cum measles and rubella surveillance project of Rajasthan was used for analysis.

Study size and sample

A total of 101 laboratory plus epidemiologically linked Rubella cases were considered for the current study.

Study period

The study period was from January to December 2014.

Study tools and technique

The suspected rubella case was defined as patient of any age in whom a health worker suspects rubella. A health worker should suspect rubella when a patient presents with: fever with macula-papular rash and one of 3 Cs cough, coryza and conjunctivitis. A laboratory-confirmed case was defined as a suspected case with a positive blood test for rubella-specific IgM where the blood specimens have been obtained between 4 and 28 days after the onset of rash. An epidemiologically-linked Rubella case was a patient with a febrile rash illness that is linked epidemiologically to a laboratory-confirmed rubella case. 13 Under the surveillance, the trigger for preliminary outbreak investigation is either five or more clinical cases of febrile rash illness in a block or different adjacent blocks in a week or any febrile rash illness associated death in a block in a week.¹⁴

Based on reports of local health authorities and integrated disease surveillance reports and also data from acute flaccid paralysis cum Measles / Rubella weekly report, outbreak was suspected as per definition described above. District immunization officers suspect an outbreak and

instruct the local ground level health workers (multipurpose health workers) or medical officer to do initial investigation to find out if there are more cases in the same area/village or adjoining areas/village. If sufficient number of additional cases are observed, then detailed house to house search was conducted by the team of health workers and cases having onset of rash or death in the last 3 months are line listed. Out of these listed cases, 5 cases having onset of rash between 4 – 28 days prior to date of line listing were selected for blood sampling to confirm outbreak. These samples are sent to World Health Organization (WHO) accredited laboratory at SMS Medical College, Jaipur where samples were tested for measles IgM and rubella IgM. The laboratory reports were used to classify outbreak.

- Measles outbreak two or more samples were positive for Measles IgM.
- Rubella outbreak two or more samples positive for Rubella IgM.¹⁵
- Mixed outbreak Atleast two samples were positive for Measles IgM and two were positive for Rubella IgM.¹⁴

Preventive and clinical outbreak management steps were taken at the time of detailed house to house search/investigation in the form of appropriate management of clinical cases.

Statistical analysis

Data collected were entered in Microsoft Excel and were analyzed using software Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive statistical measures such as percentage, mean were applied. Inferential statistical tests such as Z-test and Chi-square test were applied, wherever appropriate, to identify important relationships between variables and determine the level of significance. A p-value of <0.05 was considered statistically significant.

Ethical clearance

The co-author, Dr. Kamaljit Singh worked in the capacity of sub-regional team leader (WHO) of Rajasthan region during the study period and was involved in investigation of the Rubella outbreaks in 2014. The confidentiality has been maintained and the information thus obtained has not been used for any other purpose except for academic purposes. Hence no conflict on ethical issues and thus not required. There was no of conflict of interest and no

financial help from any source were involved in conduction of this study.

RESULTS

Out of the 24 outbreaks flagged during the study period in Rajasthan in 2014, preliminary inquiry and detailed house to house investigation was conducted and 23 outbreaks were subjected for further confirmatory laboratory investigation in which 14 were found to be of Measles. Two outbreaks were of Rubella and one outbreak was mixed (Measles and Rubella) (Table 1). District health authorities' listed 101 cases in these 03 outbreaks as Rubella cases (Lab confirmed + epidemiologically confirmed) and were used for analysis in the present study.

Table 1: District wise distribution of outbreaks and cases.

District	No. of Rubella outbreaks	No. of Rubella cases
Jaipur	1	80
Kota	2	21
Total	3	101

Outbreaks in Kota were notified on 12th April 2014 and 29th May 2014 while Jaipur outbreak was notified on 2nd June 2014. On investigation it was found the first case had onset on 5th March 2014 in Kota and 12th March 2014 in Jaipur. There was no active intervention for these outbreaks, therefore outbreaks continued for long time (Figure 1 and Table 2). However all required interventions like appropriate management of cases and measles vaccination of eligible children as per Govt. of India guidelines for managing fever with rash were done.

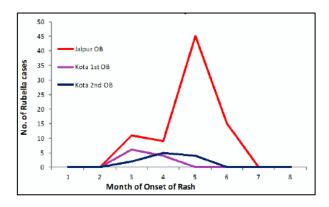


Figure 1: Progress of rubella outbreak (OB) in unvaccinated community.

Table 2: Details of Rubella outbreaks in Rajasthan 2014.

District	Outbreak	Date of rash (ons	set of outbreak)	Duration of outbreak
	Outbreak	First Cases	Last Case	(days)
Jaipur	Mixed	14.03.2014	05.06.2014	83
Kota	1st Rubella	12.03.2014	07.04.2014	26
Kota	2 nd Rubella	05.03.2014	20.05.2014	76

Table 3: Demographic characteristics of rubella cases (n = 101).

		Number of cases	Percentage (%)
Age (years)	<1	8	7.9
	1 to 4	54	53.4
	5 to 9	30	29.7
	10 to 14	5	4.9
	≥15	4	3.9
	Total	101	100
Sex	Male	55	54.5
	Female	46	45.5
	Total	101	100
Religion	Hindu	15	14.9
	Muslim	86	85.1
	Total	101	100

Table 4: Relationship of religion and age - rubella outbreaks in Rajasthan 2014.

Age (years)	Hindu (%)	Muslim (%)	Total	
<1	0	8 (100)	8	
1 to 4	10 (18.5)	44 (81.5)	54	
5 to 9	4 (13.3)	26 (86.7)	30	
10 to 14	0	5 (100)	5	
≥15	1	3 (75)	4	
Total	15 (14.9)	86 (85.1)	101	
	$x^2 = 3.22$	df =4	p=0.521	

Socio-demographic profile of cases

A total of 91% of rubella cases were less than 10 years of age with maximum number (around 53%) of cases were from the age group 1-4 years. The mean and median age of rubella cases was 57 months and 46.8 months respectively. The minimum age in cases was 4 months and maximum age was recorded to be 328 months (27.4 years). Male children contributed to about 55% of the total measles cases. Majority (85%) cases were in Muslim families (Table 3).

Among the different age groups, majority of cases (75% to 100%) were from Muslim Community (Table 4).

Vaccination status

Out of all the 101 rubella cases in the present study, none had rubella vaccine however 21 children (20.8%) had measles vaccine. As rubella vaccine is still not a part of National Immunization Schedule in India, therefore all of them were found to be unvaccinated.

DISCUSSION

The current study investigated 2 outbreaks of rubella out of which one was mixed outbreak of measles and rubella. In a study from Maharashtra in 2013, of the 98 outbreaks, 12 were of rubella and 21 mixed outbreaks of Measles and Rubella. 16

In a study from Chandigarh, among unimmunized cases, 20 (57.1%) cases were in age group of 1-4 years. ¹⁷ A study from Himachal Pradesh in 2006 revealed that the only 2/11 cases of rubella in the age group of 0-5 years and more cases in the higher age group and there was a shift of cases in higher age group. The present study it was observed that half of the cases were in the age group between 1-4 years. In the present study, the mean age of the cases was 57 months with the median 46.8 months. As there is no rubella vaccine in national immunization program, therefore there is no difference in immunization coverage among different gender (Male and Female) and religion groups (Hindus and Muslims). Higher proportion of rubella cases among muslims could be due to the fact that the community is generally underserved and have environmental conditions which are favourable for infection diseases.

A report has shown that the coverage of MMR vaccine has been reported to be 42%, 30% and 5% from Delhi, Chandigarh and Goa, respectively. But only Five cases (6%) had received MMR from private clinic in Chandigarh rubella outbreak and no rubella immunization amongst cases was observed in Himachal outbreak. The present study, no rubella vaccination in cases were observed which is due to absence of rubella vaccine in National Immunization Schedule (NIS) of India. Low/no coverage means more seronagativity particularly amongst women. As per a study from Delhi (India), immunity status for rubella among childbearing women in 1988 onwards showed steady rise over the period. While in late

1980s it varied from 49 to 72.33%, there was increase in 1990s till the year 2002 where it was 87 to 92%.²⁰ Various studies have estimated the Rubella IgG sero negativity around 13% -18%. 21-23

The need for accelerating the vaccination campaign especially against measles, mumps and rubella is need of the hour. 13 Although five states in India have been covered with rubella campaign covering nearly 3.6 crore target children, it will take another couple of years to introduce Rubella in NIS. 3,24 This MR campaign targets around 41 crore children across the country. All children aged between 9 months and less than 15 years will be given a single dose of measles-rubella (MR) vaccination irrespective of their previous measles/rubella vaccination status or measles/rubella disease status. MR vaccine will be provided free of cost across the states through regular health care delivery system and also through special session sites at schools to cover adolescents. After the completion of the campaign, MR vaccine will be introduced in routine immunization and will replace measles vaccine, given at 9-12 months and 16-24 months of age.3 With the measles-rubella vaccination drive coming to a close, Tamil Nadu has managed to cover only 79.5 per cent of the target despite extending the deadline. Many parents kept their children away from vaccinating Measles-Rubella because of the false information spread on social media.¹²

CONCLUSION

The rubella vaccination is zero among cases due to its absence in National Immunization Program. However younger age group is still most affected with almost equal affiliation to both genders. More cases are observed in Muslim families. Considering the currently available knowledge and reports, it is well justified that CRS can controlled by effective immunization program and inclusion of rubella vaccination in the national immunization program of India is much awaited. Rubella vaccination is a cost effective measure and it can very easily piggy back Measles vaccine.

Recommendations

Rubella surveillance strengthening is required for early identification and control of outbreaks. Special attention is needed for those communities in which rubella outbreak and cases are higher and robust strategy should be chalked out to protect women of child bearing age. More focus is required on the high risk pockets like minority colonies, slums, conservative communities and migratory population. As most of the cases are first reported to quacks and temples, there is a need for a strong surveillance mechanism for early report of the suspected cases and outbreaks by involving the unqualified health providers and temples just on the lines of informer system created under National Polio Surveillance Project.

The coverage of adolescent girls for rubella vaccination is need of the hour. The school based rubella immunization campaign started by Government of India is a welcome step in this regard but the school dropout girls and boys needs to be tracked and immunized.

The social media plays an important role in creating an opinion about an issue. The role of social media in this regard could be constructive or destructive. The low coverage of rubella campaign in Tamil Nadu was a result of wide spread false rumors about rubella vaccination. Thus the government machinery must be prepared to tackle this false propaganda. More media coverage is required for rubella vaccination so that the masses accept it smoothly. The involvement of ground level health workers like MPHW-F, ASHA, Anganwadis and women self-help groups would be instrumental in acceptance of rubella vaccination by the communities. Community leaders and local religious heads should be involved in Rubella campaign to overcome social and religious resistance.

Additional resources and efforts are required from Government as well as Non- governmental organizations (NGOs) for those communities where discrimination against girl child is prevalent so as to increase the rubella coverage. As prevention of CRS is one of the main concerns of the campaign, a famous women personality could be appointed as brand ambassador for this campaign.

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REFERENCES

- Centers for Disease Control and prevention (CDC). Rubella (German Measles, Three Day Measles). Signs and Symptoms, CDC, Atlanta. 2016. Available at: https://www.cdc.gov/rubella/about/ symptoms.html Accessed on 8 April, 2017.
- The History of Vaccines. Rubella. The College of Physicians of Philadelphia. Available http://www.historyofvaccines.org/content/articles/ru bella Accessed on 8 April, 2017.
- Press Information Bureau, Government of India, Ministry of Health and Family Welfare, 05-February-2017 15:26 IST. Health Ministry launches single vaccine for dual protection against measles and rubella as part of Universal Immunization Programme. Available at: http://pib.nic.in/newsite/

- PrintRelease.aspx?relid=158067 Accessed on 8 April, 2017.
- Prasad R. Why India needs the rubella vaccine? The Hindu (National Newspaper). 2017. Available at: http://www.thehindu.com/sci-tech/health/indianeeds-the-rubella-vaccine/article17369830.ece Accessed on 2 April, 2017.
- World Health Organization. Media Centre. Rubella. Fact sheet as reviewed in March 2017. Available at: http://www.who.int/mediacentre/factsheets/fs367/en/Accessed on 6 April, 2017.
- Dewan P, Gupta P. Burden of Congenital Rubella Syndrome (CRS) in India: A Systematic Review. Indian Pediatr. 2012;49:377-99.
- 7. Taneja DK, Sharma P. Targeting Rubella for Elimination. Indian J Public Health. 2012;56:269-72.
- 8. Ward K, Quinn H, Menzies R, McIntyre P. A history of Adolescent school- based vaccination in Australia. E 168- E174 Commun Dis Intell. 2013;37(2):E168-74.
- World Health Organization. Country office for India. India launches one of the world's largest vaccination campaigns against Measles and Rubella syndrome with WHO support. Available at: http://www.searo.who.int/india/mediacentre/events/ 2017/Measles_Rubella/en/ Accessed on 3 April, 2017.
- Measles and Rubella Surveillance Bulletin. Report for the month of October 2016. World Health Organization. Country Office for India and National Health Mission, India.
- World Health Organization. Media Centre. Measles.Fact sheet- Reviewed November 2016. (As accessed on 26 Feb, 2017). Available at: http://www.who.int/mediacentre/factsheets/fs286/en / Accessed on 12 April, 2017.
- 12. Seventy Nine Percentage Coverage in measles-Rubella Campaign. The New Indian Express (Newspaper). 15 March, 2017. Available at: http://www.newindianexpress.com/states/tamilnadu/2017/mar/15/79-percent-coverage-in-measlesrubella-vaccine-drive-1581506.html Accessed on 8 April, 2017.
- 13. Immunization, Vaccines and Biologicals. WHO-recommended surveillance standard of rubella and congenital rubella syndrome. World Health organization. Available at: http://www.who.int/immunization/monitoring_surveillance/burden/vpd/surveillance_type/active/rubella_standards/en/Accessed on 8 April, 2017.
- 14. Field Guide: Measles Surveillance and Outbreak Investigation November 2005. Department of Health and Family Welfare, Government of India, New Delhi (Prepared with assistance from National

- Polio Surveillance Project-India). 2005. Available at: http://www.searo.who.int/india/topics/measles/Measles_surveillance_and_outbreak_investigation_f ield_guide_2005.pdf?ua=1 Accessed on 3 April, 2017.
- 15. Surveillance Guidelines for Measles, Rubella and Congenital Rubella Syndrome in the WHO European Region. Geneva: World Health Organization; 2012 Dec. Chapter 3, Case definitions for surveillance and reporting of measles and rubella. Available at: https://www.ncbi.nlm.nih.gov/ books/NBK143259/ Accessed on 18 April, 2017.
- Vaidya SR, Kamble MB, Chowdhury DT, NS. Measles & Rubella Outbreaks in Maharashtra State, India. Indian J Med Res. 2016;143:227-31.
- 17. Madhanraj K, Singh N, Gupta M, Singh MP, Ratho RK. An Outbreak of Rubella in Chandigarh, India. Indian Pediatr. 2014;51:897-9.
- 18. Gupta SN, Gupta N, Gupta S. A Mixed Outbreak of Rubeola-Rubella in District Kangra of Northern India. Journal of Family Medicine and Primary Care. 2013;2(4):354-9.
- 19. Singh MM, Devi R, Chauhan A. India to introduce rubella and rotavirus vaccines and inactivated polio vaccine. BMJ. 2014;349:g4844.
- Gandhoke I, Aggarwal R, Lal S, Khare S. Sero prevalence and incidence of Rubella in and around Delhi 1988-2002. Indian J Med Microbiol. 2005;23:164-7.
- 21. Rustgi R, Deka D, Singh S. Rubella serology in Indian adolescent girls and its relation to socioeconomic status. J Obstet Gynecol India. 2005;55:167-9.
- Ramamurty N, Murugan S, Raja D, Elango V, Mohana, Dhanagaran D. Serosurvey of rubella in five blocks of Tamil Nadu. Indian J Med Res. 2006:123:51-4.
- 23. Nardone A, Tischer A, Andrews N, Backhouse J, Theeten H, Gatcheva N, et al. Comparison of Rubella sero-epidemiology in 17 countries: progress towards international disease control targets. Bull World Health Organ. 2008;86(2):118-25.
- 24. Sinha K. Now, India to roll out vaccine against Rubella. The Times of India (National Newspaper). May 16, 2012. Available at: http://timesofindia. indiatimes.com/india/Now-India-to-roll-out-vaccine-against-Rubella/articleshow/13159547.cms Accessed on 12 April, 2017.

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