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Surveillance of Acute Flaccid Paralysis (AFP) In the O'higgins Region, Epidemiological Weeks 1 to 52 of 2022

Dra. Marie Jesie Carrillo[1]

[1]Departamento de Enfermería Universidad de Chile.
ORCID: https://orcid.org/0000-0002-8675-6778
Email ID: marie.carrillo@uchile.cl

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ABSTRACT

Summary: The surveillance of acute flaccid paralysis (AFP) is essential for detecting cases of poliomyelitis, an infectious disease that primarily affects children under 5 years of age. In Chile, confirmation is conducted by the Public Health Institute, which requires stool samples to be collected within the first two weeks following the onset of paralysis. The O'Higgins Region has a population with a high percentage of rural areas and inadequate access to drinking water. This study focused on evaluating the epidemiological surveillance of AFP in the region during 2022, analyzing various variables such as municipality, sex, and age of the cases, as well as the notification rate and other quality indicators.

Results And Analysis: During the study period, it was observed that the cases of AFP in the O'Higgins Region had a notification rate in individuals under 15 years of age that was higher than the national level and 2.5 times more than the level recommended by PAHO/WHO. Regarding the quality of surveillance, the O'Higgins Region shows the same national trend concerning compliance with indicators, revealing critical nodes.

Keywords: *Acute flaccid paralysis, poliomyelitis, epidemiological surveillance, vaccination coverage, enterovirus*

1. INTRODUCTION

The surveillance of acute flaccid paralysis (AFP) is the primary mechanism for detecting cases of poliomyelitis worldwide (1). Poliomyelitis is an infectious disease caused by the poliovirus, which belongs to the enterovirus family and has three antigenic types: 1, 2, and 3. It primarily affects children under the age of 5. Most infections are mild and cannot be distinguished from other causes; however, one in every 200 infections manifests as irreversible paralysis, potentially affecting the nervous system and causing paralysis within hours (2,3). Confirmation of this disease in the acute phase requires laboratory confirmation, as culturing the virus from stool samples is the most sensitive and effective method for ruling out the transmission of wild poliovirus or vaccine-derived virus (1). In Chile, the poliovirus laboratory at the Public Health Institute (ISP) is certified by the Pan American Health Organization (PAHO)/World Health Organization (WHO) and is responsible for carrying out this task at the national level, being a permanent member of the global laboratory network supporting the eradication of the poliovirus (4). The surveillance of AFP includes collecting a stool sample from the case as soon as it is determined to be a probable case, as the virus can be detected in the stool within a period of 72 hours to six weeks after infection, with a high probability of detection within the first two weeks after paralysis begins. The timing of stool sample collection is one of the quality indicators for AFP surveillance proposed by PAHO/WHO (5). The O'Higgins Region is part of the central macrozone of the country, located approximately between 34° and 35° south latitude, covering an area of 16,387 square kilometers. From a political-administrative perspective, the region is composed of three provinces: Cachapoal, Colchagua, and Cardenal Caro, which together encompass a total of 33 municipalities, with Rancagua as its regional capital (6). According to the 2022 National Socioeconomic Categorization Survey (Casen), its population accounts for 5.3% of the total population of the country, with 75.3% of the general population living in urban areas, while the remaining 24.7% reside in rural areas, making it one of the regions with the highest prevalence of rural population at the national level. Regarding inadequate access to drinking water (septic tank or others), the region corresponds to 10.9%, resulting in a 28.4% increase compared to the national level (6,7). The general objective of this study was to evaluate the Epidemiological Surveillance of AFP in the O'Higgins Region in 2022, through categorization by municipality, sex, and age range, notification rates, and quality indicators of AFP.

2. METHODOLOGY

For this study, a descriptive analysis of AFP case notifications was conducted for the year 2022. The data source used was the Epivigila databases, both validated and incomplete, which were consolidated to obtain a total of 79 notifications in 2022. Crude notification rates for the year under study were calculated by region per 100,000 inhabitants under 15 years of age. Population data correspond to the 2017 population projections by age group and sex from the National Institute of Statistics (INE). Microsoft Excel 365 was used for the analysis to calculate central measures (mean, median, range), crude notification rates, and other variables such as sex and region of residence, using frequency measures such as counts and percentages. In Chile, the Technical Standard No. 55 for the Surveillance of Communicable Diseases establishes the guidelines for developing epidemiological surveillance of AFP (8). This is legally supported by Supreme Decree No. 7 of March 12, 2019 (DS7/2019), which approves the regulation for the notification of mandatory communicable diseases and their surveillance. This decree stems from Title II, Paragraph I, Article 21 of the Health Code, which states that "a regulation will determine the communicable diseases that must be mandatorily reported to health authorities, as well as the manner and conditions of notification." According to this regulation, AFP syndrome is subject to universal surveillance, meaning that all AFP cases must be immediately reported upon detection. This regulation aligns with the guidelines of PAHO/WHO (9), which establish the following quality indicators for AFP surveillance:

- ✓ Notification rate: A notification rate of at least 1 AFP case per 100,000 children under 15 years of age must be maintained.
- ✓ Timely notification: This indicator measures the interval between hospitalization and notification, which should be equal to or less than 24 hours from the time the case was hospitalized.
- ✓ Timely investigation: This indicator establishes that every AFP case in children under 15 years of age must be investigated within 48 hours of notification.
- ✓ Timely sample collection: This indicator establishes that for every reported AFP case in children under 15 years of age, a fecal sample must be collected within 14 days of the onset of AFP.
- ✓ Timely follow-up: This indicator establishes that every AFP case in children under 15 years of age must undergo follow-up at 60 days to verify possible sequelae compatible with poliomyelitis.
- ✓

The case definitions used are described in Circular B 51/18: "Update on the epidemiological surveillance of poliomyelitis and monitoring of Guillain-Barré syndrome" dated May 4, 2010 (10).

- ✓ Suspected AFP case: Any case of acute flaccid paralysis (AFP) syndrome or paralytic illness in a person of any age that is not attributable to severe trauma.
- ✓ Confirmed poliomyelitis case: When an adequate stool sample was not obtained from a suspected case within the two weeks following the onset of paralysis, and there is acute paralytic illness with residual paralysis compatible with poliomyelitis after 60 days, or death occurs within 60 days, or the case is not followed up.
- ✓ Vaccine-associated paralytic poliomyelitis case:
    - o AFP case attributed to the vaccine virus that meets the following criteria: - Clinically typical of poliomyelitis, including sequelae.
    - o The individual received the Oral Polio Vaccine (OPV) between 4 and 40 days before the onset of paralysis.
    - o Vaccine-derived poliovirus was isolated in stool samples.
    - o The implicated OPV dose is likely the first dose.
- ✓ Discarded case (non-poliomyelitis): A case of acute flaccid paralysis with adequate sample(s) collected within 14 days of the onset of motor deficiency, in which no wild poliovirus was isolated (within less than 4 days).
- ✓ Contact: Any child under 5 years of age who has not received OPV in the 30 days preceding the onset of paralysis in the probable case and shares epidemiological risks.
- ✓ At-risk case: A case in a child under 6 years of age presenting with fever and asymmetric, sudden-onset AFP at the onset of paralysis.
- ✓ Confirmed Guillain-Barré Syndrome case: A suspected case with or without residual paralysis or weakness, confirmed through diagnostic methods such as cerebrospinal fluid (CSF) analysis and electrophysiological tests.

3. RESULTS

Tables 1 and 2 present characteristics of individuals under 15 years of age with AFP and their distribution by sex and age

groups. It was observed that the population with the highest number of cases corresponds to males (Table 1), accounting for 75% (n=4) during the year 2022. Among the reported cases, the primary age group affected is the 6-14 years range, with 100% (n=5), a median age of 12 years, and an age range of 8 to 14 years (Table 2)

Table No 1: Number of Cases and Distribution of AFP by Gender in the O'Higgins Region in the Year 2022.

	2022	
Sex	**N° Cases**	**%**
Man	4	75%
Woman	1	25%
Total	**5**	**100%**

Source: Epivigila System. Epidemiology Department, MINSAL, August 23, 2023

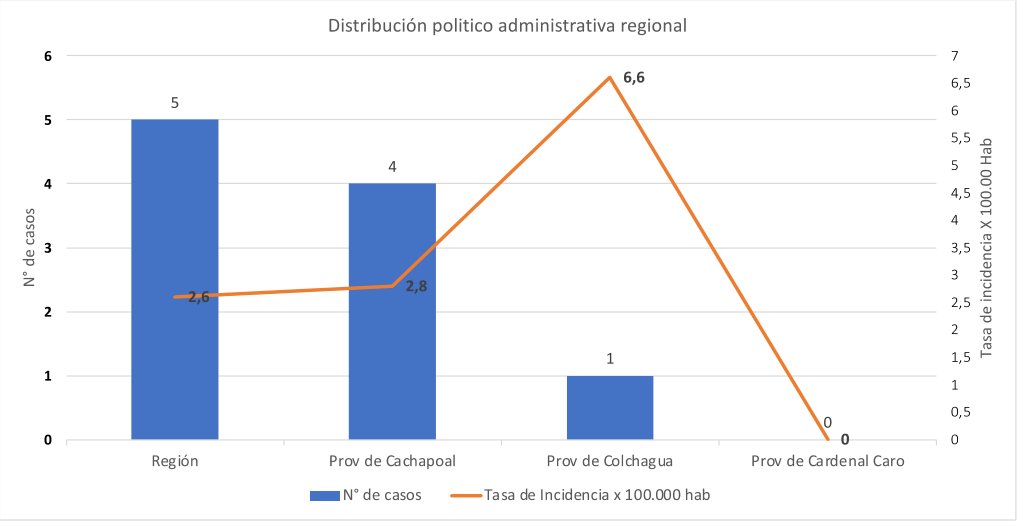
Table No 2. Number of cases and distribution of AFP by age range in the O'Higgins Region in the year 2022

	2022	
Age range	**N° Cases**	**%**
0-11 months	0	0
1-5 ear	0	0
6-14 ear	5	100
Total	**5**	**100%**

Source: Epivigila System. Epidemiology Department, MINSAL, August 23, 2023

In Figure No. 1, the regional and provincial distribution of the number of cases and notification rate of AFP cases during the year 2022 is shown. The region reported a AFP notification rate of 2.6 per 100,000 inhabitants during the review period. The province of Cachapoal recorded the highest number of cases in the O'Higgins Region (4 cases).

Figure No.1: Number of cases and Notification Rate of AFP by Region and Provinces in the O'Higgins Region in the year 2022.



Source: Epivigila System. Epidemiology Department, MINSAL, August 23, 2023

When evaluating the communal distribution (Table 3), it was observed that the only municipalities with reported cases were Rancagua, Doñihue, Graneros, Rengo, and San Fernando

Table No 3: Number of cases and gross notification rate of AFP by municipality of residence in the O'Higgins Region, in the year 2022.

Comunas	No. Cases	Population < 15 years	Incidence rate
Rancagua	1	52.451	1,9
Codegua	0	2.860	0,0
Coinco	0	1.376	0,0
Coltauco	0	4.186	0,0
Doñihue	1	4.636	21,6
Graneros	1	8.027	12,5
Las Cabras	0	5.001	0,0
Machalí	0	14.386	0,0
Malloa	0	2.477	0,0
Mostazal	0	5.643	0,0
Olivar	0	2.863	0,0
Peumo	0	2.740	0,0
Pichidegua	0	3.686	0,0
Quinta de Tilcoco	0	2.521	0,0
Rengo	1	12.729	7,9
Requínoa	0	6.318	0,0
San Vicente	0	9.321	0,0
Cachapoal	4	141.221	2,8
Pichilemu	0	3.223	0,0
La Estrella	0	471	0,0
Litueche	0	1.113	0,0
Marchihue	0	1.224	0,0
Navidad	0	1.022	0,0
Paredones	0	895	0,0
Cardenal Caro	0	7.948	0,0
San Fernando	1	15.758	6,4
Chépica	0	2.746	0,0
Chimbarongo	0	7.127	0,0
Lolol	0	1.163	0,0
Nancagua	0	3.622	0,0
Palmilla	0	2.297	0,0

Peralillo	0	2.040	0,0
Placilla	0	1.624	0,0
Pumanque	0	436	0,0
Santa Cruz	0	7.651	0,0
Colchagua	1	44.464	6,6
Total	**5**	**193.633**	**2,6**

Source: Epivigila System. Epidemiology Department, MINSAL, August 23, 2023

In Table 4, the surveillance indicators for AFP in the communes of the O'Higgins region that reported cases of AFP are presented, with the commune of Rengo standing out as the only one to obtain a diagnostic sample. Regarding the follow-up of cases to rule out residual paralysis, 100% of the cases are monitored; however, 2 out of the 5 communes do not have follow-up at 60 days, which is associated with the lack of diagnostic sample collection

Table No 4: Case monitoring indicator for AFP in individuals under 15 years old, in Chile, in the O'Higgins region during the year 2022.

	Communes O'Higgins				
AFP Surveillance Indicators	**Rancagua**	**Doñihue**	**Graneros**	**Rengo**	**San Fernando**
Number of AFP cases	1	1	1	1	1
AFP case rate	1,9	21,6	12,5	7,9	6,4
Case investigated within 48 hours	1	1	1	1	1
Samples obtained within 14 days	0	0	0	1	0
Case under follow-up	1	1	1	1	1
Case under follow-up at 60 days	0	1	1	1	0
Final diagnosis	Sd. Guillain Barré	Sd. Guillain-Barré	Sd. Guillain-Barré	Sd. Guillain-Barré	Sd. Guillain-Barré

AFP Rate: Number of AFP cases per 100,000 children under 15 years old

Source: Epivigila System. Epidemiology Department, MINSAL, August 23, 2023

Tables 5 and 6 present the quality indicators for AFP surveillance for individuals under 15 years of age at the national level between the years 2020 and 2022. Although the analysis pertains to the O'Higgins region during the year 2022, it is deemed necessary to make a comparison with the national data. When compared to the national figures, a notification rate greater than 1 per 100,000 inhabitants was observed for individuals under 15 years, reaching 100% above the recommended level in 2022, with over 15% of cases investigated after 48 hours and only 54.4% presenting an adequate sample for surveillance (Table 5). Regarding case follow-up, during the period, 100% follow-up was not conducted for all cases. In 2022, follow-up was performed for only 46% (n=36) of cases, and of these, 41.6% (n=15) met the quality indicator for surveillance. It is noteworthy that in 2022, there was an increase of 21 cases of AFP without follow-up and without samples compared to the previous year (Table 6).

Table No 5: Surveillance indicators of AFP in individuals under 15 years old in Chile, between the years 2020 and 2022.

Year	No. Cases AFP	AFP rate	% investigated cases <48 hours	% cases with a sample < 14 days
2020	60	1,6	88	50
2021	50	1,3	98	44
2022	79	2,1	83,5	54,4

AFP Rate: Number of AFP cases per 100,000 children under 15 years old

Source: Epivigila System. Epidemiology Department, MINSAL, August 23, 2023

Table No 6: Indicator for monitoring AFP cases in individuals under 15 years old in Chile, between the years 2020 and 2022

Year	No. cases AFP	No cases within follow-up	No cases within follow-up at 60 days	% cases within follow-up at 60 days	No cases without follow-up at 60 days without adequate sample
2020	60	25	11	44,0	12
2021	50	26	8	30,7	9
2022	79	36	15	41,6	30

AFP Rate: Number of AFP cases per 100,000 children under 15 years old

Source: Epivigila System. Epidemiology Department, MINSAL, August 23, 2023

When considering the differential diagnosis for poliomyelitis, Guillain-Barré syndrome remains the primary diagnosis to rule out.

Table No 7: Cases of AFP in individuals under 15 years old, ruled out for poliomyelitis, according to the final diagnosis in Chile, between the years 2020 and 2022.

Year	No cases AFP	Sd. Guillain-Barré	Trauma	Tumor	Transverse Myelitis	Other	Unknown
2020	60	44	1	1	1	13	0
2021	50	38	0	0	1	11	0
2022	79	53	0	0	1	23	2

AFP Rate: Number of AFP cases per 100,000 children under 15 years old

Source: Epivigila System. Epidemiology Department, MINSAL, August 23, 2023

4. DISCUSSION

During the study period, it was observed that the cases of Acute Flaccid Paralysis (AFP) in the O'Higgins Region have a notification rate in individuals under 15 years of age that is higher than the national level and 2.5 times more than the level recommended by PAHO/WHO (11). However, while the poliomyelitis surveillance strategy is based on the notification of cases of Acute Flaccid Paralysis (AFP), ensuring its effectiveness requires compliance with quality indicators of surveillance (1). Achieving certification for the global eradication of poliomyelitis requires countries to align with the call for the "Global Strategic Plan for the Final Phase of Polio Eradication PAHO/WHO" (GPEP) (5). To fulfill this, it is important, among other aspects, to conduct high-quality AFP surveillance, allowing for the demonstration of the maintenance or interruption of the circulation of polioviruses. Regarding the quality of surveillance, the O'Higgins region shows the same national trend concerning compliance with indicators, revealing critical nodes. Observing Tables 4, 5, and 6, difficulties are evident in

obtaining samples and following up on cases, actions necessary for ruling out residual paralysis. Nationally, from 2020 to 2022, an average of 31 AFP cases per year with sample collection is evident, which corresponds to only 50%. Analyzing the behavior of the case follow-up indicator, it is concluded that only an average of 29 cases per year are followed up, representing 46%, and of these, only 11 cases on average receive timely follow-up, that is, within 60 days. In the O'Higgins region, during 2022, of the 5 AFP cases, no stool samples were obtained for 4 of them, and of these, 2 cases did not receive timely follow-up (Table 4). This situation exposes AFP surveillance to risk, where only 1 out of the 5 AFP cases in children under 5 years had a sample collected; this risk unfortunately aligns with the national situation, as shown in Tables 5 and 6. The limitations of the study stem from the database provided by the Epivigila platform, which does not incorporate patient follow-up data, obtained through communication between territorial referents and the central level, via "Annex 2," described in the technical regulations (12). Another limitation is the database itself, which is operator dependent.

5. CONCLUSIONS

AFP surveillance is the priority mechanism for detecting poliomyelitis cases worldwide. This disease causes severe disability in the child population and is on the path to eradication; therefore, it requires the collective and synchronized efforts of all countries, including Chile. Until February 2020, only three countries in the world were considered endemic for wild type 1 poliovirus: Pakistan, which recorded 144 cases in 2019; Afghanistan, which recorded 29 cases in the same year; and Nigeria, whose last case was recorded in 2016. Type 2 and 3 polioviruses were considered eradicated since 2015 and 2019, respectively (12). In Chile, the last cases of poliomyelitis due to wild virus occurred in 1975 in the Biobío region. Since then, the country has maintained syndromic surveillance of all AFP cases, joining international efforts to achieve global eradication of poliomyelitis (10). For the management of surveillance, the country generated the Technical Standard, Circular B51/N°18 of May 4, 2010, which establishes guidelines for developing epidemiological surveillance of AFP in Chile, without new updates; consequently, it does not consider important events for surveillance, such as the gradual change in the vaccination schedule that occurred worldwide, starting with the incorporation of at least one dose of Inactivated Poliovirus Vaccine (IPV) at the beginning of 2016, which continued with the elimination of the type 2 component of the Oral Polio Vaccine (OPV) (11), an event that occurred in Chile on April 27, 2016, in a strategy called "Switch tOPV – bOPV" (13). This situation requires evaluating the AFP surveillance regarding immunity and susceptibility, with IPV vaccination coverage. Timely vaccination data for AFP cases is required from the investigator. Furthermore, it is necessary to consider that following the Switch and because of the withdrawal of the type 2 serotype from the OPV, the population's immunity to this virus will gradually decrease, increasing the risk of poliomyelitis cases linked to exposure to this serotype (5).

There are three main threats following the suspension of the use of serotype 2, as defined by WHO:

- ✓ A relatively higher risk of the emergence of circulating vaccine-derived poliovirus (cVDPV), but in the short term.
- ✓ A lower risk, but in the long term, of reintroducing poliovirus from a vaccine production center or laboratory due to containment failures.
- ✓ A lower risk, but potentially greater in the future, due to chronic infection in individuals with primary immunodeficiencies related to B lymphocytes (for example, vaccine-derived poliovirus related to immunodeficiency (iVDPV)).

This necessitates a technical regulation that includes guidelines and directives to adequately respond to an event of detection or outbreak of poliovirus in the national territory.

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