Original Article

MEASLES OUTBREAK IN A RURAL AREA OF A DEVELOPING COUNTRY: A CASE CONTROL STUDY

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Abstract

Background: Measles is highly contagious vaccine preventable disease (VPD), and a major public health problem considered as leading cause of morbidity and mortality in developing countries like Pakistan. An outbreak of measles was reported in Sharifabad Islamabad on 15th of April 2017, and an investigation was launched to assess the magnitude of outbreak, evaluate risk factors and recommend control measures.
Methods: A comprehensive house to house active case search along with vaccine coverage survey was conducted from April 19-22, 2017. A case was defined as "onset of maculopapular rash with fever in a resident of Sharifabad with at least one of the following signs/ symptoms, Coryza, Conjunctivitis, Cough, Otitis media or Pneumonia present in between 19 March to 22nd April 2017". Four age & sex matched controls were selected from the neighborhood. Data was collected through interview method using structured questionnaire and vaccination coverage was determined by using Epi survey form. Blood samples were sent for laboratory confirmation.
Results: A total of eight cases were identified through active case finding while three were reported by local practitioner. Mean age of cases were 20 months (range 8-36 months). Severely affected age-group was 1-2 years with attack rate of 46%. Around two-third (64%) of cases and a few (16%) of controls were unvaccinated against measles. Contact with measles patient [OR 25.2, CI 3.9-160.1, P=0.00], unvaccinated children [OR 9.2 CI 2.12-40.4, P=0.000], social misconception regarding vaccination [OR 7.8 CI 1.42-42.6, P=0.00], and distance from healthcare facility [OR 5.7 CI 1.15-28.35, P=0.02] were significant risk factors. Vaccine efficacy was 90%.
Conclusion: Main reasons of the outbreak were contact with the cases, and low vaccination status. We recommended comprehensive measles vaccination and community awareness sessions. On our recommendations district health authority Islamabad carried out mop up of whole area.
Keywords: Outbreak investigation, vaccination, viral disease, Pakistan.

Introduction

Measles is highly contagious vaccine preventable (VPD) viral disease and a major public health problem considered as leading cause of morbidity and mortality in developing countries like Pakistan. It can lead to high grade fever, cough, runny nose and maculopapular rash over all the body. The complication rate of measles is very high in children under 5 year of age and adults over the age of 20 years. They are at high risk of hospitalization and death in the results complications of measles as compared to schools going children and adolescents. The major complication of measles includes Pneumonia, Diarrhea, Vomiting, Otitis media, Conjunctivitis, Laryngitis, Meningitis and Bronchitis. Sometime it may causes Blindness and Encephalitis. Out of every 1000, children of measles 1 or 2 can die due to the complication of it. It is mainly occurs in malnourished and low immunity individuals (1-3). There is no specific treatment to cure measles except the vaccination to develop immunity against disease for prevention. Since the introduction of measles vaccine the epidemiology of measles has been changed dramatically in the world and the significant decline has been witnessed in the morbidity, mortality and incidence of the disease. The global number of measles death rate has been reduced up to 79% (546,800 to 114,900) from

2000 to 2014. The 17.1 million lives have been saved by the help of the measles vaccination all over the world (4-6).

In Pakistan high incidence and frequent epidemics of measles has been reported in the result of the low vaccination coverage and almost 1 million children did not receive first dose measles vaccination in 2011. In general the vaccination coverage against VPD ranges from 56% to 88% in Pakistan and varies significantly among the different provinces. The hundreds of lives has been lost in Pakistan because of measles outbreaks through the country despite of the fact that W.H.O has introduce new Global Measles & Rubella Strategic Plan 2012 to 2020 (7-10).

During the year 2012-13 a high number of outbreaks of measles were reported all over the Pakistan and a total of 463 deaths were recorded in the result of deadly outbreaks throughout the country. Initially it was started from the Sindh province later spread into the Punjab and other parts of the country (11-13).

In this era of medical science & technology it is unfortunate that still the children of Pakistan are struggle for their lives against vaccine preventable disease. There are many reasons behind the recurrent outbreaks of misdeals in Pakistan like mismanagement and low vaccination coverage. In addition there may be other possible factors like unawareness, illiteracy, lack of outreach immunization activity, negligence of parents regarding routine immunization, lack basic health facilities, improper storage of vaccine, shortage of supporting staff, malnutrition and natural disasters like floods (14-18).

In case of present study the measles outbreak was reported in an area called as Sharif Abad located in the rural part of Islamabad Capital Territory (ICT). It is thickly populated area with lower middle class families and laborer people. ICT is consisted 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. Among 2 million the majority (59%) of ICT population ranges between 15 to 65 years and 37% of the population under the age of 15 years. While the proportion of older population is 4% (19-21).

Methodology

Federal Disease Surveillance Unit (FDSRU) was informed through a local practitioner regarding outbreak of measles in Sharif Abad Islamabad on 15th of April 2017. Initially the practitioner informed regarding 3 cases of measles in the area. On the request of ICT department an investigation team was sent in area to assess the magnitude of outbreak, evaluate risk factors and recommend control measures. The investigation team was consisted of 2 FELTP fellows and a vaccinator of the area under the supervision of Technical Surveillance officer (T.S.O) FDSRU FELTP Islamabad.

A case was defined as "sudden onset of fever with maculopapular rash and at least one of the following signs/ symptoms, Coryza, Conjunctivitis, Cough, Otitis media or Pneumonia in any resident of Sharifabad between 19 March to 22nd April 2017". Four age and sex matched controls were selected for each case to evaluate different risk factors.

A comprehensive house to housed active case search along with vaccine coverage survey was conducted from April 19-22, 2017 by using pre tested questionnaire. The information was gathered on demographic characteristics along with vaccination status, clinical presentation, disease notification and disease outcome. The data was collected through interview method using structured questionnaire based on the respondent's recall and availability of vaccination card. Information regarding the reasons of non-uptake of vaccination were also documented and blood samples of two cases were taken for laboratory confirmation.

After cleaning and coding the data descriptive & inferential analysis was done for epidemiological, clinical and demographical characteristics along with risk factors by using Epi Info version 7.0 (CDC, Atlanta, GA). Vaccination coverage survey was conducted by using EPI survey form in outbreak area to assess vaccination coverage under 2 year children.

Results

The active search for Measles cases in Sharif Abad was started at 11:15 am dated 19th April 2017 by visiting every house and during search found 10 cases of Measles (total no. of cases 11). Male cases remained more frequent (72.7%) and average age was 20 months (±SD 9). Minimum age remained 8 months while maximum age was 36 months. Maximum cases were among 13-24 month age group followed by 26.4% among 25-36 month age group. The most affected age groups was 1-2 years of age and 333/1000 child remained affected (Table 2). Majority of parents of cases remained illiterate. Among the cases only 27% cases were fully immunized followed by Partial immunized (9%), and not immunized (55%) while immunized for age (9%). Previous Measles vaccination was administered among 27.2% cases. Among half of the cases EPI card was not available (Table 1)

Table 1: Characteristics of the measles cases in Sharif Abad, Islamabad (n=11)

Variables	Cases n (%)
Gender	
• Male	8 (72.7%)
• Female	3 (27.3%)
Age Groups (Month)	
• 0-12	2 (18.1%)
• 13-24	5 (45.5%)
• 25-36	4 (36.4%)
• 37 & Above	0 (0%)
Mother's Education	
• Illiterate	7 (64%)
• Primary	4 (36%)
• Metric	0 (0)%
• Intermediate	0 (0%)
• Graduation & Above	0 (0%)
Father's Education	
• Illiterate	7 (64%)
• Primary	0 (0%)
• Metric	2 (18%)
• Intermediate	2 (18%)
• Graduation & Above	0 (0%)
Immunization Status	
• Fully Immunized	3 (27%)
• Immunized for Age	1 (9%)
• Partial Immunization	1 (9%)
• Not Immunized	6 (55%)
Measles vaccination	
• Yes	3 (27%)
• No	7 (64%)
• NA	1 (9%)
Availability of EPI card	
• Yes	5 (45%)
• No	6 (55%)

Epi-Curve of measles outbreak (n=11): The index case was a male child of age 36 months with date of onset of symptoms on 22nd March 2017 with travel history to nearby Dhok Kala Khan, Rawalpindi. Another child in the premises of the index case 14 month of age was reported on 25th March 2017 with complications of Diarrhea. The peak of the outbreak was observed from 28th March to 1st April 2017. (Figure 1)

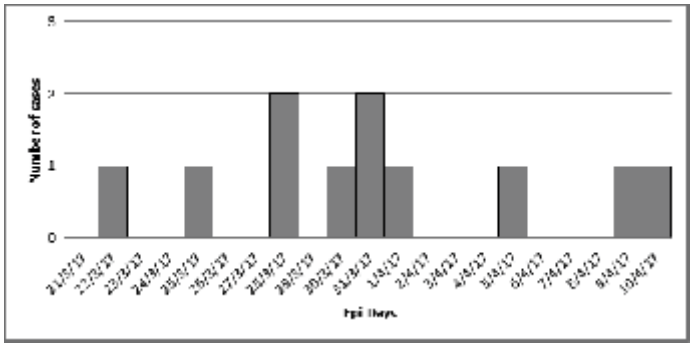

Figure 1: Epi-Curve of measles outbreak

Immunization Status of the cases and control: Among all the cases (n=3) 27% children were fully immunized, (n=1) 9% were immunized for age, (n=1) 9% were partially immunized and 55% children (n=6) were not immunized. Among all the controls (n=33) 75% children were fully immunized, (n=4) 9% were immunized for age, (n=4) 9% were partially immunized and 7% children (n=3) were not immunized (Figure 2)

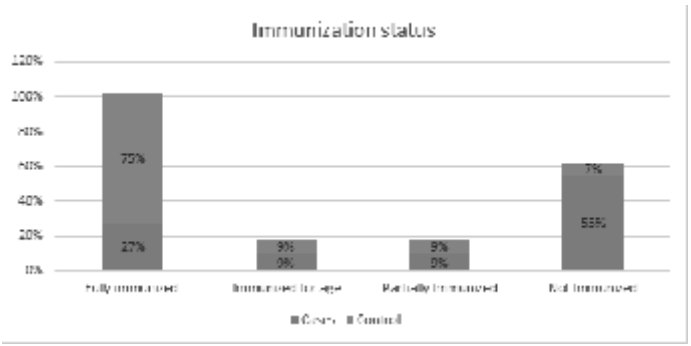

Figure 2: Immunization Status of the cases and control (n=55)

Measles Vaccination Status of cases & controls (n=55): Among the all cases (N=3) 27% were received measles vaccine while (N=7) 64% cases had not receive measles vaccination and (N=1) 9% were below the age of measles vaccination. Among the all controls (N=36) 82% were received measles vaccine while (N=7) 16% controls were not receive measles vaccination and (N=1) 2% controls were below the age of measles vaccination. (Figure 3)

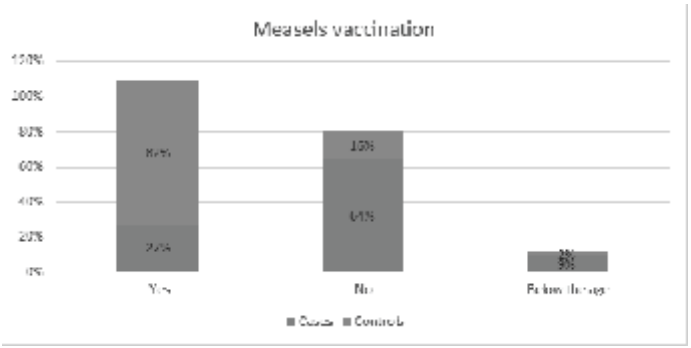

Figure 3: Measles Vaccination Status of cases & controls (n=55)

EPI Survey (n=32): EPI Survey was conducted in the premises of the index cases and visited 74 houses. From the 74 houses 32 children of age below two year of age were found and their immunization status remained as BCG Scare 84.3%, BCG Vaccination 90.6%, Penta 1 93.7%, Penta 2 81.2%, Penta 3 78.1%, Measles 1 56.2% and Measles 2 25%. (Figure 4)

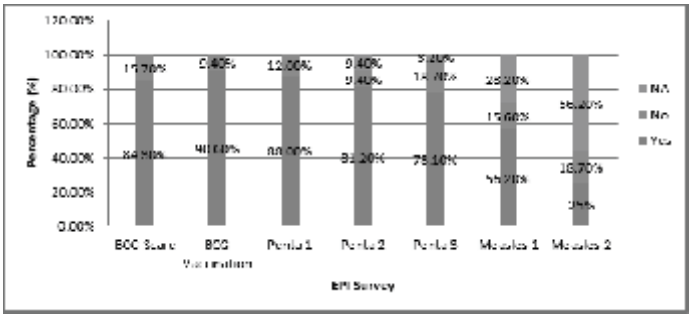

Figure 4: Percentage vaccination coverage of EPI among the surveyed population

Signs, symptoms and complications among cases: Among all the cases 63% of cases were found with Cough, Coryza 52%, Conjunctivitis 45%, Koplik's spot 44%, Diarrhea 36%, Otitis media 1% while Pnemounia & Encephalitis were not found in the cases (Figure 5).

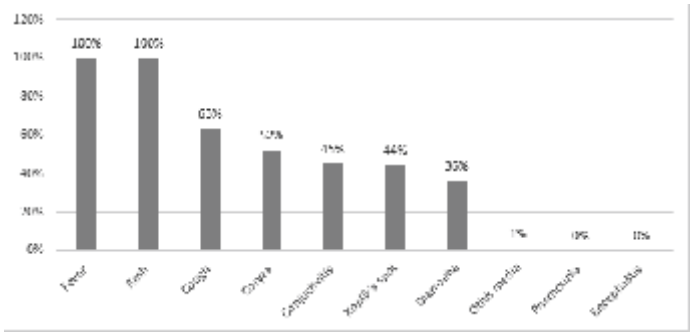

Figure 5: Percentage distribution of signs, symptoms and complications among cases

Figure 5: Showing % of complications, sign, symptoms & complications

Age wise attach rate of the outbreak (n=11): According to Epi estimation formula for population, total 550 number of people were estimated in total visited households (n=110). Moreover 3.1 (n=17) of the total population (n=550) were estimated <1 year and other age groups accordingly. The most effected age group was 1-2 years followed by 2-3 years and <1 years subsequently and age specific attack rate per 1000 population has been given below in the table.

Table 2: Age wise attack rate of the outbreak among cases

Age Groups	Total Population	Cases	Attack Rate
<1 years	17	2	117/1000
1-2 Year	16	5	312/1000
2-3 Year	15	4	266/1000
3-4 Year	14	0	0
4-5 Year	13	0	0

Total house visited 110, and Total population were 550

Table 3: Risk factors of measles outbreak among cases and controls

	Cases (n %)	Controls (n %)	Odd Ratio (95% CI)	Chi-Square Value	P-Value
Contact with measles patient Yes No	6 (54.55%) 5 (45.45)	2 (4.55%) 42 (95.45%)	25.2 (3.9-160.1)	17.66	<0.00
Unvaccinated children Yes No	7(63.64%) 4(36.36%)	7(15.91%) 37 (84.09%)	9.2 (2.12-40.4)	10.56	<0.00
Social misconception Yes No	4(36.36%) 7 (63.64%)	3(6.82%) 41 (93.18%)	7.8(1.42-42.6)	6.91	<0.00
Far away health facility Yes NO	4 (31.8%) 7 (12.8%)	4 (68.2%) 40 (87.2%)	5.7(1.15-28.35)	5.26	0.02

Discussion

It is shown in the results that majority of the cases (n=6) 55% were not fully immunized, (n=1) 9% were partially immunized and (n=1) 9% were immunized for age. The proportion of the fully immunized children among cases were only (n=3) 27%. It is evident that the transmission of the measles can be interrupted by developing herd immunity up to 95%. The communities with the suboptimal immunization coverage are more prone to the epidemics of measles and outbreaks of VPDs (22). The result of this study concurs with the above verdict as majority of the cases (n=6) 55% in this study were found unimmunized and such kind of low vaccination coverage were considered as major cause of this outbreak. The overall immunization coverage in the country is suboptimal ranging from 56% to the 88% and in rural Islamabad the immunization coverage is 74% as compare to urban 81% as per PSLM survey 2014-15 (2, 23). Nevertheless there may be some other factors could be involved in the outbreak of measles sometimes like as compromised immunity, malnutrition and vitamin A deficiency.

It is revealed in this outbreak investigation that (n=7) 64% of the case were not vaccinated against measles. Lack of awareness among the parents have been noticed towards routine immunization that may be the major cause of the suboptimal immunization coverage in the area. This lack of awareness may be because of some factors like low literacy & low education level of parents and sometimes may be social misconceptions due to the same factors low literacy & low education (24, 25).

In this study (N= 7) 64% of parents of the cases were found illiterate and less educated relatively. Majority of the parents were belongs to laborer and low socioeconomic class. The index case was a male child of age 36 months with date of onset of symptoms on 22nd March 2017 with travel history to nearby Dhok Kala Khan, Rawalpindi. There was no death was recorded in this outbreak and severely affected age group was 1 to 2 years with attack rate of (N=11) 64% which is also corresponding with international literature on measles (1).

Conclusion

This outbreak of measles in Sharifabad rural Islamabad revealed that the majority of the cases were not fully immunized and even against the measles specifically. Main reasons of the outbreak were contact with the case and low vaccination. Almost all the families belongs to low socioeconomic and laborer class that is the reason the nutritional status and the immunity of the children were not up to the optimum level. The parents of the cases were found less educated and illiterate that's why the lack of awareness regarding routine immunization and negligence were also noticed among the parents of affected children. We recommended comprehensive measles vaccination in the area along with awareness campaigns among the community. Moreover

enhancement of vaccination coverage and strong surveillance system regarding measles and VPDs were also suggested to prevent future outbreaks in the area.

Acknowledgement & impact of the study: We acknowledge the local district health authorities for their cooperation in our study. They further facilitated our findings by using our recommendations to carry out mopping up the whole area. All possible children at risk were identified and they got vaccinated for measles.

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