

Clinical Laboratory Investigations of Measles Virus Infection among Symptomatic Patients in South Central Somalia: A Retrospective Cohort Study

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Abstract:

Despite widespread vaccination, measles outbreaks still occur among vaccinated populations. The retrospective cohort study was designed to estimate the laboratory characterization of measles infection among symptomatic patients based on healthcare institutes in Somalia from January 2020 to December 2021. Patients' demographic variables, including age, gender, place of residence, feasible healthcare centers, socioeconomic status, previous history, and clinical features, were retrieved from the medical record. A total of 1180 patients were positive for measles (61.1% males and 38.9% females). A high prevalence of measles was seen in newborn babies and children aged 15 years (85%). The most affected province was Banadir (n=808, 68%), whereas the low prevalence was recorded in Galgadud and Middle Shebelle (1%). The highly affected district was Daynile with (n=142, 12.0%), whereas a low prevalence was recorded for Moqokori (0.01%). The prevalence of IgM antibodies was detected in 71.5% of the study population. Different signs & symptoms were examined, such as fever and skin rashes found in all of the study subjects (100%). The mortality was reported to be 0.10% in infants. The current study highlights the higher prevalence of measles in the population due to an immature immune system, weak vaccination plans, poor hygiene, malnutrition, fewer healthcare facilities, and a lack of awareness regarding infectious diseases.

Keywords: Epidemic; viral infections; epidemiology; pediatric infections.

Introduction

The total incidences of Measles infection globally are around 40 million every year, with more than half of these cases arising in Africans. The disease is responsible for 10% of the mortality rate among children aged below five years. In Africa, a total of 2013 deaths were recorded from measles between early 2018 and early 2019. ¹ Measles is a problem that requires prompt epidemiological evaluation and registration procedures. In populations without vaccinations and immunocompromised populations, the disease has a 90% subsequent attack rate. ² It is caused by a virus from the paramyxovirus family and typically spreads through close contacts. ³ Usually, complications such as skin rashes and fever appears within ten days after the commencement of measles which can progress into problems such as blindness, encephalopathy, or severe respiratory bacterial pneumonia. ^{4,5}

An infectious disease, such as measles, mandates a high degree of citizen immunity to prevent transmission and may be more difficult to eliminate in areas with a high population density and a high prevalence of HIV-1 infection.⁶ In resource-poor countries, notably in sub-Saharan Africa, remarkable progress has been made in reducing measles incidence and death as a result of increased measles vaccine coverage and supplementary immunization initiatives. ^{7,8} Furthermore, neonatal and infant immunization would be made easier and safer with a vaccine that does not require needles or syringes and is immune-stimulating in the early stages of life. ⁹

There is simply no substitute for immunization in developing countries when it comes to preventing measles. Measles is a substantial contributor to child morbidity and mortality. It can be stopped through a good vaccination plan.^{10,11} Failure of the secondary vaccine in later age groups (10/24 years) has caused measles outbreaks despite an 85% reduction in mortality ⁸. As a result, some countries have implemented an extra vaccine dose for school-age children. Due to immunization, measles cases among children in Somalia have decreased; however, older age groups are still experiencing outbreaks. This may be attributed to the influx of people from countries like Afghanistan and Pakistan, whose vaccination rates are below the global average of 80% ¹².

Although no research center-based information is accessible from Somalia, there are clinical signs and symptoms that appears that measles keeps on being a significant viral disease of children in Somalia. Keeping in mind the current scenario in Somalia, the present study was conducted with aims to see the rate of measles infection in different provinces of south-central Somalia.

Material and Methods

Study design, area, and period

The current retrospective cohort study was conducted from January 2020 to December 2021. The data was collected from different public sector hospitals in south-central Somalia. An institutional ethical approval was obtained before starting the study.

Sample collection

The data of a total of 1180 patients was retrieved from different hospitals and healthcare centers in south central Somalia. Sociodemographic characteristics (age, gender, residence etc.) of studied patients were noted along with the clinical and diagnostic profile.

Anti-Measles Virus IgM antibodies Method

The EUROIMMUN-ELISA kit pack was used to semi-quantitative in vitro measure for human antibodies of the IgM class against measles infection nucleoproteins (measles infection NP) in serum or Blood. The test pack contains microtiter peels each with break-off reagent wells covered with recombinant (measles virus nucleoprotein).¹³

The specimens from the patients were incubated and poured in the wells. For positive samples, explicit IgM antibodies (likewise IgA and IgG) were to the antigens. To distinguish the bound antibodies, a subsequent incubation was completed utilizing a (enzyme-labelled anti-human IgM) (protein conjugate) catalysing a variety response.

Added 100 µl of the calibrators, positive and negative controls and incubated patient samples into each microplate by the pipetting adjustment. Microplates were incubated for 30 minutes at room temperature +18°C to +25°C.

Void the wells and wash multiple times using 300 microliter of working strength wash buffer for each wash. Wash the reagent wells multiple times with (450 µl) working strength wash support. Left the wash support in each well for (30 to 60 seconds) for every washing cycle, then, at that point, void the wells again. After washing, discarded all the fluid from the microplate by tapping it on filter paper to absorb the all the reagents & buffer used in microplate for sample analysis.

Free positions on the microplate strip ought to be loaded up with clear wells of a similar plate design as that of the boundary to be explored. Added Pipette 100 µl for enzyme conjugate (peroxidase-marked anti-human IgM) into each of the microplate wells. Kept for 30 minutes at room temperature (+18°C to +25°C), and again Void the wells. Wash as depicted previously.

Pipette 100 µl of (chromogen/substrate) arrangement into each of the microplate wells. Incubated for 15 minutes at room temperature +18°C to +25°C while protected from direct sunlight. Pipette (100 µl) of stop arrangement into each of the microplate wells in a similar request and at a similar speed as the (chromogen/substrate) arrangement was presented.

Photometric estimation of the variety force ought to be made at a frequency of (450 nm) and a reference frequency between (620 nm and 650 nm) in something like (30 minutes) of adding the

stop arrangement. Before estimating, somewhat shake the microplate to guarantee a homogeneous conveyance of the arrangement ¹⁴.

Statistical analysis

The obtained data was transferred to the data sheet of SPSS (version 2.0) and Microsoft excel sheet for the interpretation and analysis of variables or Data to find out the mean (M), standard deviation (SD) and Pearson coefficient relationship. A p value of < 0.05 was considered as statistically significant.

Results

Socio-demographic characteristics of the study participants

Age and gender association

A total 1180 patients were recruited in the study in which 61.1% were males while 38.9% were females. Males group were highly infected due to outdoor activities, females were less infected due to less education of measles, lack of awareness of measles and lack of prevention of the measles. The predominance of measles in age group of 0–5 was 72.6%, 6–10 (10.0%), 11–15 (2.88%), 16–20 (1.18%), 21–25 (0.33%), and 26–30 was (0.42%) respectively.

Measles infection pattern

All infected patients were suffered from fever (100%) as well as with appearance of rashes (100%) while at the end of infection recovery 99.9% patients become recovered. 0.10% of deaths were report in infants (less than month) due to immature immune status. (Figure 1)

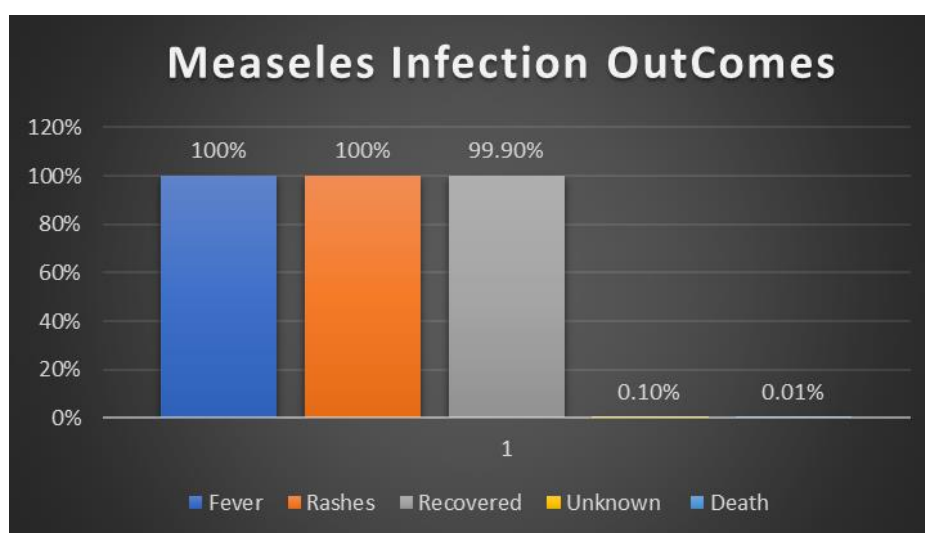


Figure 1 Infection pattern measles infection.

Frequency of measles based on Provinces

The study was conducted on n=1180 patients who were already registered as outdoor patents department (OPD) in basic healthcare hospitals of the provinces such as Lower Juba 237 (20%), Lower Shebelle 53 (5%), M Shebelle 13 (1%), Mudug 18 (2%), Bay 21 (2%), Galgadud 15 (1%), Middle Shebelle 15 (1%), while Banadir had 808 (68%). (Figure 2)

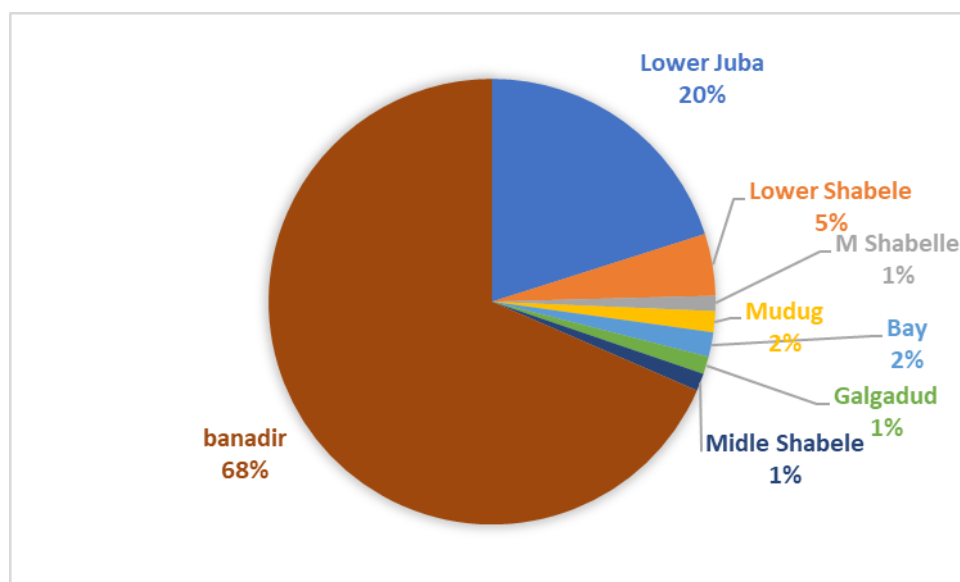


Figure 2 The provinces wise prevalence of Measles.

Frequency of measles based on Districts

We recorded different prevalence of measles from different district of the Somalia such as, 2 (0.1%), wadajir 70 (5.93%), Kahda 25 (2.11%), Daynile 142 (12.0%), Alaziz 5 (0.42%), Adado 10 (0.84%), Afgoe 55 (4.66%), Aliyale 1 (0.01%), Badhaadhe 3 (0.25%), Badoa 9 (0.76%), Baide 9 (0.76%), Balc ad 1 (0.08%), Bondhere 3 (0.25%), Bulaburde 1 (0.08%), Daynile 8 (0.67%), Dharkenley 49 (4.11%), Dhobleey 20 (1.69%), Daynile 103 (8.72%), Galkio 6 (0.50%), H. Jajab 10 (0.84%), Hamar weyn 1 (0.08%), Hawl 1 (0.08%), Wadaag 1 (0.08%), Heliwa 36 (2.97%), Hodann 69 (5.84%), Howlwadaag 15 (1.27%), Jamame 3 (0.25%), Jowhar 1 (0.08%), Karaan 2 (0.1%), Kahada 1 (0.08%), Kaaraan 41 (3.47%), Kismayo 126 (10.67%), Moqokori 2 (0.01%), N/A 5 (0.04%), Raaskaamboni 16 (1.35%), Shangani 9 (0.76%), Shibis 32 (2.71%), Waaberi 1 (0.08%), Wabari 2 (0.1%), Waberi 17 (1.44%), Wadajir 70 (2.11%), Wartanbada 25 (2.11%), and Yaqshid 76 (6.44%). The overall Mean Variance and standard deviation were calculated against prevalence of district such as (Mean= 24.6, V= 1175.4, SD= 48193.21), with probability between -1 and 1 is 0.002. (Figure 3)

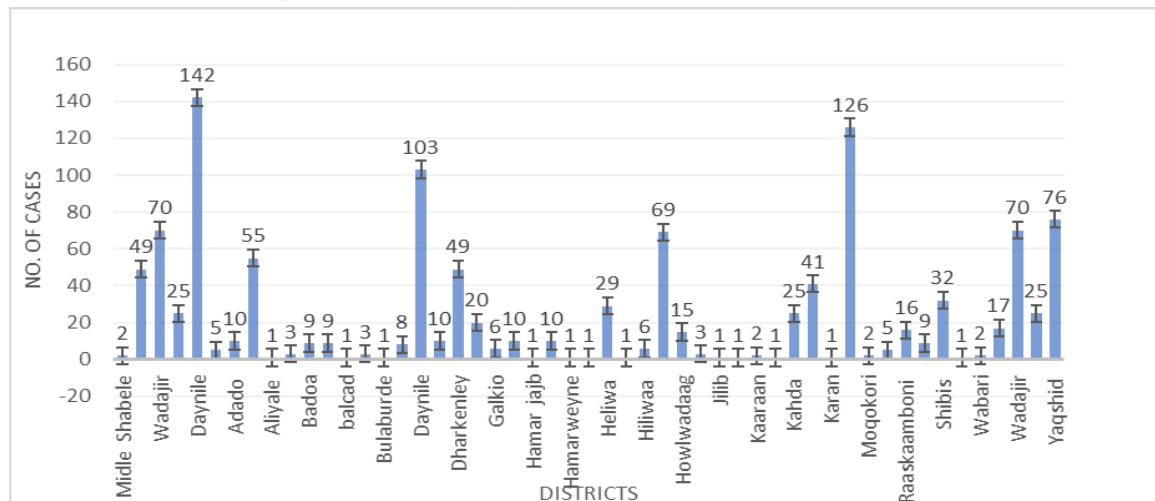


Figure 3 District wise frequency of positive cases of measles.

Frequency of measles based on Basic Healthcare Centers

We recorded different frequency of measles in enrolled patients from various basic health centres such as A/aziz Health Center 8, Adado Hospital 13, Affgo general hospital 10, Banadir 628, Bayhaw hospital 38, Cancen worldwide 9, Daynile Hospital 24, Dhobleey Referral Hospital 19, Hamarweyne MCH 24, Kismayo General Hospital 132, MCH Hamarweyne 11, Raaskaamboni Health Center 16, N/A(unauthorized/private) 7, shangani Hospital 16, Shibis Health Center 18, SOS Hospital 201, and Waberi Health Center 8.

Measles clinical detection and confirmation by EUROIMMUN

We recorded different prevalence of Measles in clinically diagnosed (0.25%), Measles Lab-confirmed (85.8%), and Discarded Case was (8.47%). While, IgM positive were (71.5%) and negative were (7.96%) from confirmed patients. (Figure 4)

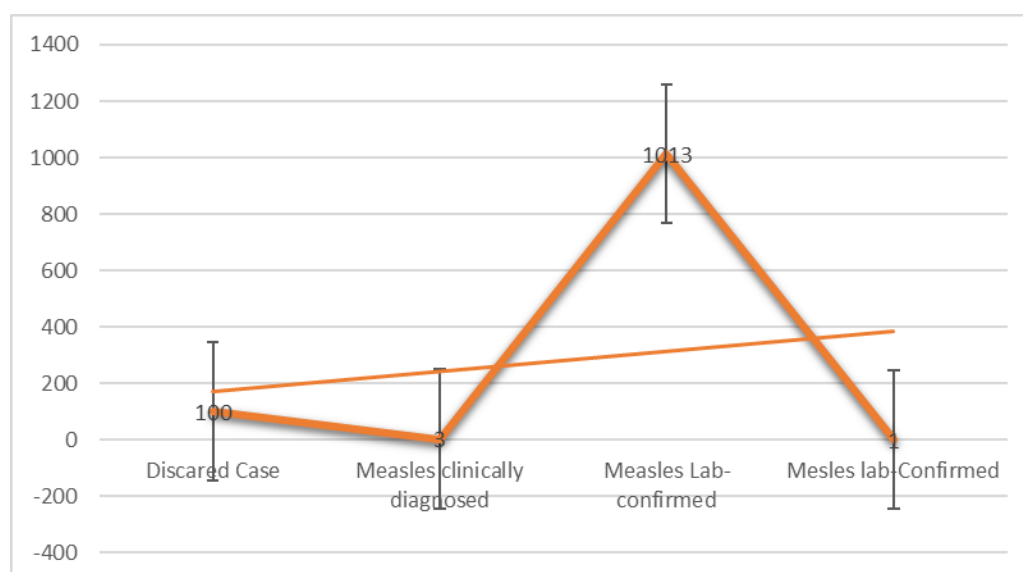


Figure 4 Clinical confirmed positive Measles cases.

Specimen receiving and reported back Expanded Program Immunization (EPI)

The specimens were received by healthcare centers of the Somalia for the detection and confirmation of the measles antibodies/antigen during 1st January to 31st December 2021. The monthly distributions of specimens were recorded as 83 samples received in January, 105 samples in February, 57 samples in March, 79 samples in April, 130 samples in May, 91 samples in June, 13 samples in July, 01 sample in August, 57 in September, 105 samples in October, 130 samples in November while December was recorded as none for sample. Whereas the months of the calendar 2020 were recorded for specimen distribution such as 26 samples in January, 29 samples in February, 09 samples in March, none samples in April, May, June, and July, 01 sample in August, 09 samples in September and 13 samples on October, 25 samples in November and 26 samples in December.

The positive measles cases were reported back to the EPI department of the Somalia during 2021. The 90 samples reported in January, 72 samples in February, 55 samples in March, 17 samples in April, 85 samples in May, 17 samples in June, 167 samples in July, 59 samples in August, 115 samples in September and none sample in October, 129 samples in November and no case of measles was reported during December of 2021. Whereas the positive measles cases were reported back to the EPI department of the Somalia during 2020. The 26 samples reported to EPI in January, 29 samples in February, 41 samples in March, 9 samples in April, none samples in May, June, and July, 01 sample in August, 09 samples in September, 13 samples in October, 25 samples in November and 26 samples in December.

Frequency of Onset of rashes

The healthcare centers of the Somalia were evaluated dissimilar frequency of onset of measles rashes during the 2020 and 2021 from different provinces or districts. In 2020, patients got treatment of the measles such 31 patients treated in January, 30 in February, 29 in March, 7 in April, 16 in September and 15 in October, whereas May, June July and August recorded as none of measles (no treated patients of measles). The healthcare centers of the Somalia were claimed January, and February as highly effected period. Whereas, the dissimilar frequency of onset of measles rashes during year of 2021 was evaluated like 136 patients treated in January, 92 in February, 70 in March, 67 in April, 233 May, 92 in Ju ne, 59 in July, 61 August, 55 in September and 170 in October. The healthcare centers of the Somalia was claimed highly affected month was January with 136 patient treated for measles, 92 in February and 170 October. (Figure 5)

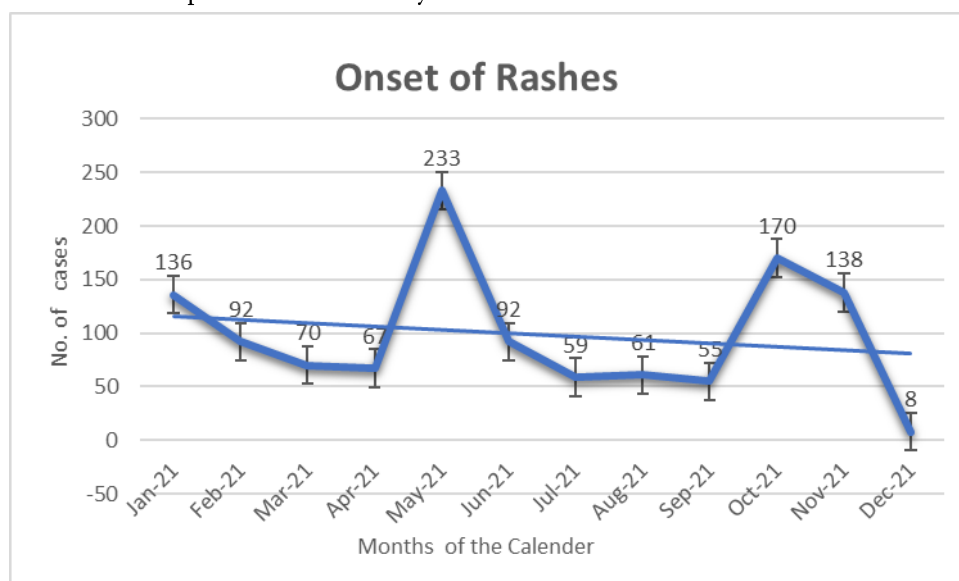


Figure 5 Monthly frequency of Rashes onsets of measles.

Discussion

The study was added n=1180 patients who were already registered as outdoor patents department (OPD) in basic healthcare hospitals of the provinces such as Lower Juba 237 (20%), Lower Shebelle 53 (5%), M Shebelle 13 (1%), Mudug 18 (2%), Bay21 (2%), Galgadud 15 (1%), Middle Shebelle 15 (1%), while Banadir had 808 (68%).

The study exposed that the age group 0-5 was highly affected with measles and recorded as the higher prevalent age group with 72.6%, due to the large number of infants, school hoing children, and young children, weakened immune systems, lack of vaccinations, immature organs, poor hygiene, malnutrition, and regular contact. They were also experienced edema and skin rashes all over the body. In the younger age group from 21 to 25 years measles was recorded (0.33%) in them, due to maintain good hygiene practice (good sanitation) and acquired immunity by vaccination.

We evaluated prevalence in clinically diagnosed Measles (0.25%), Measles Lab-confirmed (85.8%), due to high population ratio with deficient living conditions, poor sanitation, inadequate healthcare access, less vaccination centers, low socioeconomic level, less vaccine campaign and low literacy rates. Despite the low number of measles cases reported in the districts of Bulaburde 1 (0.08%), Balcad 1 (0.08%), Aliyale 1 (0.01%), Moqokori 2 (0.01%), and N/A 5 (0.04%),

We observed the higher number of patients enrolled in the Banadir 628, Due to the advanced treatment facilities, complete furnished environment, state-of-the-art buildings, skilled and trained staff, and measles dealing facilities. District Daynile and Wadjir are not developed comparing to others. The variation in prevalence because of reporting, spread of infection and number of centers reporting etc. The majority of patients were traveled to nearby hospitals or healthcare facilities because N/A (unauthorized/private) 7, A/aziz Health Centre 8, and Waberi

Health Center 8 with low frequency of measles patients admitted and poor facilities, and average healthcare providers.

The study was conducted from 31st July to tenth August 2019. We thoroughly consulted delegates from all families in Bulobacte, gathered data on mortality, births, and populace developments during the review time frame (fifteenth February 2019 to study date), to give assessments of review demise rates. There were 360 mortalities of measles during the 177 days of the review time frame, of which 186 (52%) were among youngsters matured under 5 years. The rough passing rate for the whole review time frame was 0.8 per 10,000-individuals. The under-5 demise rate was 1.8 per 10,000-man, they report high passing rates and commonness of healthiness among this populace, reflecting basically an incomplete disappointment of the different compassionate and legislative entertainers to shield the government assistance of this populace enough. A flare-up of measles and long postponements before enrolment shouldn't have happened ¹⁵.

In the current study, all of the infected patients were suffering from fever as well as with appearance of rashes while at the end of infection termination 99.9% patients become recovered. In year 2020, the frequency of the patients and onset of rashes were reported by healthcare centers in little number, the reason for low frequency was less facilitation for measles and its identification. It was noted that the higher number of measles cases has been reported with onset of rashes due to high number of frequency of patients and good facilities, state started funding for good health facilitation centers, also increase in number of patients due to high fertility rate in Somalia.

The study reported most top rated critical and panic patients with high frequency of measles in Banadir which were (68%) due to high rate of population, low literacy rate, low-income status, lack of awareness, poor sanitation, less vaccination centers, low hygiene status, packed-architect and lack of knowledge for the transmission of disease/infection. Lower Juba was 2nd most infected province that made account for (20%) while, (%), Lower Shebelle 53 (5%), M Shebelle 13 (1%), Mudug 18 (2%), Bay21 (2%), Galgaduud 15 (1%), and Middle Shebelle 15 (1%).

To decide the reasons for febrile fever in kids in an inter-epidemic of measles in a Somalian emergency clinic. Serological tests were performed on sera from (23 Somali youngsters) with febrile illness and from (23 age) matched kids, to quantify the particular (IgM and IgG antibodies) against measles infection. In around 35% of the instances of febrile illness viral could be recognized serologically as the reasonable justification of the illness. Although febrile disease with rash in kids requiring hospitalization is typically thought to be because of measles, there are a few other significant virologic reasons for this condition which should be viewed as in the differential finding ¹⁶.

In May 2021, 130 specimens received at healthcare center laboratories in which 85 were positive for measles IgM antibodies, sign & symptom for measles, in October 105 were received 13 were reported due to negative and high false positive, low sensitivity and specificity rate. In February

2020, 29 specimens received at healthcare center laboratories in which 26 were tested positive for measles IgM antibodies.

Descriptive studies were conducted five years after measles reconnaissance information examination was conducted in the Fafan zone of the Somali locale. A sum of 332 measles cases was distinguished. Among the reported measles cases, 296 (89%) were epidemiologically connected measles cases, 23 (6.9%) were lab confirmed measles cases, 7 (2.1%) were clinically suspected measles cases, and the rest 6 (1.8%) were measles cases (IgM negative cases). Among the complete measles cases; 79 (23.8%) of them were not immunized, 78 (23.5%) of them get immunization with one portion while the inoculation status of the rest around 175 (53 %) of the cases is obscure. The pattern of measles has been on the ascent for the most part influencing kids one as long as four years, and five as long as (14 years). The neonatal and infant immunization would be made easier and safer with a vaccine that does not require needles or syringes and is immune-stimulating in the early stages of life¹⁷.

In May 2021, 130 specimens received at healthcare center laboratories in which 85 were positive for measles IgM antibodies, sign & symptom for measles, in October 105 were received 13 were reported due to negative and high false positive, low sensitivity and specificity rate. In February 2020, 29 specimens received at healthcare center laboratories in which 26 were tested positive for measles IgM antibodies.

Conclusion

We concluded the higher frequencies of measles in children might be weakened immune systems, weak vaccinations plan, poor hygiene, malnutrition, and regular contact, critical and panic patients, low literacy rate, low-income status, lack of awareness, poor sanitation, less vaccination centers, packed-architect and lack of knowledge for the transmission of disease/infection.

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Author contribution

All authors made a significant contribution to the work reported, whether that is in the conceptualization, study design, execution, acquisition of data, data analysis and interpretation, or in all these areas; they took part in writing, revising or critically reviewing the manuscript; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for the contents of the article.

Disclosure

The authors report no conflicts of interest in relation to this work.

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