Measles Outbreak Investigation and Response in Jarar Zone of Ethiopian Somali Regional State, Eastern Ethiopia

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Abstract: Suspected measles outbreak was notified from Degabour hospital to the Emergency Management Team at the Regional Health Bureau. A team of experts was dispatched to the site with the objectives of confirming the existence of the outbreak, initiate measures and formulate recommendations based on the results of present outbreak investigation. We conducted a descriptive cross-sectional study from February to March 2016. We reviewed medical records of suspected cases; we interviewed the health care workers, visited affected household and interviewed parents and guardians of cases. We used line list for describing measles cases in terms of time, place and person. We collected five blood samples from patients for lab confirmation. We entered and analyzed using Epi-Info7 version 7.1.0.6. During the investigation period, 406 measles cases with 5 deaths were reported with overall Attack Rate (AR) and Case Fatality Rate (CFR) was (28.2/10,000 population, 1.2%) respectively. High AR (28.6/10000 population) was reported from male. The CFR difference was not statistically significant (P value = 0.66) by sex. High AR (127/10000 population) was reported from age group < 1 year. When we compared AR by those < 5 years and >5 years, there was statistically significant difference (P-value = 0.00). The median age of cases was 10.8 years (min 1 month to maximum 45 years). Majority (86.2%) of cases didn’t have vaccination history. All samples (5/5) became reactive for Measles IgM at national laboratory. In conclusion: Measles outbreak among unvaccinated children was reported from districts of Jarar zone. Strengthening of routine immunization, strengthening surveillance, early response actions are strongly recommended to combat occurrences of outbreaks.

Key words: Measles outbreak • Unvaccinated • Jarar zone • Somali Region • Ethiopia

INTRODUCTION

Measles is a highly infectious, acute airborne viral disease with an infectious period of four days before to four days after rash onset. It has an incubation period of 10–14 days. Measles can be a serious illness with complications including otitis media, pneumonia and encephalitis [1]. Measles remains endemic wherever vaccination coverage is low and is one of the leading causes of vaccine preventable death in children worldwide [2].

Measles follows a seasonal pattern, with increasing incidence in the dry season, i.e. from November to May. A large number of susceptible children are affected every year owing to a high birth cohort and low routine immunization coverage. According to a World Health Organization (WHO) report, measles still remains a public health challenge and is associated with high morbidity and mortality. Most of the associated deaths occur in children aged five years and younger. Measles is one of the most infectious diseases of childhood and transmitted through droplet infection rapidly in the community. They are exposed to significant health problems especially the risk of focal outbreak of infectious diseases, yet their access to health care is limited and fragmented. Generally measles cases do not report to health facilities and only some of the cases with complications reach the public sector hospitals. This leads to incomplete reporting. The reported cases are underestimates of the actual incidence of measles cases and deaths. A pocket of low immunization and population movement ensures its continued transmission resulting in numerous unnecessary epidemics [4].

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Complications of measles include the following: ear infections, diarrhea, pneumonia, seizures and encephalitis—this is rare, but can cause permanent brain damage or death. Up to 30 percent of people with measles will develop complications—usually children under five and adults over the age of 20. Measles during pregnancy increases the risk of miscarriage, premature or and low birth-weight babies [5].

Measles continues to cause high morbidity and mortality among children worldwide, despite the availability of a safe and effective vaccine. Although it is a preventable disease, it contributes as being one of the greatest burdens in developing countries with low vaccine coverage [6].

The measles mortality reduction strategy adopted by the African Region includes improving routine measles vaccination coverage, providing a second opportunity for measles vaccination through supplementary immunization activities (SIAs), monitoring the impact of vaccination activities through case-based measles surveillance and improving measles case management [7].

In Ethiopia, the implementation of the regional measles mortality reduction strategy started in 2002. The national Expanded Program on Immunization was established in 1980 in Ethiopia and includes the first dose of measles-containing vaccine (MCV1) to be given at or shortly after the ninth month of age. Routine vaccination services are delivered through fixed health facilities, outreach sites and since 2004, in some regions, during “Child Health Days,” also referred to as Enhanced Outreach Services. Enhanced Outreach Services are conducted every 6 months to provide routine vaccination services, including measles vaccination, supplemental Vitamin A, deworming tablets and nutritional screening for children [8].

In developing countries with low vaccination coverage, epidemics often occur every two to three years and usually last between two and three months, although their duration varies according to population size, crowding and the population’s immune status. Outbreaks last longer where family size and hence the number of household contacts, is large. In the absence of measles vaccination, virtually all children will have been infected with measles by the time they are 10 years old [9].

Measles is one of the country priority diseases under surveillance & immediately reportable diseases. Confirmed measles outbreak was reported from Ethiopian Somali Region from February to March 2016, during which rumors of suspected measles outbreak was reported from Degahboor Hospital, a zonal hospital, to Regional Health Bureau (RHB) and following this, a team composed of Regional Government and Partners departed to the site with the objectives of confirming the existence of the outbreak, diagnosis through Laboratory investigation, initiating preventive measures and formulating appropriate recommendations on the basis of the results of the investigation.

MATERIALS AND METHODS

Study Area and Period: The study was conducted from February to March 2016 in Jarar zone which is one of the nine zones in Somali Region, Ethiopia. Jarar zone is bordered by Korahey on the south, Nogob on southwest, Fafan on the northwest, Dollo zone on the southeast and Somalia on northeast. It is located about 160 KM away from Jigjiga town. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia this Zone has a total population of 478, 168, of whom 268, 006 are men and 210, 162 women. While 62, 584 or 13.01% are urban inhabitants, a further 223, 778 or 46.8% are pastoralists [10]. The catchment area from which the reported cases included the zonal city (Degahboor council) as well as six other districts in the zone that included: Ararso, Aware, Birkot, Degahboor, Gunagado and Yocale.

Study Design: Descriptive Cross-sectional study design was used.

Data Collection
Case Definition: A measles positive case was: any person who developed any of the following symptoms; fever, lack of appetite, cough, coryza, red eyes, maculopapular rash or tested IgM positive during the study period. The information was systematically triangulated through review of medical records of suspected cases coupled with interview the health care workers was made. We visited affected selected households and interviewed parents and guardians of cases and then an active case search in the community and assessment of the vaccination status of the cases was then conducted. Vaccination status was determined by history and/or review of the immunization card.

Since vaccination status (only below 13% coverage), presence of epidemiological linkages as well as clinical case definitions were combined to draw indication of occurrences, no need for a compulsory laboratory confirmation of all cases assumed. Thus, five blood samples were collected from patients among the study subjects and were sent to Ethiopian Public Health Institute for laboratory confirmation.
Data Processing and Analysis: The data were entered and analyzed using Epi-Info7 version 7.1.0.6. Results were presented using graph and table. Attack rate and case fatality rate were also calculated.

Data Quality Control: We used line listing for describing measles cases in terms of time, place and person. However, all data were checked for completeness before entry and analysis.

Ethical Consideration: Since it was an outbreak, no need of mandatory ethical clearance but we had obtained relevant supportive letter from Ethiopian Somali Regional Health Bureau.

RESULTS

During the study period (2/15/2016 to 3/21/2016, one hundred and six measles cases with five deaths (three facilities and two community deaths) were reported from districts of Jarar zone of Ethiopian Somali Region. The overall AR and CFR in this outbreak was (28.2/10, 000 population, 1.2%) respectively.

Distribution of Cases by Sex: In this outbreak high AR (28.6/10000 population) was reported from male, while AR among females was (27.8/10000 population). However, High CFR was reported from females (1.6%), while male CFR was (0.9%). The CFR difference was not statistically significant (P-value=0.66) by sex (Table 1).

Distribution of Cases by Age: High AR (127/10000 population) was reported from age group < 1 years, followed by 1-4 years (53.5/10000 population), while least AR (17/10000 population) was reported from age group >15 years. When we compared AR by those < 5 years and >5 years, there was statistically significant difference (P-value= 0.00; 95% CI=2.26-3.46; OR = 2.80), which means that those under-fives are about three times more affected than that of above fives. Highest CFR (3.1%) was reported from age <1 years, followed by 5-14(1.5%), while least CFR (0.7%) was from >15 years. The median age of cases were 10.8 years (1 month through 45 years) (Table 2).

Distribution of Cases by Districts: Measles cases were reported from 7(70%) districts of Jarar Zone. High AR was reported from Birkot (78.4/10000 population), followed by degahbur council (40.4/10000 population), while least AR was from Ararso (2.1/10000 population) (Table 3).

Distribution of Measles Cases by Vaccination Status: Majority (86.2%) of cases didn’t have vaccination history, while one dose constituted (13.3%) (Fig. 1).

Table 1: Distribution of measles cases by sex, AR, CFR Jarar zone, March 2016

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number</th>
<th>Total population</th>
<th>Death</th>
<th>AR/10000</th>
<th>CFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>184</td>
<td>66183</td>
<td>3</td>
<td>27.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Male</td>
<td>222</td>
<td>77693</td>
<td>2</td>
<td>28.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td>406</td>
<td>143876</td>
<td>5</td>
<td>28.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Table 2: Showing Distribution of Measles cases by Age, AR, CFR Jarar zone March 2016

<table>
<thead>
<tr>
<th>Age group</th>
<th>Number of cases</th>
<th>Number of deaths</th>
<th>Total population</th>
<th>AR/10, 000 population</th>
<th>CFR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>32</td>
<td>1</td>
<td>2518</td>
<td>127.1</td>
<td>3.1</td>
</tr>
<tr>
<td>1-4</td>
<td>99</td>
<td>1</td>
<td>18488</td>
<td>53.5</td>
<td>1.0</td>
</tr>
<tr>
<td>5-15</td>
<td>131</td>
<td>2</td>
<td>38271</td>
<td>34.2</td>
<td>1.5</td>
</tr>
<tr>
<td>&gt;15</td>
<td>144</td>
<td>1</td>
<td>84,599</td>
<td>17.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Total</td>
<td>406</td>
<td>5</td>
<td>143,876</td>
<td>28.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Table 3: Distribution of measles cases by Districts of Jarar Zone, March 2016

<table>
<thead>
<tr>
<th>Name of district</th>
<th>Number of cases</th>
<th>Number of deaths</th>
<th>Total population</th>
<th>AR/10000 population</th>
<th>CFR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ararso</td>
<td>2</td>
<td>0</td>
<td>9,438</td>
<td>2.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Aware</td>
<td>15</td>
<td>1</td>
<td>15,653</td>
<td>9.6</td>
<td>6.7</td>
</tr>
<tr>
<td>Birkot</td>
<td>34</td>
<td>1</td>
<td>4,334</td>
<td>78.4</td>
<td>2.9</td>
</tr>
<tr>
<td>Degahboor council</td>
<td>187</td>
<td>0</td>
<td>46,344</td>
<td>40.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Degahboor</td>
<td>132</td>
<td>1</td>
<td>39,960</td>
<td>33.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Gunagado</td>
<td>30</td>
<td>2</td>
<td>19,000</td>
<td>15.8</td>
<td>6.7</td>
</tr>
<tr>
<td>Yocale</td>
<td>4</td>
<td>0</td>
<td>9,147</td>
<td>4.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>404</td>
<td>5</td>
<td>143,876</td>
<td>28.1</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Laboratory Investigation: All samples (5/5) became reactive for Measles IgM at national laboratory. The remaining cases were confirmed by epidemiological linkages.

Distribution of Measles Cases by Time: The index cases were seen signs and symptoms on 2/14/2016. The cases were reported from six kebeles of Degahbor district. This outbreak lasted more than two months; there were several peaks in this outbreak. RHB team reached sites after the outbreak lasted more than two weeks (Fig. 2).

Measles Outbreak Response: A local measles outbreak response team was formed on 1/30/2016. All kebeles of Degahbor district and Degahbor council were considered for campaign by using available oral vaccine. Targeted age group was those ranging from 6 months to 15 years. Active case searching was initiated in kebeles reported measles cases. Targeted age-group was according to surveillance data analyzed and used accordingly.

Interventions: The control measures adopted during this outbreak included: increasing awareness on measles and notification of cases as a possible differential diagnosis by circulating a case-dentitions of measles to the health care facilities, establishing of zonal level coordination and collaboration, intensifying of cases management at hospital and conducting of measles campaign targeting under 15 were among target.

DISCUSSION

The overall case fatality rate (CFR) in this outbreak was 1.2%, which is less than the case fatality of measles expected in Ethiopia (3-6%) [10]. Moreover, it is also lower than data expected from developing countries which range between 3–5%. The possible reason for the less fatality in our investigation may be due to differences in case management at the health facility and early case detection.

Our finding showed that high case fatality rate was reported from children in the age-group of less than one year (3.1%) which is in line with the established fact indicating higher case-fatality reported in infants 6 to 11 months of age [10].

In our enquiry, the majority (86.2%) of cases had not been on history of vaccination what so ever and the zonal measles administrative coverage was merely reported to be 31% [11]. One dose coverage constituted 13.3% alone, according to reports. Evidences suggest that measles transmission can be interrupted at the herd immunity level of 93- 95% [12]. Epidemics of measles can arise in communities with low immunization coverage and can be a major source of measles outbreaks [13]. Thus, low immunization coverage in the study area could be a possible risk factor for occurrence of the current outbreak. The sources of current outbreak were systematically traced to a peasant associations identified as Saylic in Degahbour district, Ethiopian Somali Province. An event of religious ceremony held every January at the foci would attract people all the way from across the region commingling from different areas of Somali region during every January. It is likely that susceptible visitors from districts of Jarar zone might have acquired the virus from other infected visitors coming locations where outbreak of measles was going on at Godey in the far south-eastern part of Ethiopia. This may suggest that Regional Health Bureau should map by considering major public events for diseases prevention and control activities.
On the other hand, the median age of cases was 10.8 years in this investigation which may indicate that schoolchildren at schools may be the most common site of exposure to measles infection.

All collected blood samples (5/5) were positive for measles virus-specific immunoglobulin M (IgM), which is enough to confirm measles outbreak according to the Ministry of Health (MoH) guideline. Systematic and critical evaluation of foci of the cases indicated that all other cases were considered epidemiologically linked which is supported by literature [10].

The control measures adopted during this outbreak included: increasing the awareness on measles as a possible differential diagnosis by circulating a case definition of measles to the health care facilities, enhanced surveillance for cases by daily telephone calls to health care facilities to obtain reports on patients with acute fever and rash.

In the preceding calendar years, particularly 2013, a laboratory-confirmed case was reported from Degahbor hospital thereby suggesting an outbreak was happening in cyclic scenario which is in line observations documented in developing countries with low vaccination coverage where epidemics would often occur every two to three years, usually lasting for about two and three months. Although their duration varies according to population size, crowding and the population’s immune status matter very well [9].

Low immunization coverage in the study area may be a likely risk factor for incidence of this outbreak. As the median age of cases was 10.8 years, surveillance should be enhanced to achieve complete coverage as well as contemplation of older age-groups to avoid accumulation of susceptible children to avert future epidemics. In addition, measles “catch-up” mass immunization campaign should be conducted to interrupt chains of transmission and thwart outbreaks.

The investigation team recommends strengthening of routine immunization, strengthening surveillance, early responses, decentralization of measles case management to peripheral health facilities and capacity building for health workers at health facilities on priority diseases should be instituted to avert future loss and suffering of children. State-of-the-art diagnostic facilities should be in place in nearer geographical locations in the province to address fairly faster feedback.

Limitations of this Study: Limitations of this report include that the case definition was not based on laboratory confirmation. Some cases may be misclassified under some circumstances.

Lesson Learnt:
- Importance of coordination & Laboratory confirmation
- Importance of early response
- Importance of conducting active case search
- Mapping and considering of major public events (gathering) in Ethiopian Somali Region for diseases prevention & control activities.

Best Practices:
- Zonal Administration Authorities had taken serious notice and all affected district health bureaus carried out mass campaign of the entire district for surveillance and vaccination activities in remote locations.

Competing Interests: The authors declare that they have no conflicting interest.

ACKNOWLEDGMENTS

Our sincere thanks to the entire health personnel of Jarar Zone District Health Bureau and Degahbour Hospital for their active engagement in the implementation of the strategies defined to control the measles outbreak. We are also indebted to Regional Public Health Emergency Management (PHEM), Ethiopian Public Health Institute (EPHI), UNICEF and WHOTechnical Teamfor their vital technical support during the outbreak investigation.

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