Viral Etiology of Acute Gastroenteritis In Mozambique, 2014 – 2019

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Abstract

Stool samples collected from National Surveillance of Diarrheal in five sentinel sites in three regions of Mozambique, between May 2014 and December 2019 from 2126 children under 15 years of age with acute gastroenteritis were tested for five different etiological viral. Rotavirus, norovirus, astroviruses and adenovirus was screened by Enzyme immunoassay and reverse transcription-PCR for enteroviruses. Rotavirus was detected in 23.4%, enteroviruses in 14.1%, adenoviruses in 6.3%, astroviruses in 3.3% and norovirus in 2.7%. Rotavirus infection remains the main cause of diarrhea in Mozambique, despite the reduction in cases after the introduction of the rotavirus vaccine.

Main Manuscript

The acute gastroenteritis (AGE) is one of major cause of morbidity and mortality in children and represent large burden in public health systems in Africa. AGE in tropical countries can be caused by a large spectrum of agents such viral, parasitic, and bacterial [1]. In Mozambique, diarrhea is still one of the main causes of death in children, it is estimated that 5,741 children under the age of five died, which corresponds to 7% of the causes of death in children in this age group in 2018 [2].

The viruses are relevant causative agents of diarrhea disease, such rotavirus (RV), norovirus (NV), astrovirus (Ast) and adenovirus (ADV) are associated with AGE [1]. However, RV infection has declined in many countries since the introduction of vaccination program in children's [3–5]. Enterovirus (EV) are still not considered etiological agents of diarrhea in children, despite being identified in recent years in cases of acute gastroenteritis [6–8].

In Mozambique, the contribution of the viral pathogens in acute gastroenteritis are limited in RV and ADV [9, 10]. The aim of the present brief report was to determine the prevalence and distribution of mono and co-infections between viral agents responsible for AGE, namely rotavirus, adenovirus, norovirus, astrovirus and enterovirus agents in Mozambique.

Stool specimens collected from National Surveillance of Diarrheal within 48h of hospitalization from 2126 infants and children attending a pediatrician heath service in four provinces representing three geographic regions of country: Maputo (South Region); Nampula (North Region); Sofala and Zambezia (Central Region) with for gastrointestinal symptoms between May 2014 to December 2019.

The 998 remaining children under 12 months, 711 (12-23 months), 302 (24 – 59 months) and 115 (60-168 months). The median age was 19 months and the incidence in males (59.4%; 1263/2126) was slightly higher than in females (Table 1).

Table 1
Characteristics of samples received at National Surveillance of Diarrheal

Geographic area	No. of samples	Collection period	Median age/gender
Central Region	316	June 2015 to December 2019	24.9/ M-176; F-140
North Region	636	April 2015 to December 2019	17.5/ M-375; F-261
South Region	1174	May 2014 to November 2019	18.3/ M-712; F-462

For each samples taken from participants was tested by enzyme immunoassay (EIA) commercial kit, according to the manufacturer's recommendations, for: rotavirus (ProSpecT ROTAVIRUS TEST, Ref. R240396), adenovirus (ProSpecT ADENOVIRUS TEST, Ref. R240096), astrovirus (ProSpecT ASTROVIRUS TEST, Ref. R240196) and norovirus (IDEIA™ NOROVIRUS, Ref. K604411). Enteroviruses were detected by RT-PCR performed as described previously [11].

Overall, 2126 stool samples from children with gastrointestinal were screened for rotaviruses (23.4%, 498/2126), enteroviruses (14.1%, 69/491), adenoviruses (6.3%, 22/350), astroviruses (3.3%, 10/301) and noroviruses (2.7%, 4/149).

Rotavirus was the major virus found in association with diarrhea between 2014 and 2019 in children with AGE in Mozambique (Figure1a and b). These results are similar to other studies conducted in Botswana, Ghana and India, the data indicated that the majority of the rotavirus infections in children's with AGE [12–14]. EV was the second agent most reported, and the same data was reported in previous studies in Ghana and India [14, 15]. The other pathogens were reported at low frequencies in children, probably they have acquired antibodies against these viruses due to natural exposure [12].

The age group distribution and virus detection rate is shown in Figure 1c. From these data, children less than 12 months had a higher frequency of infection with rotavirus. The results are comparable to other studies conducted in Botswana and Ghana to suggest the importance of rotavirus etiology in developing countries [12, 13].

Duble infections were found in 3.4% (20/588) positive samples. The combination's rotavirus with one of the other four viruses was the majority (85%) followed by enterovirus (60%) (Figure 1d). Mixed infections have previously been reported in Germany, France and Japan, however it is still not clear whether this infection is more serious than mono-infection and always at very low prevalence [7, 16, 17].

Rotavirus occurred every year, with a peak during the dry season (April to September). High rotavirus circulation in this period was reported in studies conducted in other African countries such as Botswana and Ghana respectively [12, 13].

After the introduction of the rotavirus vaccine in Mozambique (September 2015) there has been a reduction in rotavirus cases, but it remains the main etiological agent (Figure 1e) [10].

The main limitations were the availability of a sufficient sample for testing and the use of molecular methods to screen all analyzed viruses. In conclusion, this is the first report of five viruses in AGE in Mozambique. Rotavirus remains the main etiological agent, and the need to continue surveillance to monitor the trend and seasonality of this virus in children.

Declarations

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Conflict of interest

All authors have declared no conflict of interest.

Ethical approval

The protocol of surveillance was reviewed and approved by the National Bioethics Committee for Health in Mozambique (IRB00002657, reference number 348/CNBS/13).

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Figures

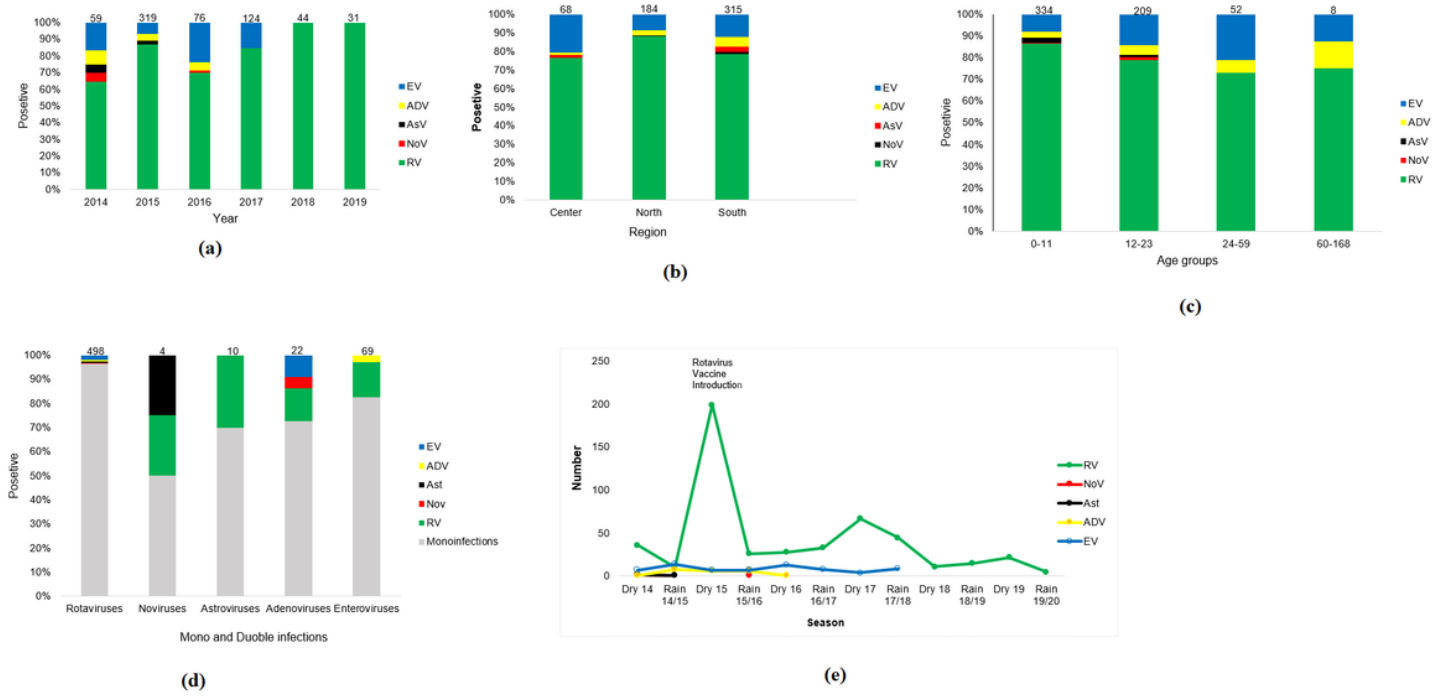

Figure 1

a) Temporal distribution of positive samples. b) Distribution of positivity by provenience. c) Distribution of positivity by age groups d) Distribution of single and mixed infections. e) Season distribution of positive sample during the period study.