Measles Outbreak among Unvaccinated Children in Bajura

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ABSTRACT

Introduction: Measles outbreak occurs when there are three or more laboratory confirmed measles cases in a village in a period of one month. Integrated surveillance system has helped to identify the measles outbreak, to characterize its epidemiology and to timely respond it.

Methods: This is a descriptive study of measles outbreak that occurred in Bajura district in February to March 2010. The epidemiological characteristics of the outbreak are described. The outbreak was investigated from 4-8 March 2010 with necessary epidemiological information and biological specimen collection. One month follow up was done to determine the clinical outcome of the measles cases.

Results: A total of 36 people had measles; 97% of them were under 15 years of age and 89% had not been immunized with measles vaccine. Attack rate and vaccine efficacy was 23% and 50% amongst children less than 15 years of age and case fatality rate (CFR) was 3%. Biological samples were collected from 11 patients; all of which tested IgM positive for measles and genotype D8 was isolated.

Conclusions: CFR of this outbreak is higher than the national CFR. Vaccine efficacy of 50% points towards the need for investigation of vaccine logistics and cold chain system. Moreover, this laboratory test confirmed an outbreak showing that the measles virus could be imported from an endemic region and rapidly spread through a susceptible population who were previously not immunized.

Keywords: *measles, outbreak, unvaccinated, bajura*

INTRODUCTION

Measles continues to cause high morbidity and mortality among children worldwide, despite the availability of a safe and effective vaccine. Although a preventable disease, it contributes as being one of the greatest burdens in developing countries with low vaccine coverage.[1]

The government of Nepal expanded routine measles vaccination in 1988 to all districts for under-one-year children.[2] Measles cases have been reported through the Health Management and Information System (HMIS) of Department of Health Services since 1994. However, measles cases reported through HMIS are aggregated and have limited information for epidemiological analysis. Therefore surveillance for measles was incorporated with the integrated surveillance program in 2003.[3] This helped to identify and confirm measles outbreaks, to characterize their epidemiology, and to respond them.

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After completion of national measles campaigns, the number of confirmed measles outbreaks declined from 46 in 2003 to 2 in 2009. Those two in 2009 occurred in Doti and Bardiya districts.[4] In countries targeting measles elimination, measles outbreak is defined as the occurrence of three or more laboratory confirmed measles cases in a village in one month.[5]

This study describes laboratory confirmed measles outbreak that occurred in Bajura, among unvaccinated children in February 2010. The epidemiological characteristics of this outbreak highlight the risk associated with occurrence of measles outbreak.

METHODS

A cross-sectional descriptive study of a measles outbreak was conducted in Kailashmandu, Bajura from 4-8 March 2010. The study was done in the suspected measles cases. A house to house search for measles cases was conducted in the village. Suspected measles cases were defined in accordance with the WHO guidelines. A measles case was defined as illness characterized by history of fever, maculo-papular rash and either cough, coryza, or conjunctivitis- as reported by the case or the guardian- with rash onset in the period from 1 January 2010 to 8 March 2010 in a resident of Kailashmandu VDC. All households in the village were visited and were asked whether any members had contracted measles like illness. A household census was done and all suspected measles cases were enumerated. Patients and guardians were interviewed after their informed consent. Vaccination status was ascertained on showing the immunization card or on recall methods. All cases were line listed; necessary demographic and epidemiological information was collected; and all the cases were clinically managed with Vitamin A administration.

For laboratory confirmation of the outbreak, six serum samples were collected from suspected measles patients that experienced rash between 4 and less than 30 days during our investigation. These were tested at National Public Health Laboratory (NPHL), Kathmandu for serology. Likewise, urine specimens were collected from five suspected measles cases having less than seven days of rash onset. These specimens were tested with RT-PCR technique at National Institute of Health, Department of Medical Sciences, Ministry of Public Health, Thailand. All specimens were transported from collection site to the testing laboratory by maintaining the reverse cold chain temperature.

A thirty day follow up of the outbreak was done on 9 April 2010 and all the cases were re-visited so that their outcome could be determined and case fatality rate due to measles could be calculated. A measles-associated death is defined as a death occurring within 30 days after rash onset in a measles case patient for whom unrelated cause of death had been ruled out.[7] The data were tabulated and analyzed using Microsoft Excel 2007.

RESULTS

A total of 36 cases of measles, with one fatality, from 46 households were found during the investigation. Cases were almost evenly distributed by sex: 40% male and 60% female. The age of the patients ranged from 9 months to 25 years (mean age = 7 years). Among 36 cases, 32 had never had measles vaccines while 4 had received at least one dose of measles vaccine shot.

Table 1. Age distribution and vaccination status of the measles cases.

Age group (in years)	No of cases (%)	No of cases with history of measles vaccination
<1	2 (6)	-
1-4	8 (22)	1 (1.2%)
5-9	17 (47)	3 (17%)
10-14	8 (22)	0
>14	1 (3)	0
Total	36 (100)	4 (11%)

The index case had rash onset on 1 Feb 2010. The whole family members of the index case had history of recent travel to India. Five patients from the same household had developed rashes within two days after the start of outbreak. Then there was a gap of five days to develop the rash in other members of the same community. The epidemic curve (Figure 1) shows the number of cases and the time taken to spread the outbreak into the community.

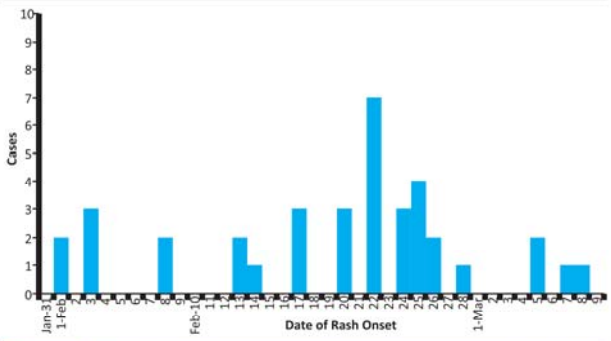

Figure 1. Epidemic curve of measles cases by date of onset.

The age specific attack rate was 23% among the children aged less than 15 years old. The attack rate among unvaccinated children was 26 % while among vaccinated children it was only 13%.

Table 2. Attack rate, vaccine efficacy and case fatality rate among <15 year children

Age group	Total population	Total measles cases	Attack rate (%)	Vaccine efficacy (%)	Case Fatality Rate (CFR)
<15 years	151	35	23	50	3
15 years and above	158	1	1	Not calculated	-
Total	**309**	**36**	**11**	-	**3**

In the estimation of measles vaccine efficacy, the cohort of population aged >15 years of age were excluded from analysis because immunization status of those population couldn't be ascertained precisely. Vaccine efficacy is the difference between attack rates among vaccinated persons and those among the unvaccinated expressed as a fraction of the attack rate among unvaccinated persons.[8] Among the children <15 years of age, vaccine efficacy was found to be 50%.

Serum samples collected from the cases show IgM positive for measles and IgM negative for rubella and hence confirmed it as a measles outbreak. Genotype D8 isolates (WHO name MVs/NPL/9.10/1-3[D8]) were isolated from the urine samples.

DISCUSSION

Bajura had no reported measles outbreak or any lab confirmed measles cases for the last four years prior to this outbreak.[9] The index case had history of travel to India and had returned to Bajura four days prior to onset of the illness. Measles virus genotype D8 is still endemic in India and many parts of the Indian sub-continent.[10] Given the index case had history of travel to India, this outbreak was possibly started by an Indian importation and spread rapidly in a community with low immunization coverage. The measles immunization coverage of the village is only 76%.[9]

The mean interval from infection to rash appearance in measles is 14 days and the patients are contagious from 4 or 5 days prior to onset of symptoms.[11] This is why the virus in this outbreak has already affected the members of the community in seven days after the rash development in the index case.

Measles is more common in pre-school children and occurs in all seasons more so in winter and spring months.[12] Different outbreak studies in East Niger, Uganda, and the USA had showed that more than 90% of cases were less than 15 years of age; but one in Dhankuta of Nepal and one in Victoria of Australia had showed 50% of cases were older than 10 years.[13-17] This outbreak affecting infants aged <1 year accounted for 6% of all cases and more than 95% were aged <15 years.

There are several misleading myths about measles. One of them is: people with measles should not be exposed to wind and light. Allegedly, if the measles patients are exposed to light or wind, measles virus can not exit the body and will remain in the body.[18] This causes the measles patient kept in a sealed room and be stuffy due to lack of air ventilation, and on the other hand are deprived of medical treatment in the health facilities. None of the cases were brought to the hospital for assessment and management of the possible complications. One child had died due to measles related pneumonia. The case fatality rate (3%) was found to be lower than that found in different African studies (5-15%);[19-21] but higher than the national measles CFR of Nepal (1.1%) and that (0%) found in the outbreak in Dhankuta Nepal.[16,22] However, since this was a small sample it is hard to generalize to other populations. One dose of measles vaccine given before one year of age ensures about 90% protection from measles,[23] but this study shows vaccine efficacy of 50% only which points towards the need for investigation of logistic management and cold chain system.

The attack rates and the complete assessment of immunization coverage of all children in that community aged <15 years enabled district health management to appraise the factors contributing to the measles outbreak. Highest attack rate was in the children aged <15 years who should have been protected with the measles vaccine during routine and campaigns.

Vaccine efficacy estimates may have been affected by the low number of cases in the selected age group, verbal histories of measles immunization, and the unknown status of vaccination in the older age group.

CONCLUSIONS

We described an outbreak of measles in a mostly unvaccinated population that spread through an importation from the endemic region. The case fatality rate, attack rate and vaccine efficacy were found 3%, 11% and 50% respectively. Universal immunization to all the children and timely reporting and investigation of the measles cases and the outbreaks is a big challenge for mountainous countries like Nepal with diverse terrain and many remote locations. It is critical to monitor, regulate and investigate all the outbreaks and the responsive campaign to interrupt the chain of transmission and to move Nepal towards measles elimination by 2011.

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