

Original Article**INVESTIGATION OF MEASLES OUTBREAK IN FARASH TOWN, ISLAMABAD, PAKISTAN. A CASE CONTROL STUDY**Nadia Noreen¹, Ijaz Shah¹, Aamir Mirza¹¹FELTP Pakistan. National Institute of Health, Islamabad**Correspondence:** Nadia Noreen, Email: drnadianoreen@gmail.com**Abstract**

Background: On April 14, 2017, two measles cases were reported by local health practitioner from Farash Town. A team of FELTP fellows were deputed to investigate the outbreak.

Methods: Outbreak investigation was carried out from April 18 to 30th April, 2017. Active case finding was conducted through house-to-house survey. Case was defined as "onset of maculopapular rash with fever and presence of any of the sign/symptoms like coryza, conjunctivitis and cough in a resident of Farash Town from March 25, 2017 to April 30, 2017". Community-based age and sex-matched controls were selected. Vaccine coverage survey was conducted in cluster of 450 houses. Frequencies were calculated, attack rates computed and vaccine efficacy was determined. Blood samples of 03 suspected cases were sent to Public Health Laboratories at NIH Islamabad for confirmation.

Results: A total of 15 cases were identified. Mean age was 44.5 months (range 05-120 months). The cases were predominantly male n=9(60%). Overall attack rate was 1.15% and most severely affected age group was 24-36 months (n=4, AR=10.81%) followed by 12-24 months (n=3, AR=8.10%). Diarrhea developed in n=12 (80%) and pneumonia developed in n=2 (13.3%). Vaccine efficacy was calculated to be 60%. The most significant reason for non-vaccination was misconception about vaccination (OR: 26 c.o, CI: 4.9-116.1). All blood samples were positive for measles-specific IgM on ELISA.

Conclusion: Low immunization status was the most probable cause of outbreak. The results were communicated to district health authorities for mass vaccination. Health awareness session was conducted for all households. No new case was reported during two weeks follow-up.

Keywords: Measles, routine 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) (1) A major public health problem and leading cause of child morbidity and mortality in the developing countries including Pakistan with implications for outbreaks. In 2015, there were 134 200 measles deaths globally - about 367 deaths every day or 15 deaths every hour.(2) 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.

Incubation period is 10-14 days after exposure to an infected person and symptoms last 7-10 days. Complications occur in about 30% of cases.(3) Post measles complications are more common in children under the age of 5, or adults over the age of 20. The most serious complications include blindness, encephalitis (an infection that causes brain swelling), severe diarrhea, dehydration, ear infections and severe respiratory infections such as pneumonia. Severe measles is more likely to occur among young children with poor nutrition status, especially those with insufficient vitamin A, or with weakened or suppressed immune system due to HIV/AIDS or other Diseases. Unvaccinated young children are at highest risk of measles(3). Measles outbreaks can result in epidemics that cause many deaths. Women infected during pregnancy are also at risk of severe complications and

the pregnancy may end in miscarriage or preterm delivery. People who recover from measles are immune for lifelong against disease.(3)

With introduction of Measles Vaccine Significant reduction in incidence, morbidity and mortality of disease has been witnessed. The number of measles-related deaths has been reduced to 79% (546 800 to 114 900) in a timespan of fourteen years in 2014. During 2000-2016, measles vaccination has saved an estimated 20.4 million deaths making measles vaccine one of the best public health intervention.(3)

Routine measles vaccination for children combined with mass immunization campaigns in countries with high case and death rates, are key public health strategies to reduce global measles deaths.

Pakistan is one of the unfortunate developing countries with poor vaccination coverage (56 to 88%) against VPD's. Pakistan stands among the ?ve nations where almost a million children did not receive their ?rst dose of measles vaccination. The measles vaccination coverage is very low in Pakistan for both 1st dose(80%) and booster dose(53%).(4). In spite of the WHO's new initiative Global Measles & Rubella Strategic Plan 2012-2020 Pakistan has lost hundreds of precious lives due to the high number measles outbreak in recent past years.(5) These outbreaks resulted in 4386 cases in 2011, number rose to 14,687 in 2012 with 310 deaths, with highest number of about 25,401 cases of measles reported and 321 affected children died in 2013,. Most deaths were reported from Punjab(6) In 2014 Sindh province was hit with the highest number of cases of measles, followed by 483 in Baluchistan and an estimated 290 in Khyber Pakhtunkhwa.(6)

The reasons behind the recurrent outbreaks of measles in Pakistan are multiple, low Immunization coverage, negligence of parents, misbeliefs about routine immunization due to unawareness and illiteracy being the main strong factors. The other possible contributing factors are poor health infrastructure, mismanagement, compromised quality of vaccines due insufficient cold chain maintenance, shortage of vaccinators, malnutrition and impact of natural disasters like flood(6) The present study the measles outbreak was reported in an area called at Farash Town Phase 1 located in the rural Union Council 20 Alipur of Islamabad Capital Territory (ICT). It is densely populated area inhabited by lower middle class families and laborer people. ICT comprises of 50 union councils and administratively divided into 2 parts namely rural and urban Islamabad. The total area of the ICT is 906 Sq. KM in which the share of rural part is 466.20 Sq. KM and urban area is consisted of 220.15 Sq. KM.(7) According to 2017 census, Population of ICT is 2.01 million, majority (59%) of ICT population ranges between 15 to 64 years and 37% of the population under the age of 15 years. Only 2.73% of the population is above 65 years of age. (8)

The Federal Disease Surveillance and Response Unit Islamabad (FDSRU) was informed through a local

practitioner about 02 clinical suspects of Measles at Farash Town, Phase 1 Alipur UC20 Islamabad on April 14, 2017. FDSRU responded to the information, and requested FEDSD-NIH for the information with District Health Authorities. On request of Local Health authorities a team was sent to the area with the objective to investigate the cases, assess the magnitude of the outbreak, evaluate the risk factors and recommend the preventive measures.

Methodology

On April 18, 2017, active search of Measles cases started in the area of Farash Town. Phase 1 Ali pur UC-20 Islamabad. Farash Town is a settlement, located on Lehtrar road at 17 kms from rawal dam and 9kms from Chak shahzad in zone IV of Islamabad. Farash town has around 600 households with estimated population of 5500 and 510 under five population. An outbreak investigation along with active case finding and vaccine coverage survey were primarily conducted in UC 20 Farash Town. Phase 1 Alipur from April 18-30, 2017 (two weeks). A case was defined as "any resident of Farash Town. Phase 1 Islamabad Pakistan, who had fever with maculopapular rash and with any of the symptoms/signs like coryza, conjunctivitis, cough, otitis media or pneumonia after 25th March 2017." A structured questionnaire was prepared as case investigation form. For evaluating different risk factors Four (04) age and sex matched controls were taken against each case. Nutritional status of the children were also assessed. A comprehensive house-to-house survey was conducted and the data was collected through interview method using structured questionnaire based on the respondent's recall and availability of vaccination card. Information regarding the illness status, symptoms, date of onset of illness, treatment and routine EPI vaccination coverage in the community was gathered. The reasons for non-uptake of vaccination were also recorded. Blood samples of 03 suspected cases were sent to Public Health Laboratories at NIH Islamabad for confirmation. Data were entered and coded, descriptive analysis was done for epidemiological, clinical and demographical characteristics along with risk factors by using Epi Info version 7.0 (CDC, Atlanta, GA). Frequencies were calculated and cross tabulation was done, graphs and tables were generated using Epi Info 7.0.

Results

The active search for Measles cases found more cases of Measles apart from two reported by FEDSD. During follow-up visits two suspected cases with fever and epidemiological link were identified. Leading to total fifteen cases. Mean age of cases is 44.5 months (range 05 months To 120 months) and 60% cases are age of 48 months and below. Most severely affected age group is between 24 - <36 months age having attack rate of 26.67% (n=4). Only one child was below the age of 09 months.60 matching control in respect of age and gender were taken for analysis. Amongst the total 15

cases, 40% (n=6) were females and 60% (n=9) were male. Out of all respondent 80% (n = 12) were illiterate. Results are displayed in Table 1 below

Table 1: Characteristics of the measles cases in Farash town, Islamabad (n=15)

Variables	CASES n(%)
Gender	
• Male	09 (60%)
• Female	06 (40%)
Age Groups(Months)	
• 0-12	01(6.66%)
• 13-24	03(20%)
• 25-36	04(26.6%)
• 37-48	01(6.66%)
• 49-60	01(6.66%)
• 61-71	02(13.33%)
• 72-84	00(00%)
• 85-96	02(13.33%)
• 97-108	00(00%)
• 109-120	01(6.66%)
Mothers Education	
• Illiterate	12(80%)
• Primary	01(6.66%)
• Matric	01(6.66%)
• Intermediate	01(6.66%)
• Graduate & Above	00(00%)
Fathers Education	
• Illiterate	08(53.33%)
• Primary	01(6.66%)
• Matric	05(33.33%)
• Intermediate	00(00%)
• Graduate & above	01(6.66%)
Immunization status	

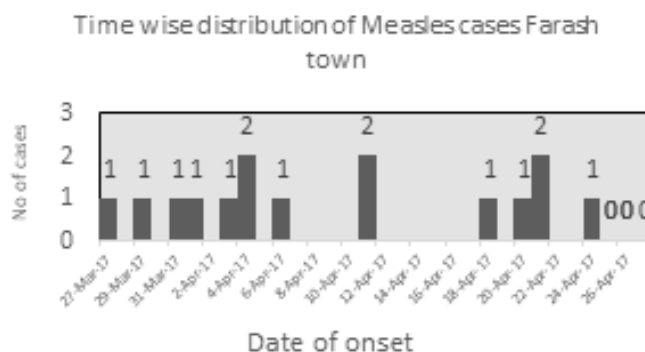


Figure 1: Epi-Curve of measles outbreak showing time wise distribution of Measles cases Farash town

Immunization Status of the cases and control
 Among all the cases 13.33% (n=2) children were immunized for age, 20% (n=3) were partially immunized and 66.67% children (n=10) were not immunized. Among All the controls 45% (n=36) were fully immunized, 11.6 % (n=7) were Immunized to Age, 16.66 % (n=10) were partially immunized and 26.66 % (n=16) were not immunized as shown in Table 2.

Table 2: Immunization Status of the cases and Control (n=75)

IMMUNIZATION STATUS CASES AND CONTROL (N=75)	FREQUENCY	PERCENT
Fully immunized(FI)	9	12.00%
FI(parental recall)	18	24.00%
Immunized to age(ITA)	9	12.00%
Not immunized(NI)	26	34.67%
Partially immunized(PI)	13	17.33%
TOTAL	75	100.00%

Epidemic curve

The epidemic curve showing date of illness of all cases shows a classical pattern of a propagated source of person to person transmission which is very typical of any measles outbreak.(fig 1) The index case was a female child of age 22 months with date of onset of symptoms on 27rd March 2017 with travel history to dhok kazim who then got admitted to a private hospital on 27th March 2017 with complications of diarrhea and pneumonia.

Measles Vaccination Status of cases & controls (n=75)

The vaccine coverage survey was completed in all households and data show that the first dose of Measles vaccination was given to 53.16% children (n=42) while second dose of Measles vaccine was given to only 36.71% children (n=29). While 1.26% (n=1) were below the age of measles vaccination. The low coverage of second dose of Measles vaccine resulted in compromised immunity of children of Farash Town and as a consequence Measles outbreak occurred in this area. Among cases only 20 % (n=3) received first dose of Measles Vaccination, while 80% (n=12) received no Measles vaccination.

EPI Survey (n=22)

The routine vaccination coverage survey showed 22 children were under 2years of age, Out of 22 children, 10 children were vaccinated and 12 were unvaccinated. Vaccine effectiveness was calculated to be 40%.EPI card was not available with majority of the cases 80% (n=12).Immunization status of the surveyed children was as BCG was 81.81%(n=18) BCG Scar

77.27%(n=17) Pentavalent. one77.27%(n=17). Pentavalent 2 77.27%(n=17).Pentavalent 3 63.64%(n=14). Measles 1st Dose 45.6%(n=10). 4.55%(n=1) was below age of measles one dose. Measles 2nd dose was given to 18.2 %(n=4).4.55 %(n=1) was below measles booster dose age. (FIG 2)

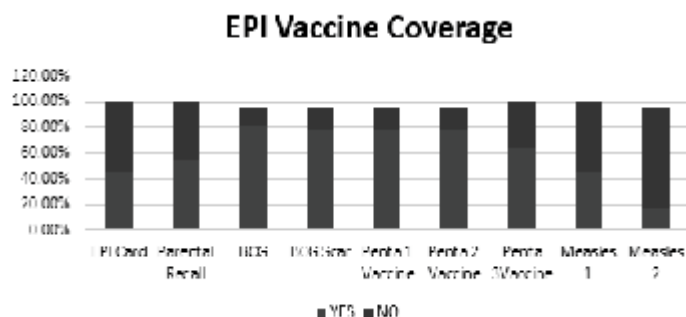


Figure 2: Percentage vaccination coverage of EPI among the surveyed population
Lack of Outreach Vaccination Activities

Inadequate outreach vaccination services was highest reported reason for non-vaccination. Out of total 75 cases and controls 80% (n=60) responded that vaccinator has not visited their home.20 % (n=15) responded in yes.

Laboratory Results of Blood samples of suspected cases

All blood samples were positive for measles-specific IgM antibodies on ELISA.

Signs, symptoms and complications among cases

Among all the cases 100% of cases were found with signs and symptoms of Cough Coryza, Koplicks spot and sore throat. Conjunctivitis was 86.6%, Complications like Diarrhea was 80%%, Pneumonia was 13.3% 1% while Otitis Media & Encephalitis were not found in the cases.

Table 3: Frequency of signs, symptoms and complications among cases

Symptoms	Frequency	Percentage
Sore throat	15	100%
Conjunctivitis	13	86.6%
---	15	100%
Diarrhea	12	80%
Pneumonia	2	13.3%
Otitis media	0	0
Encephalitis	0	0

Nutritional Status of Children (n=15)

Mid arm circumference (MAC survey) was conducted among cases and controls to access the nutritional status of children

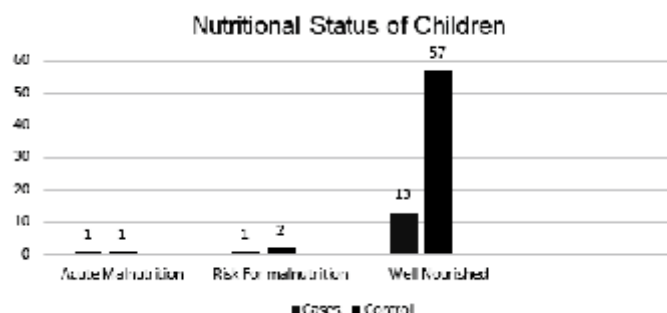


Figure 3: Nutritional Assessment Status
Age wise attack rate of the outbreak (n=15)

Overall attack rate in <10 years age children was 5.88% with severely affected age being 24-36 months (n=4, AR=9.52) total household visited was 245 population was 1225.

Table 4: Age wise attack rates

AGE (MONTHS)	FREQUENCY	ATTACK RATES
0 - <12	1	2.17%
12 - <24	3	7.14%
24 - <36	4	9.52%
36 - <48	1	2.38%
48 - <60	2	4.7%
72 - <84	2	4.7%
96 - <108	1	2.38%
120 +	1	2.38%
TOTAL	15	5.88%

Risk Factor Analysis Of measles Outbreak

Table 5: Risk Factor Analysis.

RISK FACTORS	ODD RATIO	95% CI	P VALUE
Misconception about vaccine	26	5.99-112.84	0.00000
Mothers Literacy	4.57	1.169-17.86	0.0115
Vaccinator home visit	1.0	0.24-4.11	0.4849
Measles Vaccination	7.42	1.88-29.28	0.001
MV /misconception	24.00	4.95-116.14	0.00000
MV/Vaccinator home visit	2.25	0.70-7.14	0.0904
MV/Mothers education	1.69	0.69-4.26	0.1379

Discussion

The results of the study show majority of the cases 66.67% (n=10) were not fully immunized, 20 %(n=3) were partially immunized and n=2 (13.33%) were immunized for age. Evidence shows that transmission ambulation of measles can be halted by achieving hard immunity up to 95%(8).Low immunization coverage in communities can result in epidemics and are major source of outbreaks(9)the results of the study accord with the above deduction as majority of the cases 66.67%(n=10) were not immunized and this low vaccination status is implicated as the major causative factor for this outbreak. 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.(10)

Malnutrition, poor socioeconomic status, overcrowding, vitamin A deficiency and compromised immunity may also have played a role in cause of this measles outbreak. Results of the outbreak revealed majority of the cases 66.67% (n=10) were not immunized 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. Inadequate outreach vaccination services was highest reported reason for non-vaccination, 80% (n=60) responded that vaccinator has not visited their home. Studies has indicated that by improvement and strengthening of outreach vaccination services along with measles supplementary immunization Signiant reduction can be achieved in burden of measles.(11)

Low literacy level and serious misconceptions and myths regarding routine vaccination are the major cause of this lack of awareness leading to suboptimal immunization coverage in the area. Majority of the parents 80 %(n=12) were illiterate and belonged to labourer and low socioeconomic class. No death was reported during this outbreak, the most common complication reported during this outbreak was diarrhea 80 %(n=12) Most effected age group was 2-3 years with attack rate of 9.52 %(n=4).

Conclusion

This Measles outbreak in Farsh Town Islamabad revealed that majority of the children were not fully 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.

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