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Original Article

Community Section

Double Outbreak of Measles in the Talaja Block of Bhavnagar District, Gujarat, India 2011: A Need for Improving the Vaccine Coverage and the Community Participation

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ABSTRACT

Background: Two outbreaks of measles were reported from an urban and a village area of Bhavnagar District, Gujarat, India in January and March 2011 respectively.

Aim: The present study was conducted to investigate and to assess various epidemiological features which were associated with the measles outbreak.

Settings and Design: The present study was designed as a cross sectional study, which was conducted in an urban and a rural area of the Talaja block of the Bhavnagar district of Gujarat, India from December 2010 to April 2011.

Methods and Material: The suspected cases were detected through an active case finding in the community. We defined a case clinically by the WHO criteria as the occurrence of a febrile rash with or without cough, coryza and conjunctivitis in a resident of the Talaja-urban and the Gorkhi village of the Talaja block, in the period from 1st December 2010 to 30th April 2011. Blood samples from 10 case patients were collected for the IgM antibody detection. A community based, retrospective, cohort design was carried out to find the vaccine efficacy in the Gorkhi village.

Statistical Analysis: We entered and analyzed the data by using an MS-Excel sheet.

Results: This study identified 27 confirmed cases of measles in the urban area of Talaja and 78 cases in Gorkhi village. All the 105 case patients belonged to the age group of 3 months-15 years. According to their mothers' statements, out of the 105 measles cases in the two areas, 40 (38%) case patients were immunized. Ten sera from five case-patients each from both the areas were tested; all were found to be positive for the IgM/IgG antibodies by ELISA.

Conclusions: The outbreaks occurred due to a poor community participation and the poor vaccine coverage levels.

Key Words: Measles outbreak, Measles vaccination, Measles, Bhavnagar

INTRODUCTION

Rubeola or measles is the fifth leading cause of childhood mortality, especially in the developing countries like India and Pakistan and the African countries [1]. Prior to the availability of the measles vaccine, measles was endemically present in the human population with epidemics of increased activity every 2–3 years, infecting over 90% of the children before they reached 15 years of age [2]. Measles can largely be prevented by delivering at least one dose of the measles vaccine to all children [3]. Although it has been committed to reduce the global measles deaths by 90% by 2010 as compared to the 2002 estimates [4]; the global measles deaths have decreased by 74% from an estimated 535, 300 deaths in 2000 to 139, 300 in 2010 [5]. In spite of the low measles vaccination coverage among infants in Africa, which ranged between 54-55% in 1999 and 65-67% in 2003, it has achieved 72% of the global reduction in the measles mortality [6,7]. In 2010, about 85% of the world's children received one dose of the measles vaccine by their first birthday through routine health services – up from 72% in 2000 [5]. Through an increased routine immunization coverage and large-scale immunization campaigns, sub-Saharan Africa made the most progress with an 85% drop in the measles deaths between 2000 and 2010 [8].

In India, measles was the major cause of mortality and morbidity in the pre-vaccination era. The major factors which determine the occurrence of the measles outbreak are, accumulation of the susceptible population, illiteracy, poor hygiene, low income, over-crowding and a refusal for vaccines [9]. The measles immunization coverage in India which ranged from 42.2-58.8%, suggested that there was a gradual increase in the coverage [10]. A nationwide coverage evaluation survey which was conducted by UNICEF in 2009-documented 74.1% and 78% measles immunization coverages among children who were aged 12-24 months in India and Gujarat respectively [11]. Because of the increase in the measles vaccine coverage, there is a reduction in the number of outbreaks and this has changed the epidemiological pattern which involves older children [12].

BACKGROUND

In the months of January 2011 and March 2011, we investigated the double outbreaks of measles under 2 areas, viz., Talaja-urban and Gorkhi village, of the Talaja block of the Bhavnagar district. On 8th January 2011, a Female Health Worker (FHW) who worked at a Community Health Centre (CHC) reported an outbreak of measles in the Dindayalnagar ward of Talaja which has a population of 3500. On the other hand, on 18th March 2011, a local health worker of Gorkhi village reported an increase in the number of cases with febrile rash in Gorkhi which has a population of 5640. The areas which were affected by the outbreak were located nearly 60 km

from Bhavnagar. We investigated the first outbreak which had occurred on 11th January 2011, followed by the second outbreak which had occurred on 19th March 2011, with the objectives of confirming the diagnosis and formulating recommendations for their prevention and control.

MATERIALS AND METHODS

The Descriptive Epidemiology

The first outbreak of measles was reported from the Talaja urban area during the month of January and the second outbreak was reported from Gorkhi village in the month of March. We obtained the measles weekly reporting data from the Integrated Disease Surveillance Project (IDSP) unit to confirm the outbreak. We defined a case clinically by the WHO criteria as the occurrence of a febrile rash with or without cough, coryza and conjunctivitis in a resident of Talaja-urban and the Gorkhi village of the Talaja block in the period from 1st December 2010 to 30th April 2011. We initiated an active case search by conducting house-to-house visits to identify the cases that met the case definition or by stimulated passive surveillance in the aforementioned two-affected areas which had a total population of 9140.

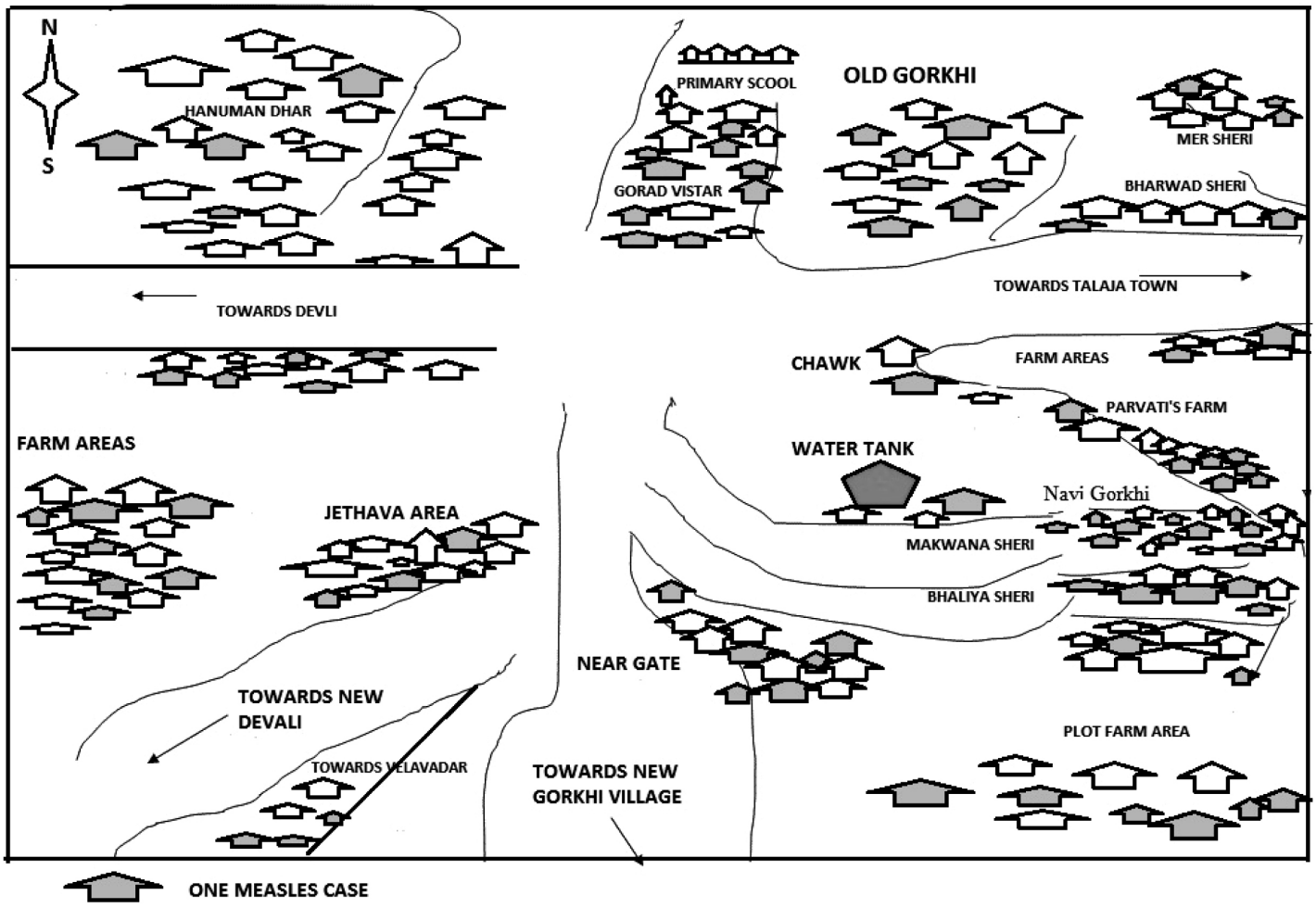
We line-listed the case patients and described them in terms of the person, place and the time characteristics. We also collected information on their age; sex; place of residence; symptomatology, date of onset of the illness, the treatment which was taken, the immunization status of the case patients, the susceptible population and assessment of the cold chain system. We mapped the areas by the location of the households to show the distribution of the cases by their residences in Gorkhi village [Table/Fig-1]. We calculated the attack rate of the cases by their age and sex groups by using the population data which was obtained from the district health authorities. We examined the dynamics of the outbreaks by constructing an epidemic curve.

The Analytic Epidemiology

We collected estimates of the measles vaccine coverage from the district head. We also estimated the vaccine coverage in the population by using the data which was gathered from the mothers' interviews, immunization card reviews and the health care facility records reviews during the field visits. We adopted a retrospective cohort design to estimate the vaccine efficacy. We selected as the study population, the affected patients that were in the age group of 10 months to 15 years. We calculated the preventable fraction of the children among those who were exposed (i.e., those vaccinated) to obtain the vaccine efficacy. We used the following formula for the cohort study: (attack rate among non-vaccinated - attack rate among vaccinated) / attack rate among non-vaccinated (The formula used was ARU–ARV/ ARU*100). We entered and analyzed the data by using an MS-Excel sheet.

Laboratory Methods

We explained the purpose of collecting the samples and the processing of the samples to the population of the study areas. We collected 5 samples from the affected population for testing the specimens for the IgM/IgG antibodies by using ELISA. We assigned identification numbers and labeled other epidemiological details on all the samples. We transported the specimens to B.J Medical College, Ahmedabad India, in a reverse cold chain separately. The



[Table/Fig-1]: Spot map of measles outbreak in Gorkhi village of Bhavnagar district, Gujarat, India 2011

Age group in years	Talaja-urban		Gorkhi village	
	Cases/Total	Incidence Rate (per 1000 Pop.)	Cases/Total	Incidence Rate (per 1000 Pop.)
0-4	15/1855	8.1	45/940	47.9
5-9	12/805	14.9	24/414	58.0
10-15	0/840	0	9/418	21.5
Sex-specific attack rate				
Male	10/1785	5.6	40/904	44.2
Female	17/1715	9.9	38/868	43.8
Total	27/3500	7.7	78/1772	44

[Table/Fig-2]: Attack rates of measles by age and sex in Talaja-urban and Gorkhi village, Bhavnagar district, Gujarat, India, 2011

samples were only taken from those who were willing, while the reluctant/refusing populations were dropped.

RESULTS

The Descriptive Epidemiology

In our study, we identified 27 confirmed cases of measles in the urban area of Talaja and 78 cases in Gorkhi village. There was a 75% increase in the measles cases as compared to those in the previous year. All the 105 case patients belonged to the age group of 3months-15 years. The ages of the case patients ranged from 2-7 years in the Talaja urban area, whereas the age range was 3 months-15 years in Gorkhi village. The Attack Rate (AR) was highest among the children who were aged 5 to 9 years in both the areas [Table/Fig-2]. None of the areas reported a sex wise statistically significant difference in the attack rate. A history of febrile rash was present in the all-case patients. According to their mothers' statements, out of the 105 case patients in the 2 areas, 40 (38%) case patients were immunized. The block health administration organized a special measles catch-up program with the support of the district authority in the month of March 2011.

There was a sporadic distribution of the case patients in the households. In the first outbreak in the Talaja-urban area, the index case which was identified in the area was reported on 8th January 2011; and the maximum number of cases (80%) was reported in the second week of January, one incubation period after the migration of two cases which had travelled from Bhavnagar city. The second outbreak which got the index case on 18th March in Gorkhi village, reported the highest number of cases in the final week of March. One death was reported during the second outbreak. The dynamics of the two outbreaks in the epidemic curve [Table/Fig-3] indicated that there were a number of generations of cases, with the propagated outbreak. The number of cases declined during the second week of January 2011 in the first outbreak, and the second outbreak ceased in the second week of April 2011. The acute cases of measles were given vitamin A supplementation and supportive treatment by the health staff.

Laboratory Results

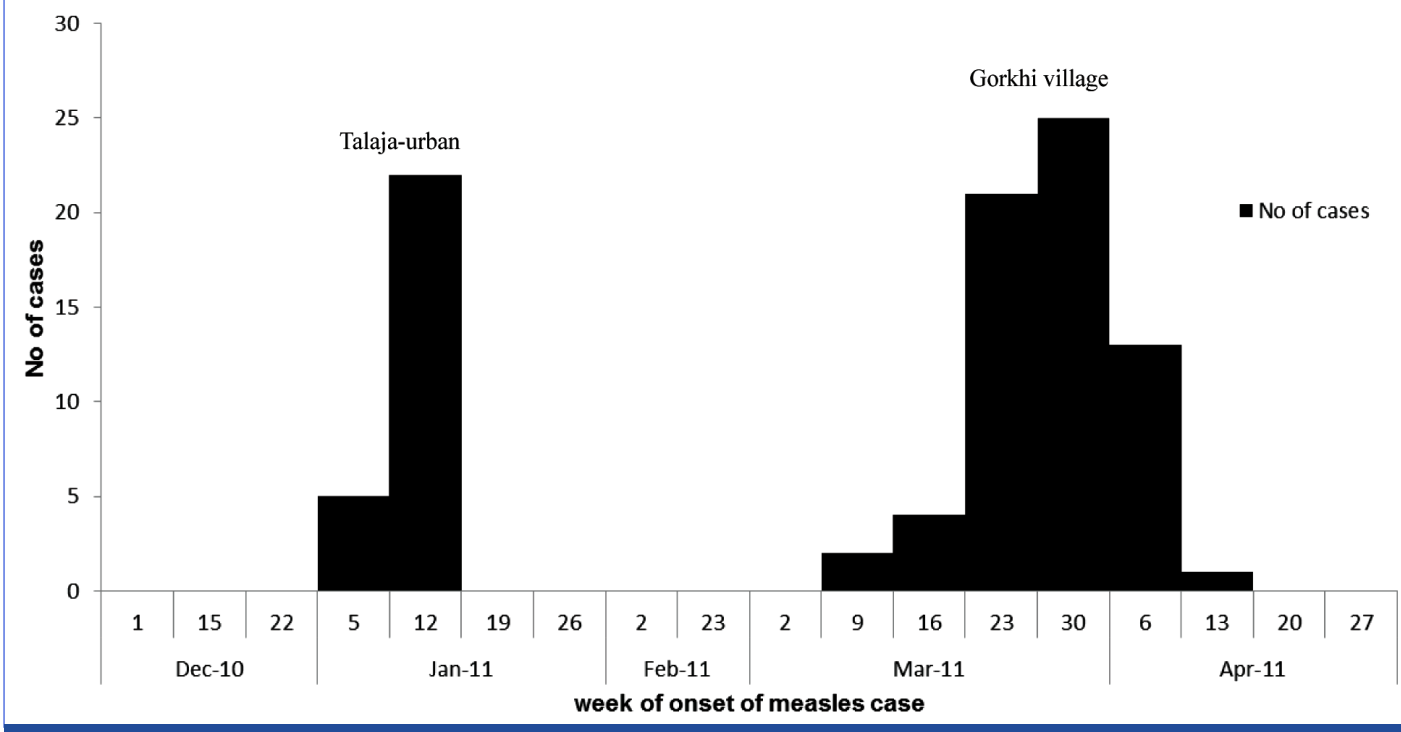
A total of 10 sera from five case-patients each from both the areas were tested; all were found to be positive for the IgM/IgG antibodies by ELISA.

The Analytical Epidemiology

The Attack Rates (ARs) of measles by the age and the vaccination status indicated that there were 21 case patients among the 740 non immunized children as compared to 6 case patients among the 2620 immunized children in the urban area of Talaja; while in the Gorkhi village, the ARs of measles by the age and the vaccination status indicated that there were 36 case patients among the 375 non immunized children as compared to 33 case patients among the 1326 immunized children; and both were statistically significant (P <.001) [Table/Fig-4].

DISCUSSION

This outbreak occurred in the rural and the urban area of Bhavnagar, India in 2011. The outbreaks of measles in the rural and the urban areas were reported from various states of India [9,13-15]. Measles is generally an endemic disease with sporadic



[Table/Fig-3]: Epidemic curve of measles outbreak in Talaja block of Bhavnagar district, Gujarat, India 2011

	Talaja-urban			Gorkhi village		
	Cases	Total	Attack rate (per 1000 population)	Cases	Total	Attack rate (per 1000 population)
Children† immunized against measles	6	2620	2.3	34	1326	25.6
Children not immunized against measles	21	740	28.4	36	375	96.0
Relative risk: 12.4; 95% confidence interval, 5.02-30.59; X^2 – 46.1, P <.001, calculated vaccine efficacy: 92%				Relative risk: 3.7; 95% confidence interval, 2.38-5.90; X^2 – 35, P <.001; calculated vaccine efficacy: 73%		

[Table/Fig-4]: Attack rates of measles by vaccination status in Talaja-urban and Gorkhi village, Bhavnagar district, Gujarat, India, 2011
† Children less than 10 month were excluded

outbreaks. An outbreak is said to occur when the number of cases which are observed is greater than the number which is normally expected in the same geographic area for the same period of time. We identified 105 measles case patients during this outbreak, which confirmed the measles outbreak. In the present study, the highest no of measles cases was found in the 5-9 years age group, suggesting an age shift from the younger children [14] to the old age group. Similar observations were made by Mishra et al. [16] The attack rate was higher in Gorkhi village (44 per 1000 pop.) as compared to Talaja urban (27 per 1000 pop.). This can be explained on the basis of the higher number of susceptible individuals in the previous area.

We used the outbreak investigation method to find out the measles vaccine efficacy. The vaccine efficacy in the urban area was 92% but in the Gorkhi village, it was only 73%. The lower efficacy might be due to a recall bias, but it warrants the requirement of a second dose opportunity for measles.

The present double outbreak is due to the progressive accumulation of a small number of susceptible children in the community over the years. Such accumulations are typically caused by the combination of the following 2 factors: (1) the measles vaccine efficacy not reaching the level of 100% and (2) the children being left un-immunized each year. We found that the participation of people in the routine immunization for measles was poor due to the injectable vaccine and the low level of awareness about the importance of the immunization. We had organized community awareness programmes along with the local community leader to raise awareness and to increase their participation in the catch-up campaign; this resulted in the immunization of 158 children who were previously unimmunized because of the refusal by their parents.

The United Nation's Millennium Development Goal 4(MDG4) aims at reducing the overall number of deaths among children by two-thirds between 1990 and 2015 [17]. The measles and rubella initiative contributed 23% of the overall decline in the under five years deaths between 1990 and 2008 [18]. If India wants to progress towards MDG4, then the measles control is a must. The strategy for global measles and rubella eradication envisages achieving and maintaining high levels of the population immunity by providing a high vaccination coverage with the two doses of the measles vaccines. Till the introduction of the second dose of the measles vaccine in the National Immunization Schedule of India, strengthening of the routine vaccination should be the cornerstone of the measles control, to achieve a >90% coverage. This can be achieved by identifying the population which is without an access to the routine coverage, raising the community awareness on the need for the vaccination and providing sustainable outreach services. In addition, a measles 'catch-up' mass immunization campaign should be conducted to interrupt the chains of transmission and to prevent outbreaks. The catch-up campaign is envisaged to reduce the transmission of measles to very low levels and to thereby protect the infants as they lose their maternal antibodies [19].

The limitation of this study was that we could not obtain the data regarding the migrating population, which would have helped us in improving the present findings.

CONCLUSION

The measles outbreak that affected the Talaja block was due to factors like refusal by the community, poor hygiene, misbeliefs and illiteracy. Supplementary immunization activities and vitamin A supplementation, as a part of the outbreak control measures, were implemented in both the outbreaks to reduce the morbidity and the mortality, which could result in the control of the outbreak.

The authors have called for the attention of the public health practitioners to a simple methodology of the case detection and analysis that generates information for action - in terms of creating public awareness, increasing the immunization coverage and calling attention to the changes in the trends with regards to the most affected age groups.

ETHICAL APPROVAL

However, this investigation was conducted in the context of a public health response to an outbreak, and therefore an ethical committee review was not indicated.

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