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Measles outbreak investigation in Basso Liben District, Amhara Region, Ethiopia 2017

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Measles is an acute, highly contagious viral disease caused by measles virus and transmitted primarily by respiratory droplets or airborne spray to mucous membranes in the upper respiratory tract or the conjunctiva. Measles is one of vaccine preventable diseases but the virus usually causes outbreaks especially among unvaccinated population. The aim of this study was to investigate the outbreak and identify associated factors in Basso Liben district in Ethiopia. An unmatched case control study was conducted to investigate measles outbreak from 90 study subjects (30 cases and 60 controls). Face to face interview was conducted using structured questionnaire. Epi info version 7 was used for data entry and analyzed using SPSS version 20 software. Logistic regression was employed to identify factors associated with measles outbreak with 95% confidence level and statistical significance was declared at p-value <0.05. The total attack rate of measles was found to be 1.24 per 1,000 population in Basso Liben district. The highest age specific attack rate was seen in under- one age groups (4.76 per 1,000 children), and the next was in age groups 1- 4 years old (3.28 per 1000 population). In multivariate logistic regression, contact history with measles case AOR=8.132 (95% CI 2.047, 32.297) and presence of measles case in the neighbor (AOR= 6.928; 95% CI 1.37, 29.12) were risk factors for contracting measles. But previous history of measles case (AOR= 0.10; 95% CI 0.02, 0.56) and vaccinated with measles vaccine AOR=0.11 (95%CI 0.021, 0.573) were protective associated factors for measles.

Key words: Measles, outbreak, Basso Liben, case control, Ethiopia.

INTRODUCTION

Measles is an acute, highly contagious viral disease caused by measles virus. The infection is transmitted primarily by respiratory droplets or airborne spray to mucous membranes in the upper respiratory tract or the conjunctiva and it is an eradicable disease (Liebert, 1997). The virus mostly affects the epithelial cells and suppresses the immune system and it is the cause for secondary bacterial infections (CDC, 2015). Measles is particularly severe in susceptible infants, pregnant women, and immunocompromised individuals. The most

effective way to control measles is by active immunization of a high proportion of the population. Vaccination against measles was introduced in 1968 but coverage was sub-optimal up to the late 1980s (CDC, 2015; WHO, 2009). Measles can be controlled and prevented by immunizations programs. WHO global vaccine plan for 2012-2020 was established to the target of rubella and measles eliminations (Durrheim et al., 2014). Measles depress serum levels of vitamin A and hyporeninemia which is mostly associated with increasing mortality of children under two years of age. Since vitamin A deficiency leads to increased susceptibility to infections (Hussey et al., 1990). Routine MCV coverage plus supplementary immunization activities (SIAs) reaching 145 million children in 2012, led to a 77% decrease worldwide. As previously reported, measles annual incidence ranges from 146 to 33 per million population, and a 78% decline in estimated annual measles deaths from 562,400 to 122,000 (Whiteside et al., 2014).

Globally approximately 197,000 measles deaths occurred in 2017, with 136,000 (69%) in Southeast Asia and 45,000 (23%) in Africa. In Africa, the measles case fatality rate ranges from 3 to 5%, reaching up to 30% during severe outbreaks and outbreaks in closed communities such as refugee camps. Measles continues to be a major public health problem in Africa, causing an estimated 28,000 deaths each year (Dabbagh et al., 2009).

A study conducted in Southern Ethiopia showed, 1507 (31.3%) were found positive during 2007 to 2014. Patients with age 1 to 4 years were the most affected groups (Getahun et al., 2017). And In Oromia region from the total 1059 suspected cases and two deaths were reported by a measles outbreak in Guji zone. Of these, 821 (77.5%) cases were < 15 years of age (Adeba et al., 2014). Another study in Amhara region indicated 2412 (36.7%) were found positive. Measles was found distributed throughout the regional state (Getahun et al., 2016). The aim of this study was to investigate the outbreak and identify associated factors in Basso Liben district in Ethiopia.

MATERIALS AND METHODS

Study area and period

The study was conducted in Basoliben woreda East Gojjam, Amhara region, Northern Ethiopia. The woreda had an estimated total population of 112,673 and had also one health center. Data was collected on February 2017.

Study design

A case control study was conducted to investigate outbreaks of measles.

Sampling method

1:2 unmatched case control study design were conducted. A case

was a person residing in Basso district that tested positive for IgM or any person with fever, maculo-papular generalized rash, cough, coryza (runny nose) or conjunctivitis.

Data collection methods

Face to face interview was conducted to gather information from cases and controls by using structured questionnaire.

Sample size determination

Sample size was calculated using StatCalc function of Epi-info version 7 with confidence level of 95%, power of 80%, and assuming percent of controls exposed 18% and percent of cases with exposure 52% for vaccination. Total sample size included in the study was 30 cases and 60 controls beyond the minimum calculated sample size. Cases and controls were selected by non-probabilistic purposive sampling technique.

Data analysis and interpretation

The collected data were checked for completeness, and then it was entered and analyzed using the statistical package for social sciences (SPSS) version 20 statistical software. For testing of significance and association, continuous variables, and categorical data were compared using logistic regression. In all case P-values, less than 0 .05 was considered statically significant.

Ethical clearance

Before conducting interview, informed verbal consent was obtained from all study participants.

RESULTS

Case presentation

A 28 years old index female case came to Yelamgiej health center on February 2/2017. She was presented with fever, cough and rash; Her history of measles vaccination status was unknown and had no history of travel but she reported her participation at a wedding. A total of six (6) suspected measles cases were sent to Amhara regional public health institute for laboratory confirmation, of whom four out of six (4/6) were positive for IGM, enough to confirm measles outbreak. Starting from January 3/2017 to the beginning of March the number of measles cases reported by Basso Liben district increased in irregular manner. During measles epidemic in Basso district, the highest number of cases was reported in February 18/2017 and the next was reported in February 16/2017. In Basso district, 201 persons were affected by measles in the period between February and April (Figure 1).

Out of 201 total measles cases reported from 15 kebeles, 121(60%) cases were reported from Yelamgiej, Komie and Anjimkebeles. Kebele attack rate of Yelamgiej, Komie and Anjimkebeles were 10.5, 4 and 3.5,
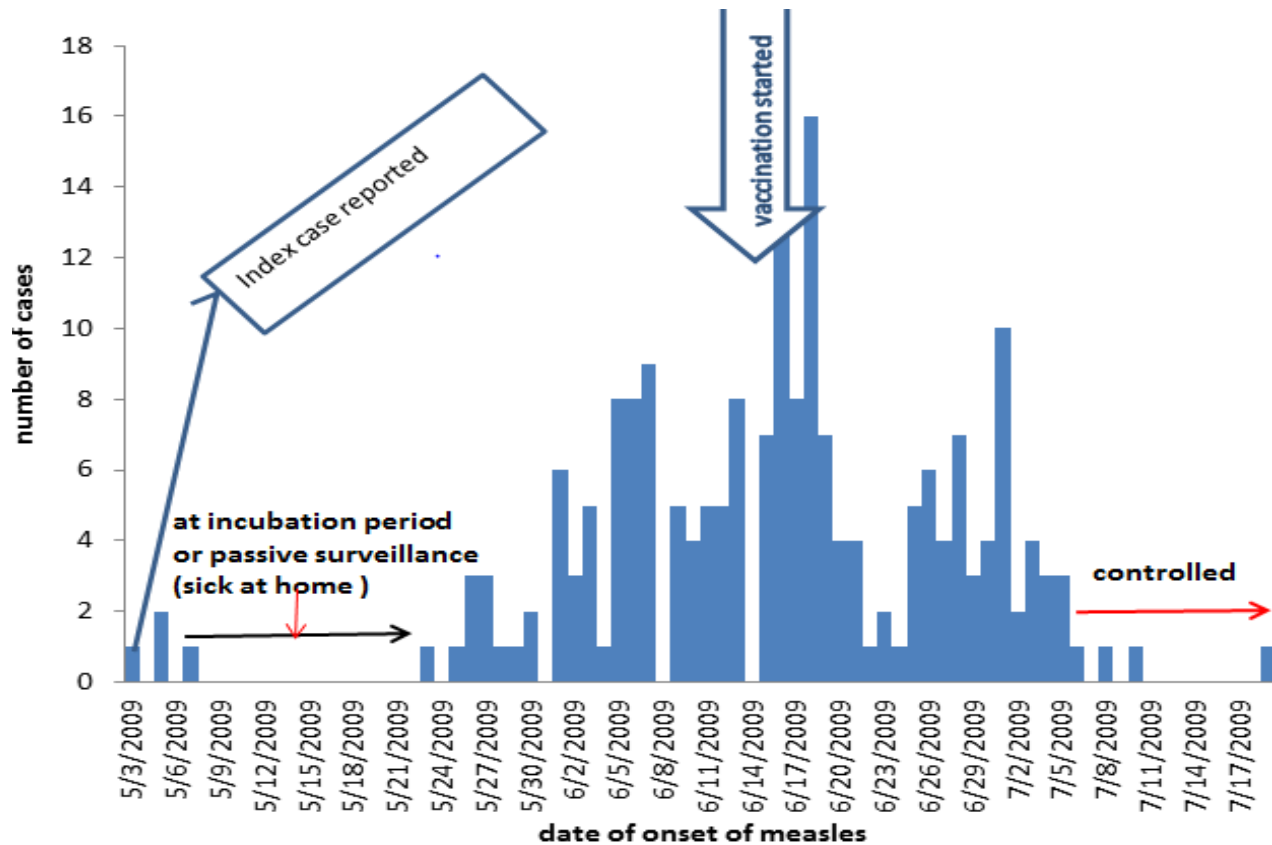
Figure 1. Measles cases date of onset in Basso Liben district, Amhara region, Ethiopia, 2017.

respectively (Figure 2).

Among the total measles cases, 51% were females. The median age of the case was nine (9) years old with a range of 2 months to 50 years. Attack rate of measles in female and male was similar, which was 0.08 per 1000 population in Basso district.

In Basso Liben district the total attack rate by measles outbreak was 1.24 per 1000 population. The highest age specific attack rate in basso district was in ≤1year's old age group (4.76 per 1000 children) and the next was in 1 to 4 years old age group, which were 3.28 per 1000 population in the age category. Age groups > 30 years old age was the least affected group by measles outbreak in the district, which had attack rate of 0.04 per 100 populations in the age group.

Among all populations affected by measles, 20, 36.8 and 14.9 % were given zero doses, one dose and two doses respectively, but 28.4% had unknown history of measles vaccine dose. Out of measles cases that were not given measles dose, 10.5% were under five year's old age groups. Out of the total measles cases with unknown history of measles vaccine dose (28.4%), 24.4% was in the age category of 15 to 30 age groups.

Among the total measles cases, 100%(30/30), 93%(28/30), 97%(29/30) and 86%(26/30) developed

fever, cough, rash and conjunctivitis respectively. And also 67, 13, 53 and 20% cases developed pneumonia, vision change, mouth ulcer, and ear infection of measles complication respectively (Table 1).

Multiple logistic regressions

In multivariate logistic analysis, independent factors which remained significantly associated with contracting measles in Basso Liben district during an outbreak were, contact history with measles case AOR=8.132 (95% CI 2.047, 32.297) and the presence of measles case in the neighbour [AOR= 6.928(95% CI 1.37, 29.12)]. But previous history of measles case AOR= 0.10 (95% CI 0.02, 0.56) and vaccinated with measles vaccineAOR=0.11(95%CI 0.021, 0.573) were protective associated factors for measles during the outbreak, as shown in the Table 2.

DISCUSSION

In the present study, measles outbreak investigation in Basso district males accounted 49% of cases, lower than
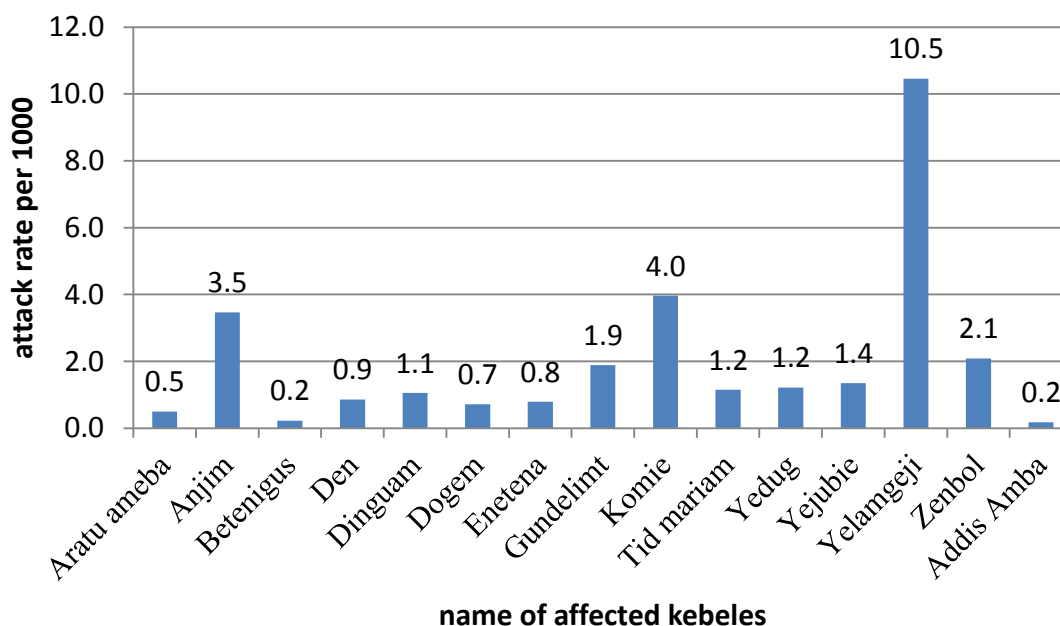
Figure 2. Measles attack rate by affected kebeles in Basso Liben District, Amhara region, Ethiopia, 2017.

Table 1. Frequency and percentage of measles dose received by age category among measles cases in Basso district, East Gojam, Amhara region, Ethiopia, 2017.

Number of measles dose		Age category of measles case in years						Total
		≤1	1-5	5-10	10-15	15-30	≥30	
0.00	Count	14	7	7	5	7	0	40
	% of Total	7.0	3.5	3.5	2.5	3.5	0.0	19.9
1.00	Count	9	28	13	9	15	0	74
	% of Total	4.5	13.9	6.5	4.5	7.5	0.0	36.8
2.00	Count	1	12	9	3	5	0	30
	% of Total	0.5	6.0	4.5	1.5	2.5	0.0	14.9
Unknown	Count	0	0	1	5	49	2	57
	% of Total	0.0	0.0	0.5	2.5	24.4	1.0	28.4
Total	Count	24	47	30	22	76	2	201
	% of Total	11.9	23.4	14.9	10.9	37.8	1.0	100.0

the regional measles case-based surveillance data collected in 40 African countries during 2002 to 2009 in which males accounted for 52% of confirmed measles cases (Goodson et al., 2011).
In this study the total attack rate of measles outbreak per 1000 population in Basso district was 1.24, higher than a total attack rate of measles outbreak investigation conducted in the Oromia region, Ethiopia which was 0.2% (81/100,000 population) (Adeba et al., 2014). Also over all attack rate of measles in this investigation was lower than overall AR of a case control outbreaks of

measles in district Kangra, North India which was 42 per 1000 population (Gupta et al., 2011). This variation might be due to difference in awareness for vaccination.
In the present study, among all cases affected by measles outbreak in Basso district, 20% was unvaccinated, lower than a study conducted in Zaka district, Zimbabwe which was 29% unvaccinated (Pomerai et al., 2012) and the most common symptoms in Basso district among cases were fever 100%(30/30), rash 97%(29/30) and conjunctivitis 86%(26/30) which was in line with the study conducted in Zaka district, Masvingo

Table 2. Multivariate logistic analysis of risk factors for measles in Basso district, East Gojam zone, Amhara region, Ethiopia, 2017.

Variable		Controls (%)	cases (%)	AOR	P-value	95% CI for AOR	
Vaccination	No	32(53%)	7(23.3%)	0.11	0.009	0.021	0.573
	Yes	28(47%)	23(76.7%)				
Previous history of measles	No	22(36.7)	24(80%)	0.10	0.005	0.02	0.573
	Yes	38(63.3%)	6(20%)				
Exposure with measles case	No	49(81.7%)	9(30%)	8.13	0.003	2.047	32.97
	Yes	11(18.3%)	21(70%)				
Presence of cases in neighbor	Yes	51(85%)	16(53.3%)	6.93	0.012	1.37	29.12
	No	9(9%)	14(47.7%)				
Age				0.914	0.031	0.843	0.99

Province, Zimbabwe which showed that maculo-papular rash 103(93.6%), red eyes 97(88%) and fever 110 (100%) during the outbreak (Pomerai et al., 2012).

In thid study, among measles cases in Basso Liben district during the outbreak, 12% of the affected age group was below one year's old age which was lower than that in a study conducted in Shelby County, Tennessee 43% (Fill M-MA, 2016), and Under 15 years old age measles cases in Basso district were accounted 61% whereas a study conducted in Sudan showed that 92% were below 15 years old (Coronado et al., 2006). This difference might be due to measles vaccine coverage was improved than the previous years.

In the present study, among all measles cases in Basso district, 20% were unvaccinated which was lower than that in a study conducted in Sudan 48.6% (Coronado et al., 2006). This discrepancy might be due to the result of better access to health care and higher vaccine coverage in Basso district whereas in Cordillera, northern Philippines indicated that 20% were unvaccinated (Goodson et al., 2010).

CONCLUSION AND RECOMMENDATION

In multivariate logistic analysis, presence of measles case in the neighbor and contact with measles case was significant associated factors for contracting measles, but previous history of being measles case and vaccination were protective factors for measles. BassoLiben district health office and health centers should improve and strengthen routine measles vaccine immunization coverage and also under 30 years age groups should be targeted for supplementary immunization programmed for measles.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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