

## Epidemiological Report

# Rotavirus

Historic Séries 2010 – 2021

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## BRIEF HISTORY

Rotavirus is an enterovirus associated with acute diarrheal diseases (ADD), affecting humans and several species of mammals and birds. It is a highly transmissible virus whose clinical manifestations range from mild conditions, with liquid diarrhea and limited duration, to severe, with dehydration, fever and vomiting, and asymptomatic cases may also occur.

Worldwide, many deaths in children under 5 years of age are attributable to rotavirus, and an estimated 40% of hospitalizations are due to severe diarrhea. Thus, in 2006, Brazil implemented rotavirus surveillance in this age group, especially those under 2 years of age. Infections involving children aged 5 years and older and adults are commonly outbreak-related or occur in at-risk population groups, such as travelers to endemic/epidemic areas, individuals working in enclosed spaces such as day care centers, nurseries, schools, and hospitals, and communicators of sick children, elderly and immunocompromised people.

Although cases are concentrated in developing countries, the virus is universally distributed, infecting children and adults from different social classes. Despite this, the prevalence of strains varies by geographic area and is influenced by climate, with greater occurrence in the autumn and winter months in temperate regions, but without a well-defined seasonality in tropical areas, and cases may occur throughout the year.

## ETIOLOGICAL AGENT

It is a virus of the *Reoviridae* family, of the Rotavirus genus, identified in 1973. They are serologically classified into groups, subgroups and serotypes. The rotavirus genome is composed of 11 double-stranded RNA genes, which encode six structural proteins and five non-structural proteins.

Since then, seven groups (A-G) have been identified, with groups A, B, and C associated with the disease in humans, in addition to several other animal species. Group A is the one with the best characterization and predominance in nature, for which commercial diagnostic kits were developed (ELISA, *enzyme linked immunosorbent assay*). They have a common group antigen, located in the VP6 component, in the intermediate capsid, detectable by most serological tests.

This protein also determines the subgroup (I, II, I and II, not I – not II) to which the strain belongs. Serotypes are determined by two proteins (VP4 and VP7) located in the outer capsid. Of the 14 known G (VP7) serotypes, 10 have been described as human pathogens, while types G1 to G4 are the most frequently found worldwide.

Serotypes G5, G6 and G10, which were found exclusively as animal pathogens, have also been isolated in humans. In the 1980s and 1990s, serotype G5 was detected in segments of the Brazilian population. In a global review of circulating G and P genotypes, there was the predominance of the G1P[8] genotype, with the emergence of the G9 genotype in different countries. Currently, the G2P[4] genotype is predominant throughout Brazil.

## TRANSMISSION MODE

Rotaviruses are eliminated in high concentration in the feces of infected people. Transmission occurs mainly via the fecal-oral route, both through person-to-person contact and through objects and surfaces in contaminated collective environments.

There is also the possibility of being transmitted by other modes, such as respiratory droplets and contaminated food/water.<sup>1</sup> It may have a three-day incubation period, but usually occurs in less than 48 hours, and is transmitted for approximately two weeks.

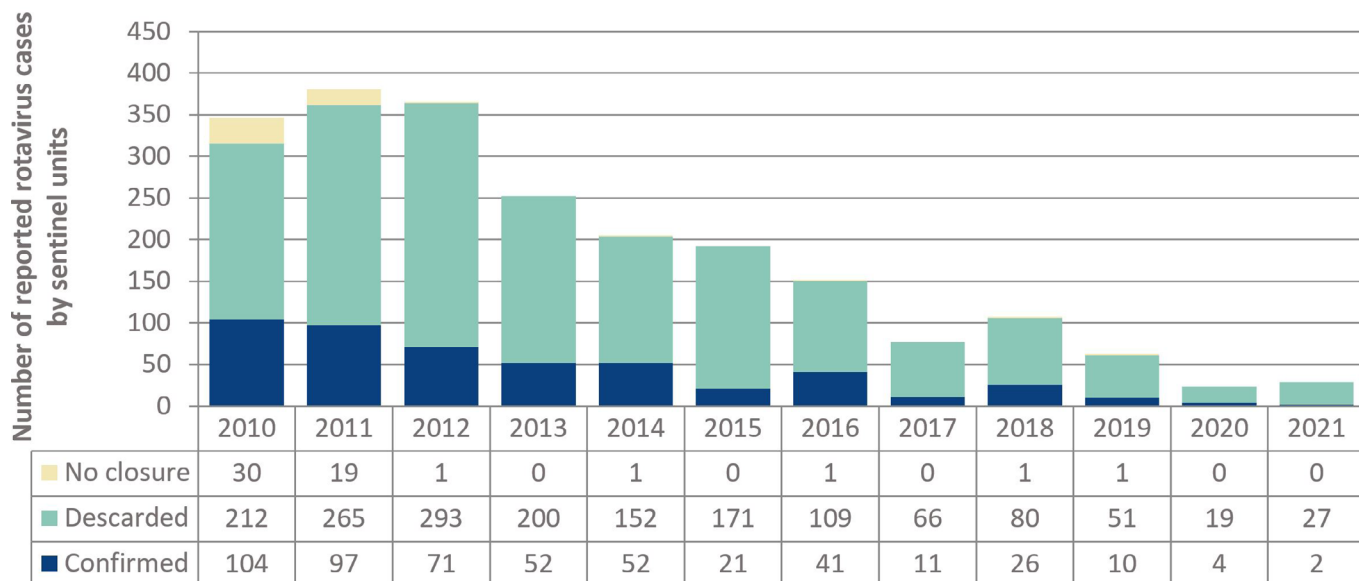
## EPIDEMIOLOGICAL SITUATION

It is known that each year these viruses cause millions of cases of diarrhea in the world, so that rotavirus A is responsible for more than 90% of gastroenteritis in humans. In Brazil, surveillance is based on the epidemiological investigation of individual cases of children under 5 years of age who have acute diarrheal diseases treated in sentinel units, usually hospitals, as hospitalized patients are the most serious. In addition, it is relatively easier to carry out proper sample collection, storage and transport.<sup>2</sup>

The state of São Paulo (SSP) has three sentinel hospitals for surveillance of rotavirus, two of them located in the capital of São Paulo (Campo Limpo and São Luiz Gonzaga municipal hospitals) and the other in São José do Rio Preto (Santa Casa de Misericórdia). Currently, rotavirus surveillance in the SSP is in the process of being reorganized, with the possibility of expansion being analyzed.

From 2010 to 2021, the sentinel units carried out 2,190 notifications of children under 5 years of age who met the recommended case definition. Of this total, 1,645 were discarded (75.1%), 491 were confirmed (22.4%) and 54 (2.5%) had not yet been properly closed in the system ([Graph 1](#)). It is observed that over the period evaluated there is a decrease in notifications, as well as in the number of confirmed cases, among those registered by the sentinel units.

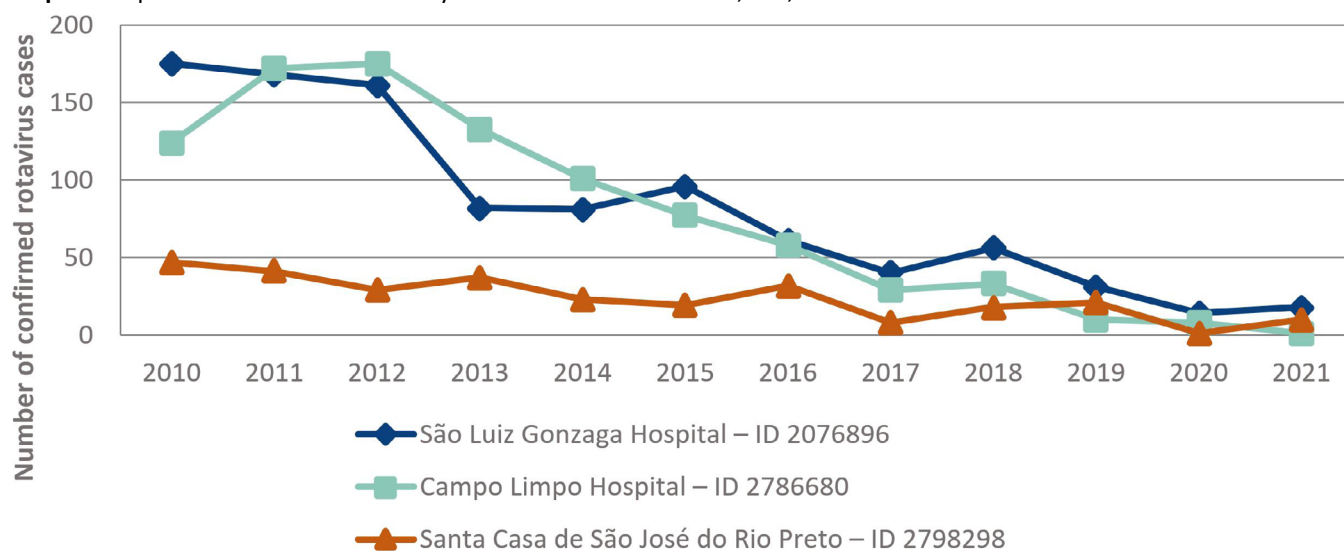
**Graph 1.** Number of reported rotavirus cases by sentinel units, SSP, 2010 to 2021.\*



Source:DFWD/ESC/SHD-SP. \*Data extracted from Sinan and handled by DFWD on June 21, 2022.

It is important to note that with the covid-19 pandemic, the data verified in 2020 and 2021 may not reflect the closest reality of the occurrence of cases, especially last year, which had a slightly higher number of notifications compared to the year before last. This behavior is also observed when analyzing the data per notification sentinel unit (Graph 2), with the units located in the capital of São Paulo having the highest number of records.

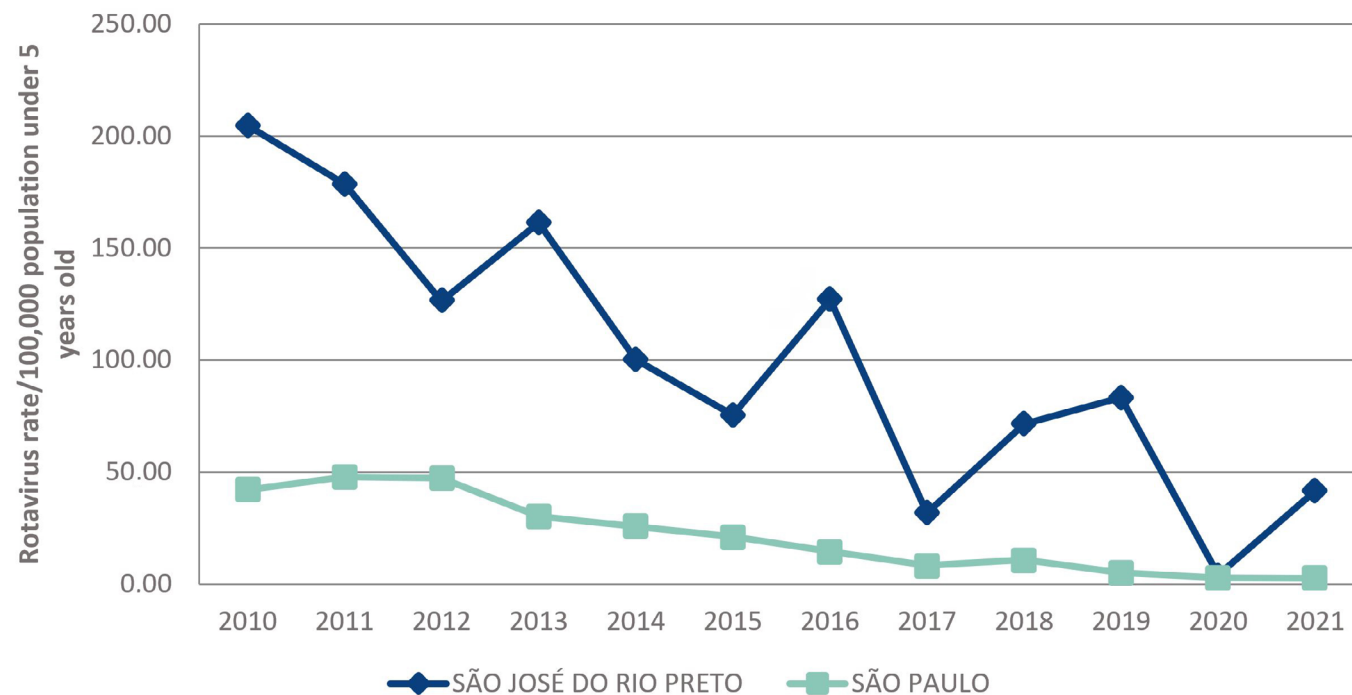
**Graph 2.** Reported cases of rotavirus by notification sentinel unit, SSP, 2010 to 2021.\*



Source:DFWD/ESC/SHD-SP. \*Data extracted from Sinan and handled by DFWD on June 21, 2022.

However, when observing the notification rate by municipality, considering the data on the population under 5 years old extracted from Fundação Seade, the highest rates are observed in the municipality of São José do Rio Preto (Graph 3).

**Graph 3.** Rotavirus notification rate municipality of notification, SSP, 2010 to 2021.\*



Source:DFWD/ESC/SHD-SP. \*Data extracted from Sinan and handled by DFWD on June 21, 2022.

Although rotavirus surveillance notifications are currently concentrated in cities in the state of São Paulo, the sentinel units end up providing care to citizens from other states, so that when observing the volume of confirmed cases, in the evaluated period, the capital of São Paulo concentrates the largest gross number of cases over the years ([Table 1](#)).

**Table 1.** Number of confirmed rotavirus cases reported in sentinel units by municipality of residence, SSP, 2010 to 2021.\*

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
EMBU DAS ARTES	-	1	-	1	1	-	-	-	-	-	-	-
EMBU-GUAÇU	-	-	-	1	-	-	-	-	-	-	-	-
GUARULHOS	6	6	2	3	5	-	1	1	2	1	-	-
ITAPECERICA DA SERRA	-	-	-	-	-	-	-	1	-	-	-	-
MIRASSOL	-	-	-	1	-	-	-	-	-	-	-	-
MONTE APRAZÍVEL	-	-	-	-	-	-	-	-	-	-	-	1
PONTES GESTAL	-	-	-	-	1	-	-	-	-	-	-	-
SÃO JOSÉ DO RIO PRETO	8	5	2	3	9	1	12	-	2	-	-	-
SÃO PAULO	85	85	66	43	36	20	28	9	22	9	4	1
TABOÃO DA SERRA	5	-	1	-	-	-	-	-	-	-	-	-

Source:DFWD/ESC/SHD-SP. \*Data extracted from Sinan and handled by DFWD on June 21, 2022.

However, when the incidence rate per 100,000 inhabitants under 5 years of age is verified, according to data from Fundação Seade, there is variation over time (Table 2).

**Table 2.** Rotavirus incidence by municipality of residence, SSP, 2010 to 2021\*.

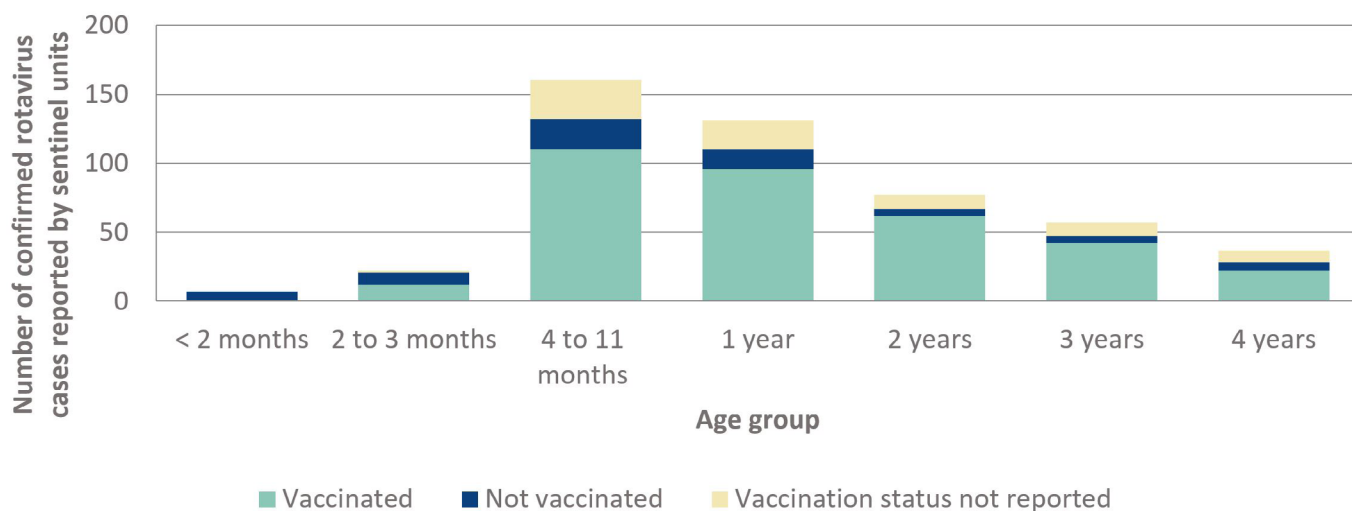
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
EMBU DAS ARTES	0.00	5.36	0.00	5.36	5.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EMBU-GUAÇU	0.00	0.00	0.00	22.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GUARULHOS	6.70	7.81	2.23	3.35	5.58	0.00	1.01	1.01	2.02	1.01	0.00	0.00
ITAPECERICA DA SERRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.55	0.00	0.00	0.00	0.00
MIRASSOL	0.00	0.00	0.00	32.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MONTE APRAZÍVEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.82
PONTES GESTAL	0.00	0.00	0.00	0.00	684.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SÃO JOSÉ DO RIO PRETO	34.87	26.16	8.72	13.08	39.23	3.97	47.65	0.00	7.94	0.00	0.00	0.00
SÃO PAULO	12.39	13.65	9.29	6.05	5.07	2.44	3.42	1.10	2.69	1.10	0.52	0.13
TABOÃO DA SERRA	27.85	0.00	5.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source:DFWD/ESC/SHD-SP. \*Data extracted from Sinan and handled by DFWD on June 21, 2022.

But we can highlight the high incidences of the disease in this age group in Pontes Gestal (684.93/1,000,000 inhabitants), in 2014, and in Monte Aprazível (83.82/1,000,000 inhabitants), 2021

The occurrence of cases is concentrated in children aged 4 to 11 months (32.6%) ([Graph 4](#)), of which 70.1% had some dose of vaccine.

**Graph 4.** Confirmed rotavirus cases by age group and sex, SSP, 2010 to 2021\*.



Source:DFWD/ESC/SHD-SP. \*Data extracted from Sinan and handled by DFWD on June 21, 2022.

In this sense, it should be clarified that the human rotavirus vaccine protects against complications resulting from rotavirus infection, including extraintestinal ones involving the central nervous system, so that cases of rotavirus can be detected regardless of the vaccination status.

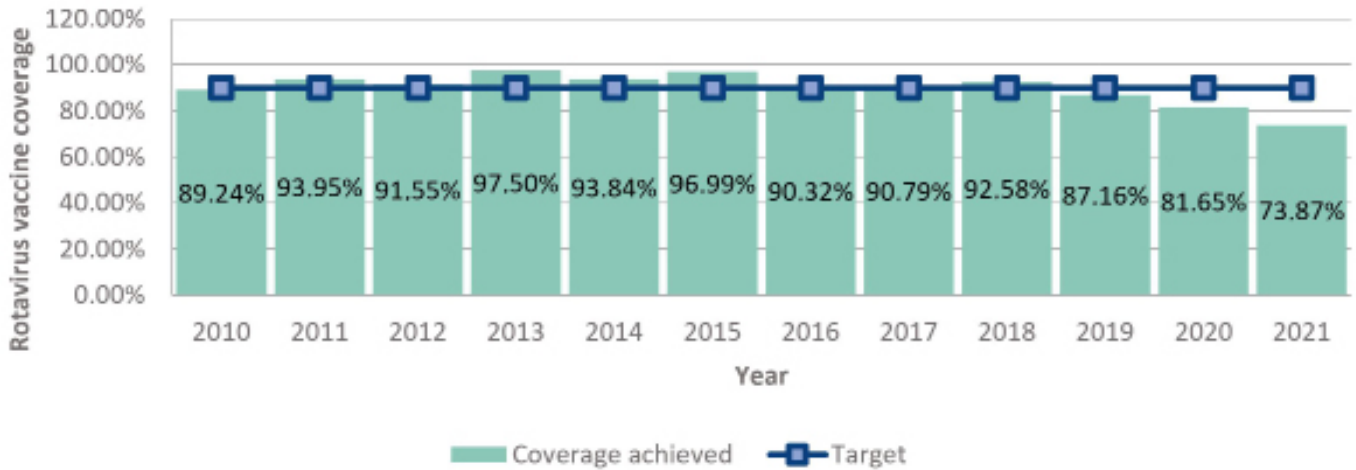
In addition to the sanitary measures already recommended for the prevention of acute diarrheal diseases, the encouragement of breastfeeding is of fundamental importance due to the high levels of maternal antibodies against rotavirus in this food.<sup>1</sup>

Still on vaccination, the regimen against rotavirus consists of two doses, orally, the first at 2 months and the second at 4 months of age, with a minimum interval of 30 days. The first dose can be administered from 1 month and 15 days to 3 months and 15 days of age, the second from 3 months and 15 days to 7 months and 29 days of age and is not recommended outside the established age group.

It is noteworthy that the administration of the dose should not be repeated when the child regurgitates, vomits, spits out or if the vaccine is outside the defined deadlines, that is, it is necessary to consider the valid dose. Regarding rotavirus vaccine coverage in the SSP, in the evaluated period, the target of 90% was not reached in 2010, and the same has happened since 2019 ([Graph 5](#)).

The importance of vaccination is reinforced since the drop in vaccine coverage has been observed not only in the state of São Paulo, but nationally, since 2016, for all vaccines considered “routine” by the National Immunization Program, that should be applied even in childhood.

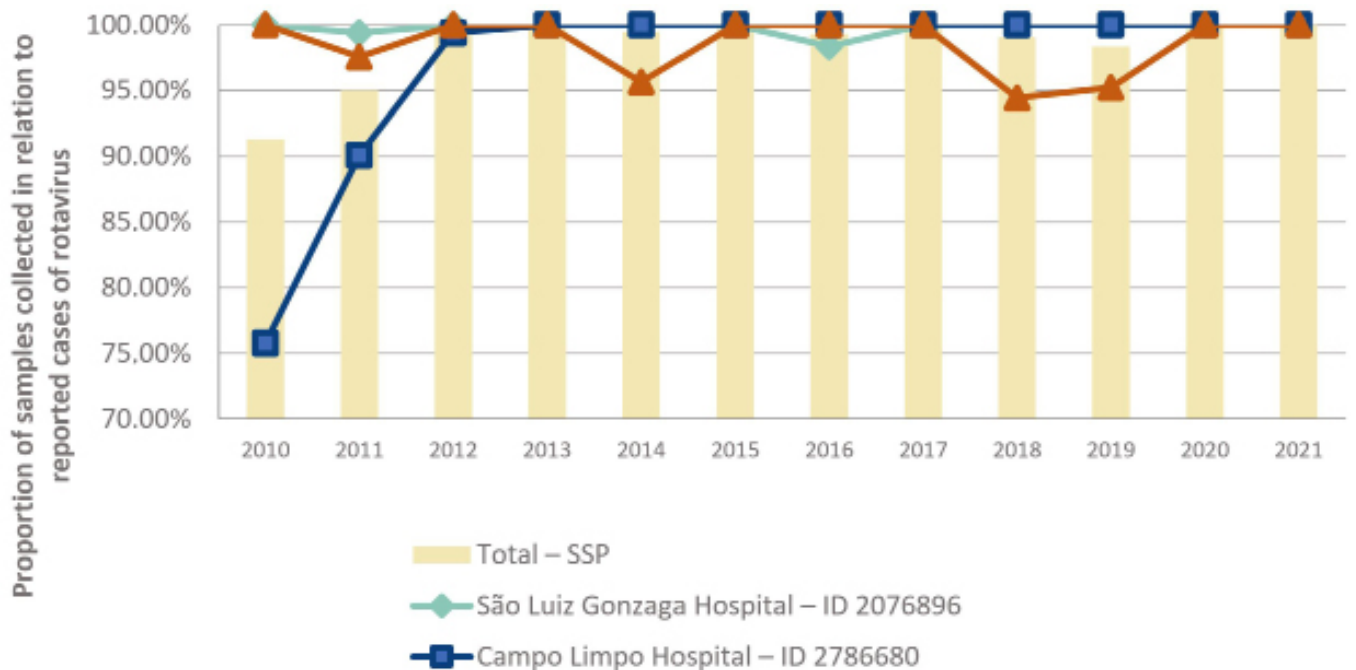
**Graph 5.** Vaccination coverage and coverage target, SSP, 2010 to 2021\*.



Source: National Immunization Program Information System (SI-PNI/CGPNI/DEIDT/SVS/MS). \*Data extracted on July 22, 2022.

It is worth mentioning that for the detection of rotavirus it is recommended that the collection of feces be performed. Analyzing the period from 2010 to 2021, it is inferred that all reporting units, as of 2012, reach percentages above 90% with regard to the proportion of samples collected in relation to the total number of reported cases (Graph 6).

**Graph 6.** Proportion of stool samples collected in relation to reported cases of rotavirus, SSP, 2010 to 2021\*.



Source: DFWD/ESC/SHD-SP. \*Data extracted from Sinan and handled by DFWD on June 21, 2022.



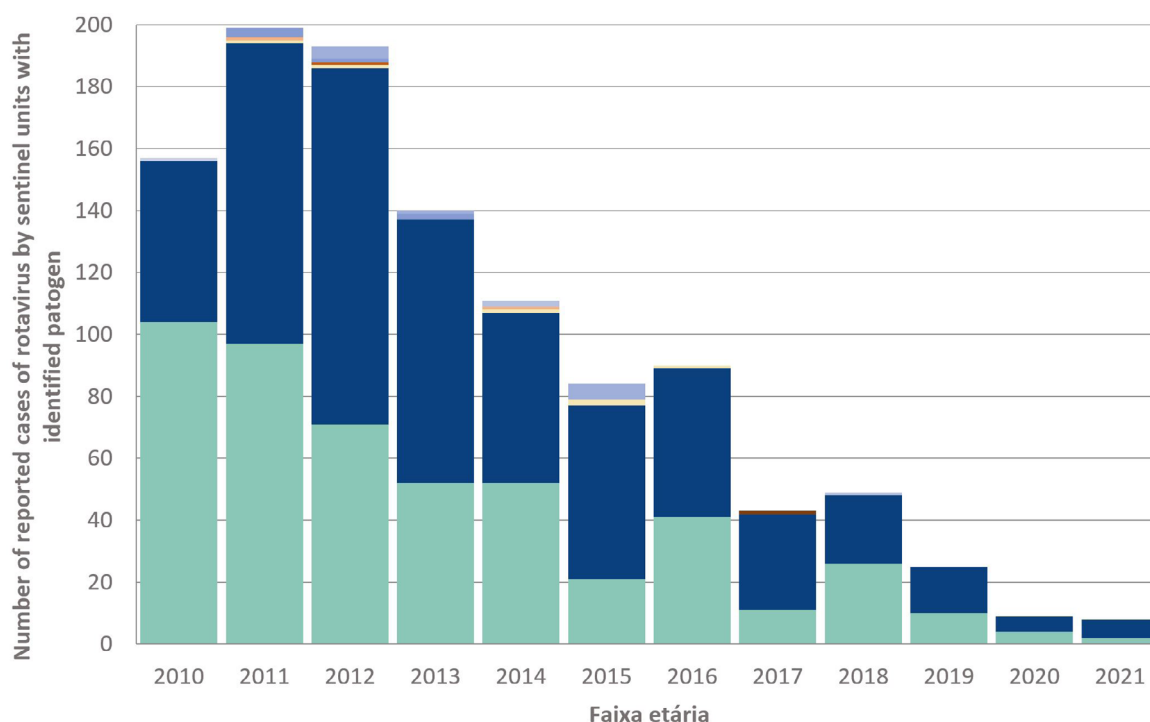
With the collection of feces, analyzing the data entered in Sinan in the evaluated period it is possible to conclude that among the 1,645 discarded cases, in 587 another virus was detected, the norovirus, which represents 35.7% of discarded cases, also being possible to detect bacteria in 29 occurrences (six of *E. coli* patogênica; one of *Samonella enteritidis*; one of *Salmonella agona*; two of *Salmonella* spp; six of *Shigella flexneri*; ten of *Shigella sonnei*; and three of *Shigella* spp). In only one case was the parasite *Giardia lamblia* detected.

## PREVENTION MEASURES

The prevention of rotavirus is currently based on the administration of the vaccine in children under 1 year of age. The purpose of this measure is to reduce hospitalization of cases for severe diarrhea in the group of children under 5 years of age, as well as to reduce mortality and morbidity from the disease.

Other prevention actions are related to basic hygiene: washing hands with soap and water, especially before meals and after using the bathroom, changing diapers, breastfeeding, handling and preparing food, contact with animals, as well as eating sanitized food and treated water.

**Graph 7.** Pathogens identified in reported cases for rotavirus in sentinel units, SSP, 2010 to 2021\*.



Source: DFWD/ESC/SHD-SP. \*Data extracted from Sinan and handled by DFWD on June 21, 2022.

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