

## OUTBREAK INVESTIGATION OF MEASLES IN DISTRICT RAHIM YAR KHAN

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Article Received on 21/05/2022

Article Revised on 11/06/2022

Article Accepted on 01/07/2022

## ABSTRACT

**Introduction and background:** Measles is highly contagious and remains a leading cause of childhood mortality. Outbreak of Measles were reported from various parts of Pakistan. An outbreak was reported to district health officer Rahim Yar Khan through a medical officer working at THQ hospital Sadiqabad on 22-05-2021. An investigation team was formulated under the direction of the CEO health and Deputy Commissioner Rahim Yar Khan to investigate the outbreak. The investigation team comprised of polio team. The study continued from 22-05-2021 to 20-07-2021. **Purpose:** To confirm the outbreak, assess its magnitude and to implement prevention and control activities to stop spread of the outbreak. **Methods and material:** It was a cross-sectional study. Sampling was done through non-probability purposive sampling technique. A case of measles was defined as a person of any age, resident of district Rahim Yar Khan with non-vesicular maculopapular rash with fever and at least one of the following: cough, coryza and conjunctivitis presenting between 22-05-2021 to 20-07-2021. Data was collected using pretested structured questionnaire and analyzed using SPSS v. 26.0. **Results:** Total 24 cases were identified. The Epi curve ranges from 25-06-2021 to 26-06-2021. Mean age of the cases was  $59.71 \pm 47.94$  (range 7–156 months). There were 17 (70.8%) males and 7 (29.2%) females. All patients recovered, no death reported. Vaccination showed protective effect. Among 5 Measles IgM positive cases, 4 patients received zero dose of vaccination and 1 patient received one dose of vaccination (P value 0.001). Vaccination coverage showed 4.2% of suspected patients received measles-1, sixteen patients were fully immunized and remaining 7 patients didn't get any dose of Measle vaccination. The main symptoms of the cases were fever among 100% cases (n=24), followed by rash among 100% cases (n=24), coryza among 50% cases, and conjunctivitis among 58.3% cases (n=51) and pneumonia among 4.2% of the cases. **Conclusion:** This Measles outbreak in District Rahim Yar Khan revealed that majority of the confirmed cases were not immunized against measles and other vaccine preventable diseases included in routine immunization.

**KEYWORDS:** Measles, outbreak, immunization, expanded program on immunization, Risk factors. Misconception.

## INTRODUCTION

Measles is a highly contagious Vaccine Preventable Disease caused by the Measles virus (single-stranded, enveloped RNA virus of Paramyxoviridae. Family). It is a major public health problem and leading cause of child morbidity and mortality in the developing countries including Pakistan. Despite the availability of a safe and effective vaccine against measles, many countries have experienced measles outbreaks in recent years. In 2015, there were 134 200 measles deaths globally - about 367 deaths every day or 15 deaths every hour. In 2019, there was a precipitous increase in measles outbreaks worldwide, with 413,308 confirmed cases and 207,500 measles-related deaths, compared with 140,000 deaths in 2018, 110,000 deaths in 2017, and 89,780 deaths in 2016.<sup>[1,2]</sup>

Pakistan one of the developing countries, has lost hundreds of lives to measles as a result of last year's outbreaks in many different areas. In Pakistan 2012, there were 15,000 cases and 305 deaths. The outbreaks started in Sind province of the country in December 2012 which killed more than 70 children and affected more than 500 children and then spread into many other parts of the country claiming further lives.<sup>[3,4]</sup> However, in Punjab 94 deaths in the first half of year 2013 as compared to only 16 deaths in 2012. It was also very shocking that a maximum number of these deaths occurred in the capital city of the province, Lahore instead of any of another under developed rural areas.<sup>[4]</sup> Pakistan stands among the top five countries with the largest number of children not vaccinated against measles in 2021, and therefore has the highest toll of measles cases, along with Yemen, Tanzania, India and Nigeria.<sup>[1]</sup> Measles has been endemic in Pakistan for decades and accounts for 65% of the total measles

burden among 22 countries in the Eastern Mediterranean region.<sup>[4]</sup> According to CDC surveillance, only 75% of children receive first dose of measles vaccine (MCV1) with even lower percentage, of 45%, received MCV2. Similarly, another survey reported that frequency of children who were completely vaccinated against measles was 30.7%, incompletely vaccinated were 21.5% and unvaccinated were 47.8%.<sup>[5]</sup>

Measles is an airborne disease which spreads through coughing and sneezing or with close personal contact or direct contact with infected nasal or throat secretions. Cardinal signs and symptoms include non-vesicular maculopapular rash with high grade fever 40 °C (104.0°F), along with cough, coryza, and conjunctivitis. Koplick's spots usually appear within the mucosal lining of the mouth within 2 -3 days of onset of symptoms. Measles usually does not kill children directly however, as a result of its associated immune suppression, measles can lead to lethal complications, such as pneumonia, otitis media, neurological complications such as post measles encephalitis, SSPE and measles inclusion body encephalitis, croup, diarrhea, brain damage, deafness, visual disturbances, which may lead to morbidity and mortality.<sup>[6]</sup>

Previous studies conducted on measles outbreaks showed that the possible risk factors of measles outbreaks were, low measles vaccination coverage, nutritional problem, vitamin A deficiency, low socioeconomic living conditions, weakened or suppressed immune system due to HIV/AIDS or other Diseases, absence of vaccination facilities in remote areas and being pastoralist, travel history, contact history, and unaware of the need of immunization and lower levels of education were associated with measles outbreaks.<sup>[7]</sup>

To confirm suspected cases, laboratory diagnosis is very important for measles-specific IgM detection and to identify the genotype. The incubation period of measles is 10-14 days. This represents two incubation periods (14 days from exposure to rash), and the maximum period of communicability of 4 days post-rash.<sup>[8]</sup>

A safe vaccine against measles has been available and globally recommended since 1974. The World Health Organization established measles elimination as a goal for 2020 but, unfortunately, this objective has not been achieved yet and outbreaks still occur. Herd immunity, ie, a population immunity higher than 95%, is required to stop the measles virus transmission.<sup>[9]</sup> Measles eradication is biologically and technically feasible because humans are the only natural hosts for measles virus, only one serotype of the measles virus exists, and measles virus is genetically stable.<sup>[10,11]</sup> In Pakistan, parents are found reluctant to get their child vaccinated secondary to wrongful beliefs and fear of development of developmental delay, sterility and other long term side effects in their children.

As a result of COVID-19 emergency measles immunization, surveillance and supplementary immunization campaigns were halted and a significant step back in progress toward global measles elimination was reported in 2019. Suspension of childhood immunization programs might seem helpful for containment of the COVID-19 pandemic, but it has triggered other public-health disasters, including measles.<sup>[12]</sup>

Timely and thorough case investigation should, confirm the patient's diagnosis, ensure appropriate medical follow-up for affected persons, identify the source of infection, locate persons who may have been exposed, and isolate potentially infectious persons to prevent transmission of illness in the community. Outbreak investigation provides an opportunity to identify at-risk groups, changes in measles epidemiology, and gaps in the routine immunization program. Outbreak investigations can help to identify the source of measles, characterize by person, place, and time and guide public health intervention.

### Objective

Objective of this study was to confirm the outbreak, search active and assess disease magnitude and to implement prevention and control activities to stop spread of the outbreak. To communicate the results and findings and to develop recommendations for prevention and control to decision-makers for policy and advocacy.

### Material and method

**Outbreak Setting:** District Rahim Yar Khan

**Study Duration:** 22-05-2021 to 20-07-2021.

**Study design:** Descriptive Cross-Sectional

**Sampling technique:** Non-probability purposive sampling technique.

**Study Tool:** A semi-structured questionnaire was developed and used for data collection.

**Sample Collection:** Blood for Measles IgM antibodies.

### METHODOLOGY (Data collection procedure)

District Rahim Yar Khan has 4 tehsils (Liaquatpur, Khanpur, Rahim Yar Khan, Sadiqabad), 139 Union council, 1150 villages, 11880 Sq Km total area, 1 Tertiary care hospital (Sheikh Zayed hospital, RYK), 3 THQs, 19 RHCs, 104 BHUs, 56 Rural dispensaries, 7 MCH centers. According to 2017 consensus the estimated total population was 48 lacs app. Rahim Yar Khan is situated between 27°40'-29°16' north latitudes and 60°45'-70°01' east longitudes.

An outbreak was reported to district health officer through a medical officer working at THQ hospital Sadiqabad on 22-05-2021. An investigation team was formulated under the direction of the CEO health and Deputy Commissioner Rahim Yar Khan to investigate the outbreak. The investigation team comprised of polio team. The study continued from 22-05-2021 to 20-07-2021.

A comprehensive house-to-house survey was conducted for the “active case finding” by using a pre-tested questionnaire. Information was collected on demographics, disease notification, clinical presentation, and vaccination status and disease outcome. Information collected was based on respondents’ recall, and vaccination card if present. A questionnaire was established regarding the “routine immunization status”. Data was collected based on the presence of vaccination card and/or recall (or scar in case of BCG vaccination). A case of measles was defined as a person of any age, resident of district Rahim Yar Khan with non-vesicular maculopapular rash with fever and at least one of the following: cough, coryza (i.e. runny nose) and conjunctivitis (i.e., red eyes) presenting between 22-05-2021 to 20-07-2021.

The data was analyzed using SPSS software 26.0 (IBM Corp., Armonk, NY, USA). The numeric variables were expressed as mean  $\pm$  standard deviation. The categorical variables (gender, vaccination status) were represented as frequency and percentages.

## RESULTS

Total 24 cases were identified. The Epi curve ranges from 25-06-2021 to 26-06-2021. Mean age of the cases was  $59.71 \pm 47.94$  (range 7–156 months). There were 17 (70.8%) males and 7 (29.2%) females. All patients

recovered, no death reported. Vaccination showed protective effect. Among 5 Measles IgM positive cases, 4 patients received zero dose of vaccination and 1 patient received one dose of vaccination (P value 0.001). Vaccination coverage showed 4.2% of suspected patients received measles-1, sixteen patients were fully immunized and remaining 7 patients didn’t get any dose of Measle vaccination.

Among four tehsil, 4 (16.7%) suspected cases were reported from Liaquatpur, 4 (16.7%) cases from Rahim Yar Khan, 14 (58.3%) cases from Sadiqabad and 2 (8.3%) from Khanpur.

Majority of the Measles cases were referred from health units. The main symptoms of the cases were fever among 100% cases (n=24), followed by rash among 100% cases (n=24), coryza among 50% cases, and conjunctivitis among 58.3% cases (n=51) and pneumonia among 4.2% of the cases.

Sex (Male, Female)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	female	7	29.2	29.2	29.2
	male	17	70.8	70.8	100.0
	Total	24	100.0	100.0	

Month of reporting					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	July	9	37.5	37.5	37.5
	June	14	58.3	58.3	95.8
	May	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

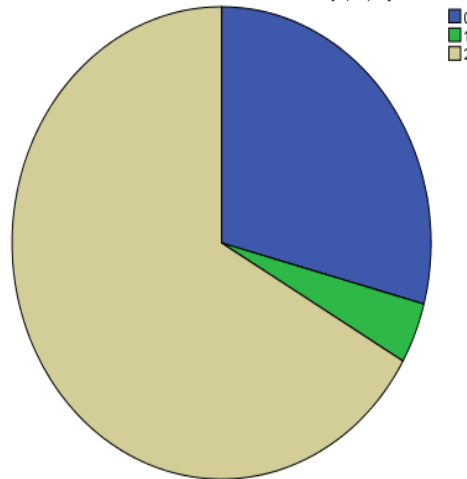
Sex (Male, Female)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	female	7	29.2	29.2	29.2
	male	17	70.8	70.8	100.0
	Total	24	100.0	100.0	

Tehsil/Town					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Khanpur	2	8.3	8.3	8.3
	Liaquat Pur	4	16.7	16.7	25.0
	Rahim Yar Khan	4	16.7	16.7	41.7
	Sadiqabad	14	58.3	58.3	100.0
	Total	24	100.0	100.0	

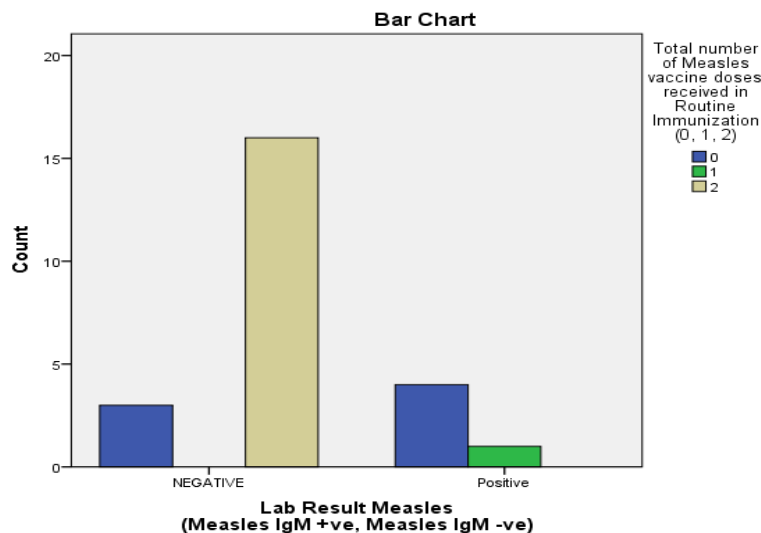
**Clinical presentation among suspected cases.**

Clinical presentation	Frequency	Percentage
Rash	24	100%
Fever	24	100%
Cough	2	8.3%
Coryza	12	50%
Conjunctivitis	14	58.3%

**Total number of Measles vaccine doses received in Routine Immunization (0, 1, 2)**



Lab Result Measles (Measles IgM +ve, Measles IgM -ve)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEGATIVE	19	79.2	79.2	79.2
	Positive	5	20.8	20.8	100.0
	Total	24	100.0	100.0	



**DISCUSSION**

The results of the study show majority of the confirmed cases 4/5 were not fully immunized, 1/5 were partially immunized. Overall full immunization rate among clinically suspected case was 66.7% (n=24). In another local study there were total of 15 cases identified. Mean age was 44.5 months (range 05-120 months). Diarrhea

developed in n=12 (80%) and pneumonia developed in n=2 (13.3%).<sup>(7)</sup> Contrarily, in our study, no case reported with diarrhea. Noreen et al. reported there were more male n=9 (60%), which is similar to our study.<sup>[7]</sup> The efficacy of vaccination was 60% in a local study,<sup>[7]</sup> we reported the efficacy of 100% in our study. Low immunization coverage in communities can result in

epidemics and are major source of outbreaks.<sup>[13]</sup> The results of the study accord with the above deduction as large number of the cases 7 (29%) were not immunized and this low vaccination status is implicated as the major causative factor for this outbreak. The situation is compounded with a general lack of awareness about the importance of immunization to prevent diseases such as measles. Lack of awareness about the importance and need of vaccination was noted among parents. According to PLSM survey 2014-15 the overall routine immunization coverage status of Pakistan is very low (60%) with urban coverage being 70% and rural still poor at 56%. The routine immunization coverage in Islamabad is 81% in urban area and 74% in rural Islamabad. Malnutrition, poor socioeconomic status, overcrowding, vitamin A deficiency and compromised immunity may also have played a role in cause of this measles outbreak.

Another local study reported, a total of 49 cases (AR=0.17%), including five deaths (CFR=10.2%), were identified. Males, 61% (n=30), were more affected. Pneumonia, 42.8% (n=21), and diarrhea, 38.7% (n=19), were the most common complications. All five samples were positive for measles IgM. Significant statistical association was found between nomadic populations having zero routine doses of measles containing vaccines (MCV1) (OR 2.85; CI 1.83 – 4.42; p value <0.0021) and developing measles.<sup>[14]</sup> These findings correlate with our results. No death was reported during this outbreak, the most common complication reported during this outbreak were pneumonia (4.2%) and vomiting (4.2%).

Public Health Impact of this Outbreak Investigation District administration took serious notice and the local health department carried out a mop up of the entire district for measles vaccinations with a special focus on high-risk group populations. The measles outbreak taught a lesson and lead to capacity building of community health workers and health staff to manage measles outbreaks. Local health authorities were sensitized to do risk assessment for public health emergencies. The provincial government was approached for the allocation of resources to carry out regular outreach/mobile activities for routine immunization.

## CONCLUSION

This Measles outbreak in District Rahim Yar Khan revealed that majority of the confirmed cases were not immunized against measles and other vaccine preventable diseases included in routine immunization. Parents of Majority of the cases were illiterate lacked awareness and knowledge about the routine immunization, spread of measles and its cure.

## Recommendations

- Informing the public about the consequences of measles un-vaccination in children.

- Informing the public about the symptoms of measles in children through mass media and educational brochures in order to timely refer to medical centers to reduce the consequences of the disease.
- Active follow-up of cases who did not receive measles vaccine as soon as possible.
- Separation of vaccine injection centers from other centers providing services related to COVID-19 disease.
- Implementation of scheduling programs in order to prevent the accumulation in vaccination centers.
- Retraining the primary care staff and general physicians about diagnose measles to improve diagnosis.
- Empowerment of health care systems in the field of monitoring and supervision of vaccination program, identification and isolation of patients and etc.
- Colleges, technical schools, and other institutions for post-high school education should require documentation of two doses of live measles-containing vaccines, documentation of prior physician-diagnosed measles disease, or laboratory evidence of measles immunity before entry for all students.
- Strengthening routine immunization by increasing coverage to more than 95%, using strategies like outreach, regular pulse immunization, follow up measles SIAs and defaulter tracking is of utmost importance and should be adopted.
- It is also recommended to address issues related to management, human resource involving district PPHI (People's Primary Health Care Initiative), ensuring timely supply of vaccines and proper cold chain maintenance.
- Strong surveillance is recommended for measles and other vaccine preventable diseases to prevent future outbreaks in the district.

## Conflict of Interests

The authors declare no competing interests.

## Acknowledgment

We are thankful to the district administration Rahim Yar Khan which allowed us to conduct the study and also grateful to the CEO district health office for his cooperation in the study.

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