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Retrospective Analysis of Measles Surveillance Data - Amhara Region, North-Western Ethiopia, 2008-2010

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Abstract: Introduction: Despite the availability of a safe and cost effective vaccine, measles remain one of the leading causes of death among young children. The majority (more than 95%) of measles deaths occur in low income countries like Ethiopia. Measles outbreaks are consistently reported from Amhara region of Ethiopia. Therefore analysis of surveillance data was performed to describe measles epidemiology within the region, to characterize the population affected and develop guidance to improve measles control activities. Methods: Measles surveillance data reported from Woreda to Amhara regional health bureau from 2008-2010 were obtained, reviewed and analyzed using Microsoft excel. The World Health Organization(WHO) clinical case definition for suspected measles case is a person with fever, and maculopapular rash (i.e. non vesicular) and cough, coryza or conjunctivitis. Result: A total of 2520 suspected cases of measles were reported to Amhara regional Public Health Emergency Management (PHEM). Out of this 353 (18%) were positive for IgM antibodies to measles , 1037 were epidemiologically linked and clinical cases. The median age of cases is 7 years with a range of two months to seventy nine years. Higher incidence was observed in children less than five years (12, 5.3 & 3.5/100,000 < five population) in the years 2010,2009 &2008 respectively. From the reported 1319 measles cases 1039(78.7%) were unvaccinated. And out of the unvaccinated children less than five years were (%). Conclusion: Majority of cases are children less than five years of age. A large proportion of cases occur among unvaccinated individuals. Improving vaccination coverage, maintaining information on vaccination history and strengthening measles surveillance is mandatory. Effectiveness of cold chain needs further assessment if vaccine failure is a factor for measles outbreaks.

Keywords: Measles, Measles Surveillance, Amhara

1. Introduction

Measles is a highly infectious viral disease caused by a Morbillivirus and for which humans are the only reservoirs. In a non-immune person exposed to measles virus, after an incubation period of about 10 to 12 days (range 7-18 days), prodromal symptoms of fever, malaise, cough, coryza (runny nose), and conjunctivitis appear. Within 2 - 4 days of the prodromal symptoms, maculo-papular rash appears behind the ears and on the face. The rash spreads to the trunk and extremities and typically lasts 3-7 days [1]. Most persons recover from measles without complications. Some complications are associated with measles due to transient suppression of cellular immunity, which is a characteristic feature of the disease. Frequent complications in children less than five years of age include otitis media (5% - 15%) and pneumonia (5% - 10%) [2]. Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons. Individuals with measles are infectious 4 days before through 4 days after rash onset [1].

Despite the existence of a safe, effective, and inexpensive vaccine, measles is still not being controlled in many parts of the world. However the use of measles vaccine over the last 30 years has reduced global measles morbidity and mortality by 74 and 85%, respectively, compared with the pre-vaccine era

[3]. The World Health Organization (WHO) estimates that almost one million measles-related deaths occur each year, the majority (85%) in Africa and Asia [4, 5, 6].

Measles is widely known in Ethiopia and it has many names in various ethnic languages, e.g., Kufign, Ankelis or Shifto. In 1980 Ethiopia introduced measles vaccination as part of the Expanded Program on Immunization (EPI) [7]. A single dose of measles vaccine is recommended at 9 months of age [8,9]. Several developed and developing countries follow a strategy that differs in timing and in the number of doses delivered either through routine immunization or supplemental mass immunization campaigns [10]. In determining the age for vaccination, countries must balance the consequences of an older age (lack of protection in the early months of life) and a younger age (reduced effectiveness). In many countries, where morbidity and mortality due to measles are uncommon in infants, choose an older age for vaccination (e.g., age 12 or 15 months). In other countries, where a high number of deaths due to measles occur in children aged <9 months, a younger age for vaccination has been advocated [11, 12].

However, during supplemental immunization campaigns, a single dose of measles is given, irrespective of the immunization and disease history status, to all children in the target age group [13]. A study conducted in Ethiopia showed also that campaign vaccination elevated immunity in the target ages by between 30% and 50% according to age group, or an average of around 40% [14].

According to the National Public Health Emergency Management (PHEM) guideline, every suspected measles case should be detected, reported using the cases based form and undergo laboratory investigation (or the first five cases in the situation of outbreaks) and during an outbreak all cases must be entered on a line listing, investigated and reported to next higher level [7, 15].

Amhara region has experienced a number of measles outbreaks and analysis of measles surveillance data is essential for the control and prevention of the disease.

The aim of the surveillance data analysis is to describe the distribution of measles and burden in the region and communicate the findings for further action.

2. Method

Amhara region is located in north-western part of the Ethiopia in an area of 170000km [2]. The region is administratively divided in to eleven zones and this further divided in to166 woredas/districts. The total population is estimated to be 18.2 million, which accounts one-fourth of the country's population. The rate of the natural increase is 1.8%.

After getting permission letter from the regional PHEM office for the analysis, data was accessed from the regional WHO coordinator office data base. Cross sectional retrospective descriptive data analysis was conducted on three years (2008_2010) regional measles surveillance data from February to March 2011. Data was analyzed using Microsoft excel. The study variables included were age, date of onset, laboratory result, specimen quality, vaccination status, zone and year.

Case Definitions

The national Public Health Emergency Management and measles guideline was used for the case definitions and the final classification of cases by the laboratory as it was registered in the data base. [14]

Suspected case: Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects measles.

Confirmed case: A suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases in an epidemic.

All suspected cases of measles are finally classified based on the laboratory result or for cases with no laboratory testing clinical criteria and linkage to the case confirmed by laboratory is used to classify cases as follows;

Laboratory confirmed: A suspected measles case that is investigated, including the collection of an adequate blood specimen (5ml), and has serological confirmation of recent measles virus infection (IgM positive).

Epidemiologically linked: A suspected measles case that has not had a blood specimen taken for serologic confirmation, but is linked to a laboratory confirmed case (definitive serologic evidence of recent measles virus infection). Linked is interpreted as being in the same geographic area (place) during the infectious period (time) of a laboratory-confirmed case (person), i.e., in the same district within 30 days.

Discarded: A suspected measles case that has been completely investigated, including the collection of adequate blood specimen (5ml), but lacks serologic evidence of recent measles virus infection (i.e., IgM negative).

Clinical / Compatible: A suspected measles case that has not had a blood specimen taken for serologic confirmation and cannot be epidemiologically linked to a laboratory confirmed case.

Laboratory Investigation: Blood samples were collected by health professionals working in the respective woredas and serum samples were transported to Ethiopian Health and Nutrition Research Institute EHNRI measles laboratory (accredited by WHO) and confirmation done using indirect ELISA technique by trained laboratory technologists.

3. Results

A total of 2520 suspected cases were reported from 2008 to 2010. Of the suspected cases 1973 (78.3%) serum samples were taken to the EHNRI and 1843 (93.4%) have good specimen conditions. Out of the suspected cases with serum sample 353 (18%) were positive, 1190 (60%) were negative, 44(2%) were indeterminate, 373 (19%) samples were test not done and 13 (1%) missing laboratory results.

Based on the case definitions; suspected measles cases(2520) were further classified as 353 (14%) confirmed by laboratory, 549 (21.7%) confirmed by epidemiologically linked, 415 (16%) clinically compatible, 1190 (47%) discarded and 13 (0.5%) missing laboratory result.

Based on the above classification a total of 1319 measles cases (confirmed and clinical) were reported from 2008 to 2010. The mean age of measles cases was 10 years (SD 9.8 years) with a range of 2 months to 79 years and median 7 years. In the consecutive three years the incidence of measles case was higher in children less than five years of age, accounting 3.5, 5.3 and 12.0 per 100,000 populations in 2008, 2009 and 2010 year respectively. (Table 1)

Table 1. *Distribution of measles cases by age group and year Amhara region, 2008-2010 year.*

Year	Population by age group		No of Cases by age group		Incidence per 100,000 population by age groups	
	< 5 yrs	> 5 yrs	< 5 yrs	> 5yrs	< 5 yrs	> 5 yrs
2008	2,277,608	15,242,450	80	228	3.5	1.5
2009	2,319,938	15,525,742	124	143	5.3	0.9
2010	2,365,063	15,827,731	283	461	12.0	2.9

The proportion of measles cases was higher in children less than five years of age, accounting 37% (489) of the total confirmed cases followed by 29% (382) for ≥ 15 years of age. (Fig 1)

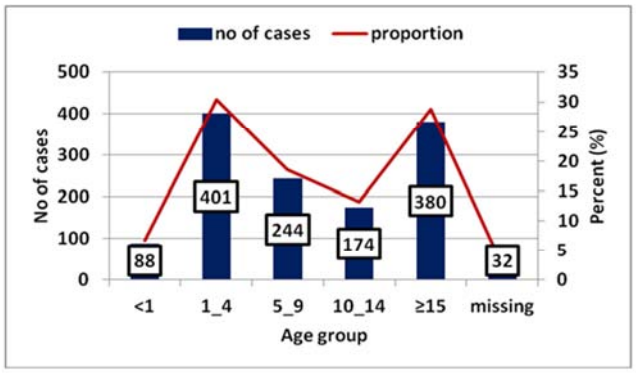

Fig. 1. *Distribution of measles cases by age group Amhara region 2008-2010 year.*

The overall regional incidence of cases shows an increment from 1.8/100,000 in 2008 year to 4.1/100,000 in 2010 year. The incidence was 1.5/100,000 in 2009 year. The incidence of cases in children less than five years of age also increased from 3.4/ 100,000 < five year populations in 2008 to 12/ 100,000 < five year populations in 2010. In the year 2008 the highest incidence (19/100,000 <five years children) was reported from North Shoa. The highest incidence in the three years period (21/100,000 < five years populations) was reported from Bahir Dar zone in the year 2010 followed by west Gojjam (19.3/100,000) and East Gojjam 18.3/100,000 < five years populations. (Fig 2)

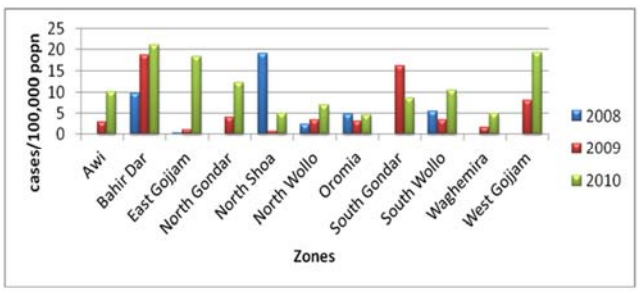

Fig. 2. *Incidence of less than five years measles cases by zone and year Amhara region 2008-2010 years.*

From the eleven zones, the highest incidence of cases was observed 11/100,000 population from North Shoa in 2008 year followed by 2.6/100,000 from South Wello. Awi and Waghemira zones have zero incidences in 2008. In the year 2009 the highest incidence 5.7/100,000 was observed in South Gondar followed by 3.8/100,000 from Bahir Dar. Though the incidence decreased to 0.5/100,000 for North Shoa, it shows a slight increment for Awi (0.5/100,000) and Waghemira (1.4/100,000). In the year 2010 around five zones have almost similar incidence 5.2/100,000 for East Gojjam, 5.1/100,000 for North Gondar, 4.9/100,000 for Bahir Dar and South Wello and 4.7/100,000 for West Gojjam. Overall the incidences of cases have increased in all of the zones.

The vaccination status of measles cases were 235 (18%) one dose, 45 (3%), two or more vaccination status, 559 (42%) not vaccinated and 480 (37%) with unknown vaccination status. Of the unvaccinated 191(34%) are children less than five years of age.

The measles vaccination coverage in the Amhara region increases from 65.5% in the year 2004 to 80% in 2010 [17].

Though the vaccination coverage of all zones was less than 90% except North Wello (93%) in the year 2008 the coverage has shown an increment in each year. [17] (Table 2)

Table 2. *Measles immunization coverage by zone Amhara region year 2008-2010.*

Zone	Measles immunization coverage By Year (%)		
	2008	2009	2010
Awi	65	63	73
Bahir Dar	39	49.7	64
East Gojjam	82	83.6	88
North Gondar	72	74.6	82
North Shoa	81	65.9	58
North Wello	93	82.9	76
Oromia	78	84.8	90
South Gondar	82	81.8	90
South Wello	77	76.2	80
Waghemira	54	64.7	78
West Gojjam	70	65.3	86
Regional	77	74.3	80

In each month on average 37 confirmed cases were reported to the regional PHEM. The number of measles cases start to increase on March and reach its peak on May then it decreases on June on 2009 and 2010 year. In the year 2008 the number of cases starts to increase in June and it reaches its peak on July. (Fig 3)

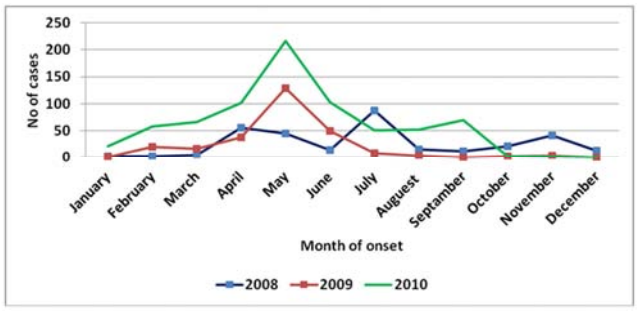

Fig. 3. *Distribution of confirmed and clinical measles cases by month, Amhara region 2008-2010years.*

Through filtration of the data for the specific months that showed highest peak on the line graph; Aneded, Tenta, Dembia and Wogdei in the year 2010, Simada in the year 2009 and Jama, Merha bête and Mida woremo in the year 2008 reported an increased number of cases using line listing which indicates the occurrence of outbreak. Since after confirmation of the outbreak cases are registered in line listing format and reported to the next level.

4. Discussion

The number of measles cases has increased year to year and the region also experienced a number of outbreaks in the last three years. This could probably be due to low vaccine coverage and strong measles surveillance activities. From the total reported suspected cases 1190(47%) were negative, which indicates increased awareness for notifying the suspected measles cases and increased detection of non measles rashes. Among the total confirmed and clinical cases 280(21%) were vaccinated, 554(42%) not vaccinated and 480(36%) with unknown vaccination status. This may be due to low immunization coverage and failure in vaccine efficacy. And this may also contribute for the occurrence of the outbreak and for the increased number of cases.

Though the regional measles immunization coverage shows progress it is still much lower than the target (90%).

The incidence of measles cases also shows an increment especially in zones with low vaccination coverage like Bahir Dar. Even zones with vaccine coverage > 85% percent have reported higher incidence in children less than five years of age and this may indicate there might be poor cold chain management.

Cases were not evenly distributed by age and the most affected age group was observed from 1-4 years throughout the three years period (Figure 1). This could be the immaturity of immune system in this age group and it is also documented that in developing countries the most vulnerable children are between the ages of 9 months and 5 years [15].

Seventy-eight percent of the suspected measles cases have their blood specimen sent to the national measles laboratory and this is lower than the target set by WHO ≥ 80%. Ninety four percent of samples arrived in good conditions (adequate volume, no leakage and not desiccated) and this was similar with target set by the FMOH Ethiopia and WHO which is <10%. And also 18% of the samples were positive for measles IgM antibody and this is much higher than the target set by WHO which is ≤10%. [16]

5. Conclusion

Generally there was an increment in the incidence of measles cases. The regional vaccine coverage showed progress year to year. Around five zones were responsible for the highest peaks on the regional epi- curve of three years period. Majority of cases are children less than five years of age. A large proportion of cases occur among unvaccinated individuals. The highest incidence rate was observed in East Gojjam, North Gondar, West Gojjam and Bahir Dar zones. These also reported higher incidence in less than five years of age children.

Limitation

Data is incomplete it lacks sex, outcome, address of cases.

Recommendations

- Measles surveillance activities should be strengthen at all levels
- Improve vaccination coverage and maintain information on vaccination history
- Effectiveness of the vaccine needs further assessment

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