

Epidemiology of Dengue Fever in Ethiopian Somali Region: Retrospective Health Facility Based Study

Yusuf Mohammed Ahmed*, Ali Abdi Salah

Public Health Emergency Management, Ethiopian Somali Regional Health Bureau, Jijiga, Ethiopia

Email address:

Zakyu44@yahoo.com (Y. M. Ahmed)

*Corresponding author

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Abstract: Dengue fever (DF) is globally emerging mosquito born viral disease. In Ethiopia, DF is newly emerged since 2013. The existing outbreak data was not compiled which is important for the provision of epidemiological information as a base for the health care systems, and to make possible preventive and curative measures for the coming dengue fever outbreak. We conducted retrospective descriptive study on three years outbreak of DF during 2014, 2015, and 2016. We collected line lists of outbreak over past three years on main epidemiological parameter. We entered, cleaned, and analyzed collected data by using Microsoft Excel 2007. Four hundred forty suspected Dengue cases reported from 1/21/2014 to 3/3/2016 with no deaths. Male constitute majority 58% of cases. Age of patients ranged from 2 months to 82 years with median age of 26 years. Age group ranging from 15 to 45 constitute majority 305(69.3%) of the cases, followed by >45(12.5%). About 18.2% of cases were those <15 years old, while >15 constitute 81.8% of cases. High percentages (37%) of cases reported in February. During 2014 and 2016, outbreak happened in the same months (Jan, Feb, and March). High percentages of cases (43.2%) reported in 2015. Majority 368(83.6%) of cases reported from Godey Council. In 2014 and 2015 outbreak confined to Godey council only, while in 2016 dengue reported from Dollo Ado town. About 98.6% of cases reported from urban. Two hundred ninety two (66%) of cases were managed at outpatient department (OPD). From all collected 57 blood samples, 33(57.9%) was positive for dengue virus by RT-PCR technique. Dengue fever is a serious public health problem and is newly emerging threat in affected town of Ethiopian Somali region. Our study highlights as dengue appearing cyclic every year mainly affecting adult population of reproductive age group. It also shows the sign of expanding to other town of region, there is an urgent need to enhance dengue surveillance, and control, especially for the high-risk populations in high-risk areas in dengue affected areas of the region.

Keywords: Dengue Fever Outbreak, Godey Council, Dengue Epidemiology, Ethiopian Somali Region

1. Introduction

Dengue has become an important public health concern all over the world since the 1950s particularly; the disease is growing most rapidly in tropical and subtropical countries where majority of the world's population resides, and increasing health and economic burden. Dengue considered the predominant vector-borne disease in terms the number of human infections occurring globally [1].

Dengue is a widespread mosquito-borne infection in human beings, which in recent years has become a major international public health concern. Symptomatic dengue virus infections can present with a wide range of clinical manifestations, from a mild febrile illness to a life-

threatening shock syndrome [2]. Both viral and host factors are thought to contribute to the manifestations of disease in each infected individual. It is important to understand its burden on health care, morbidity, and mortality. Early diagnosis and suspicion of DF in primary care might reduce the complications if handled properly [2].

Dengue fever (DF) has emerged as one of the world's major infectious diseases. Epidemics of dengue fever were first reported from the coastal area of Africa and later from Malaysia in the 19 century. The infection is by now seen as a global epidemic with recorded prevalence in more than 120 countries. Dengue is transmitted by *Aedes* mosquitoes, particularly *Aedes aegyptii* and, less important, *Ae. albopictus*. During the last 200 years, spread of the disease has increased, reaching endemic proportions during the last

three decades [3].

The incidence of dengue fever (DF) has grown dramatically around the world in recent decades. Over 2.5 billion people – over 40% of the world's population – are now at risk. WHO currently estimates there may be 50–100 million dengue infections worldwide every year [4].

DF is characterized by fever, which lasts from 5 to 7 days with two or more of the following symptoms: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations, or leucopenia [5].

Dengue Hemorrhagic fever (DHF) is defined as an acute febrile illness with hemorrhagic manifestations (shown by a positive tourniquet test, petechiae, ecchymosed or purpura, or bleeding from the mucosa, gastrointestinal tract, injection sites, or other locations), a platelet count <100,000/mm [5]. Dengue is one of the tropical diseases, included in the list of top 13 neglected tropical diseases, recommended by World health organization [6].

Since 2013, Ethiopia has reported more than 12,000 dengue fever cases. A confirmed Dengue fever case was reported for the first time in Ethiopia in Dire Dawa city in mid-September 2013. Suspected cases later reported from Gode town of Ethiopian Somali Region in January 2014 and in Afar Region 2014[7].

Starting from 2014 to 2016 dengue fever outbreak was reported from Ethiopian Somali Region.

Even though outbreak was reported, the existing outbreak data was not compiled and not well documented or published, which is important for the provision of epidemiological information as a base for the health care systems to make possible preventive measures for the coming dengue fever outbreak.

The aim of the current study was

- To provide epidemiologic data in Somali region which serve as baseline data which is essential for monitoring trends of disease occurrence, identifying epidemic-prone areas, and assessing the potential of a future dengue burden reduction in the region
- To make dengue surveillance and prediction more systematic and effective, trend assessment of the diseases should continue to be essential both at local and national level. Moreover, trend analysis of dengue incidence could help public health authorities in improving vector control to minimize the burden of future outbreaks

2. Method and Material

Study area: Godey Council is located in the Shabelle Zone of the Somali Region it is located 600 km away from Regional capital, Jijiga (capital town of Ethiopian Somali region). It is Semi arid weather condition and low altitude with flat land surfaces. The city has a latitude and longitude of 5°57'N 43°27'E. At an average temperature of 30.3°C, March is the hottest month of the year. In December, the average temperature is 27.9°C. It is the lowest average temperature of the whole year. The average annual rainfall is

325 mm. Precipitation is the lowest in January, with an average of 0 mm. Most precipitation falls in April, with an average of 102 mm [28]. Administratively, it consist 10 kebeles. Total population of the council is estimated to be 75,000 in 2016 (33,000 male and 42,000 females). In terms of health delivery system, the council has one Hospital, 1 NGO clinics and 4 Health Posts [29].

Study design and Study period: This cross-sectional retrospective descriptive study carried out from March 10 - 20/2016 on patients presented with dengue fever at both government and private facilities of Godey and over past three years.

Study population & sampling: it was all cases presented with sign and symptom of dengue fever. All cases were included.

Data collection instrument and data collection: Data was collected on three outbreak of DF during 2014, 2015, and 2016 in Ethiopian Somali region. A Line list of every outbreak over past three years was collected on main epidemiological parameter including name of patient, age, sex, complete residential address, date of onset of sign and symptom, months of admission, year, admission status, laboratory results, and final patient outcome.

Data analysis: we entered, cleaned, and analyzed collected data by using Microsoft Excel 2007. Findings of the study were presented in tabular and graphical format.

Ethical considerations: Permission to conduct study secured from regional health bureau. Our Study approval was taken from the hospital authorities. Retrospective nature of study makes no consent was sought from the patients.

3. Results

Starting from 1/21/2014 to 3/3/2016, 440 suspected dengue cases were reported with no deaths. Age of patients range from 2 months to 82 years with median age of 26 years. Those age group ranging from 15 to 45 constitute majority 305(69.3%) followed by >45(12.5%). About 18.2% of cases were those <15 years old, while >15 constitute 81.8% of cases. Male constitute majority 253 (58%) of the cases. Female age group ranging <1, 5 to 14, and > 45 outnumbered males cases, while male age group ranging 1 to 4 and 15 to 44 outnumbered the number of females cases(table 1). High percentage (37%) of cases were reported in February, followed by June (31.1%), while the least (0.9%) of cases were reported in May (table 2).

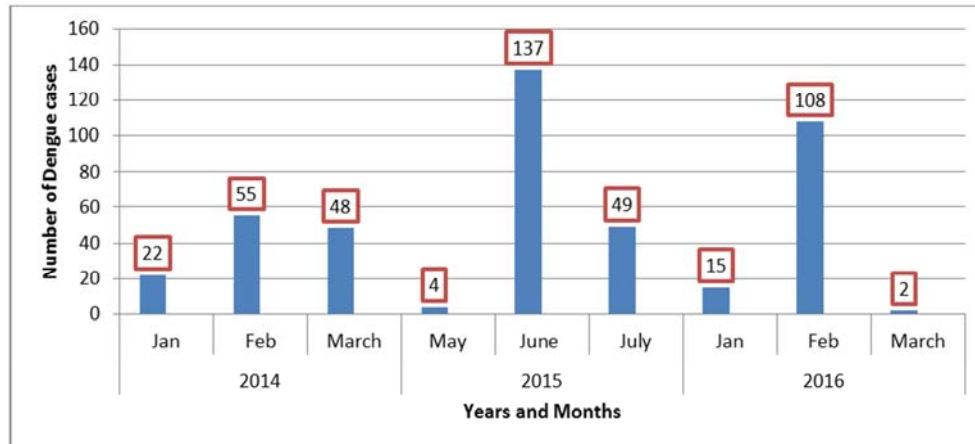
Table 1. Showing distribution of dengue cases by age & sex Ethiopian Somali Region from 2014 to 2016(n=440).

| Age in year | Female | Male | Total |
|-------------|------------|------------|------------|
| <1 | 4(2.1%) | 1(0.4%) | 5(1.1%) |
| 1 to 4 | 11(5.9%) | 18(7.1%) | 29(6.6%) |
| 5 to 14 | 23(12.3%) | 23(9.1%) | 46(10.5%) |
| 15 to 45 | 122(65.2%) | 183(72.3%) | 305(69.3%) |
| >45 | 27(14.4%) | 28(11.1%) | 55(12.5%) |
| Total | 187(42.5%) | 253(57.5%) | 440(100%) |

Table 2. Showing distribution of dengue cases by months Ethiopian Somali Region from 2014 to 2016(n=440).

| Months | # of cases | percentage |
|----------|------------|------------|
| January | 37 | 8.4 |
| February | 163 | 37.0 |
| March | 50 | 11.4 |
| May | 4 | 0.9 |
| June | 137 | 31.1 |
| July | 49 | 11.1 |
| | 440 | 100.0 |

During 2014 dengue outbreak, cases reported in January, February, and March months, during 2015 cases reported in May, June, and July, while in 2016 dengue outbreak cases reported in similar months with that of 2014. In 2014, and 2016 peak of cases reported in February, while in 2015 peak of cases reported in June. High percentage of cases (43.2 %), were reported in 2015, followed by 2014(28.4%) both 2014 and 2016 (figure 1).

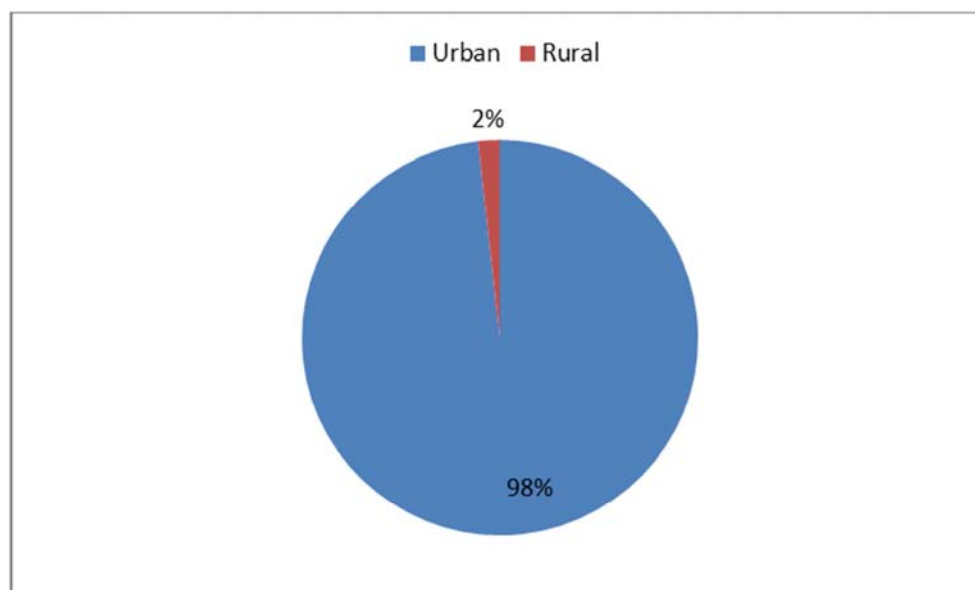
**Figure 1.** Showing distribution of dengue cases by years and months Ethiopia Somali Region from 2014 to 2016(n=440).

Majority 368(83.6%) of cases were reported from Godey Council, followed by Dollo Ado town 66(15%), while remaining cases were reported from Godey District, and Emey (table 3). Generally, 98% of cases were reported from urban, while remaining 2% was from rural (figure 2). About 292(66%) of cases were managed at outpatient department (OPD), while remaining 148(34%) of cases were managed at inpatient department (IPD). From all collected 57 blood samples, 33(57.9%) was positive for dengue virus by RT-PCR technique during past three years of dengue outbreak.

Serotype DENV – 2 was identified as a virus circulating.

Table 3. Showing Distribution of dengue cases by Districts/town Ethiopia Somali Region from 2014 to 2016(n=440).

| Name of Woredas | Number of cases | Percentage |
|-----------------|-----------------|------------|
| DolloÁdo | 66 | 15.0 |
| E. Imey | 1 | 0.2 |
| Godey Council | 368 | 83.6 |
| Godey District | 5 | 1.1 |
| | 440 | 100.0 |

**Figure 2.** Showing Distribution of dengue fever cases by Residency Ethiopia Somali Region from 2014 to 2016(n=440).

All three years outbreak Epicurve is typical of propagated outbreak. 2014-dengue outbreak takes three months of duration while that of 2015 and 2016 took short duration to control (figure 3).

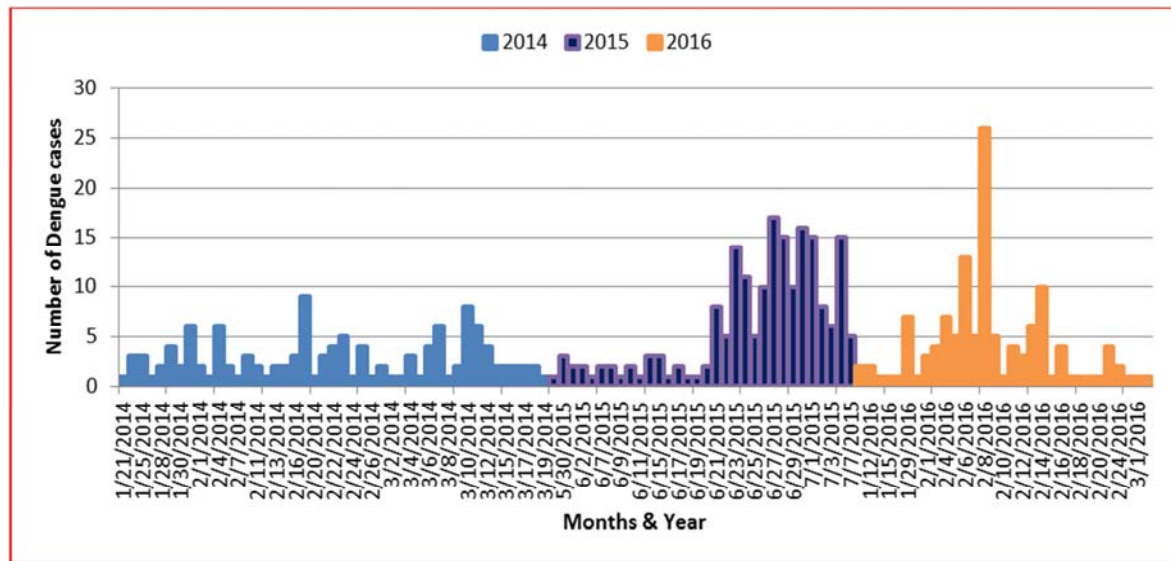


Figure 3. Epi Curve Showing distribution of dengue fever Cases by Year and Months, Ethiopia Somali Region from 2014 to 2016(n=440).

Interventional activity conducted

- Active case search
- Case management at hospital and private clinics
- Coordination and Collaboration activities
- Enhanced social mobilization
- On job training on Rapid Diagnostic Test (RDT) to laboratory staff & Providing for health facilities
- Identifying mosquito breeding sites and awareness creation for community

4. Discussion

In Ethiopia, Dengue Fever has never been detected and reported so far. It is not included among the lists of national reportable diseases. The 2014 dengue outbreak in Godey Town is the first in Somali Region and the second in Ethiopia following Dire Dawa outbreak in 2013. The introduction of dengue into Godey town may be mediated by travel of infected individuals from Dire Dawa to areas that may support transmission, because mosquito vectors move only short distances during their lifespan.

Since dengue confirmation at Godey council in 2014, every year's dengue cases were reported from the council. The possible factor may be non-availability of municipal water supply that enforces the residents to store water in open containers. This water storing habits of the people may provide a favorable breeding habitat for *Aedes* mosquitoes as reported in similar studies [6, 9].

In past dengue fever outbreak reported from Godey and Dollo Ado town, there was no deaths reported which may be due to good case management at health facilities or no cases develop Dengue Shock Syndrome (DSS) which may causes more fatality.

In the present study, the proportion of male cases is higher

than the female cases. Similar finding was reported by study done [2, 4, 8, 9, 10, 11, 12, 14, 19, 20, 22, 23, 24].

The possible reason why males affected more than females may be due that local community are Muslims and female are covering their body according to Islamic ways of clothing during time of bites or may be males outdoor activities which may expose more than females.

The median age of dengue cases in current study was 26 years, which is in line with other studies [2, 5, 9, 11, 13, 14, 15, 16, 17, 18, 19, 21, 23, 24]. This may shows that they are active age groups and they spent most of the time outside of the house, which exposed them to day bite mosquito. This predominance of adults may be due to involvement of adult groups in outdoor works (agricultural and herd keeping activities) which to low age group as they have the more chances of exposing infected mosquitoes than the low age groups.

The dengue outbreak in Ethiopian Somali Region was under reported and majority of cases were managed as malaria. This is in line with that Dengue is likely under recognized and underreported in Africa as well as in Ethiopia because of low awareness by health care providers, incidence of other prevalent febrile illnesses, and lack of diagnostic testing and systematic surveillance [25, 26].

Our study shows that high percentages of cases were reported in February, and June, which may be due rainy time in the study areas and collected water, may create favorable condition for vector.

The 2014 and 2016 dengue outbreak was reported in similar a month that was January, February, and March, this may show that dengue outbreak was happening in cyclic ways and study suggests that more preparedness activities for appropriate vector control measures to be implemented during stated months.

There is currently no specific therapeutic protocol for, or vaccine against, infection. Current control measures focus on vector control, although these measures are often logistically difficult and have shown varying efficacy in controlling epidemics. In the absence of effective prevention and treatment, public health system preparedness remains the single most important tool for minimizing morbidity and mortality as dengue epidemics spread beyond endemic areas [27]. There for current study have an important role in providing baseline data for local health department for plan by using available outbreak report data as Available data come from local studies, including serosurveys, reports of outbreaks, and entomological studies are the main sources of dengue information in resource-limited areas.

The Epicurves of past three years outbreak was typical of propagated outbreak, which is similar with vector born diseases. The 2014 outbreak took three months to control and this may be due to it was new for health staffs and until confirmed patients were managed as malaria.

Study limitations: Retrospective nature of the study, lack of laboratory diagnosis, and underreporting were among limitation in current study.

5. Conclusion

Dengue fever is a serious public health problem and is newly emerging threat in affected town of Ethiopian Somali region. Our study highlights as dengue appearing cyclic every year and mainly affecting adult population of reproductive age group. It also shows the sign of expanding to other town of region, as the prevention of dengue fever lacks proper vaccine; the main preventive strategy is the awareness building in the community regarding the source reduction process.

Recommendation

1. Improved, proactive, surveillance systems that can provide early warning of a coming dengue epidemic in future targeting high-risk populations in high-risk areas in dengue-affected areas of the region.
2. Training of clinicians/health workers on case definition, identification and recording
3. Vector prevention and control should be strengthening by doing environment sanitation through community engagement.
4. Emptying the man made containers or dispose those in a systematic or in a proper way.
5. Much efforts to promote the participation of the community in the action program for eliminating vector-breeding sites.

Authors' Contributions

YM conceptualized the study, collected data, analyzed the data, wrote the manuscript; AA facilitated the structuring of the study and provided relevant documents. All authors

approved the final manuscript.

Competing Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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