POLIOMYELITIS: EPIDEMIOLOGICAL ASPECTS IN RIO DE JANEIRO (GUANABARA STATE) AND ADJACENT AREAS IN THE PERIOD FROM 1961 TO 1970 *

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(With 5 figures)

SUMMARY: Based on the available data from the Hospital responsible for the care of paralitic poliomyelitis cases in Rio de Janeiro City (Guanabara State) and adjacent areas, and the laboratory studies carried out on these patients, the authors analize epidemiological aspects of poliomyelitis in a period of ten years (1961 to 1970).

Paralitic poliomyelitis remains a public health problem, with a typical incidence in the less than 4 year age group. All three poliovirus types have been prevalent for at least one period of time during the last ten years.

Trivalent oral vaccine has been used since 1961 but the vaccination levels achieved were not enough to a permanent control of the disease.

A definite seasonal distribution of cases could not be observed with the available data.

Active mass campaign vaccinations with previous motivation of all segments of the population, specially the low-income groups instead of passive waiting of children in Vaccination Centers seems to be the best aproach to control poliomyelitis in this area.

POLIOMYELITIS control has been achieved in many parts of the world through oral live vaccine which is well accepted by children and their parents. Although this vaccine gives a good immunity in the vaccinees, when well applied, this disease is still a major Public Health problem in many parts of the world.

This paper presents a study with available data for Guanabara State and geographically, socio-economical-

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ly areas related to it (Figure 1), in order to better understand the poliovirus dissemination, as well as to evaluate the efforts which has been done for paralytic poliomyelitis control.

MATERIALS AND METHODS

Two basic parameters were used for our studies. First, the data obtained from the Isolation Unit for Poliomyelitis in the Hospital (Hospital Estadual Jesus) which is in duty to handle all polio cases in the area. The Hospital receives at least 80% of paralytic cases and from the epidemiological point of view, works as a Sentinel Hospital.

Second, we organize all available laboratory data on poliovirus isolation and identification, as well as vaccination records in this period of time.

Other epidemiological data on poliomyelitis, in the area, are scanty and are presented through the discussion.

RESULTS

Table 1 shows the number of clinically diagnosed cases of poliomyelitis at the Hospital, presented by age group, as well as the observed letality rate. About 93,1% of paralytic cases have occured in children under four years of age.

Figure 2 shows the age distribution on poliomyelitis cases, where a slight tendency of reduction on the group under 1 year can be observed, besides of a ciclic phenomenon of a lower incidence in this group each 3 years (1963, 1966, 1969).

Table 2 shows all available data on virus isolations from paralytic cases. All three poliovirus types have been prevalent for at least one period of time during the last ten years in this area.

The hospitalized paralytic cases, presented in the Figure 3, came either from Guanabara State (Rio de Janeiro City) or areas of Rio de Janeiro State, which are economically and geographically related with the former State. It can be seen a changing of pattern in poliomyelitis incidence in both areas in the studied period.

The paralytic cases, recorded by the onset of the disease are presented in Figure 4 by monthly distribution.

Table 3 shows the available data on poliomyelitis vaccinations with oral live vaccine in Guanabara State. The schedule of vaccination has changed slightly along the years. It began with two doses of vaccine (1961), changing afterwards to three doses with four to eight weeks intervals between doses, and a forth dose intended to be applied ideally at age one.

The children vaccination age was kept the same, starting with 2-3 months to 3 years old, through the studied period. The trivalent vaccine has been used all the time. Unfortunately due to many different factors there is no available data to show how close this schedule could be accomplished.

Table 4 presents the vaccination records of paralytic cases in accordance to informations from children's parents. Children that had received less than 3 doses of oral live vaccine are also included.

Figure 5 shows the morbidity rate for poliomyelitis in the group aged under five years old, plotted together with the ratio: doses of applied vaccine/number of children under five years old.

TABLE 1

POLIOMYELITIS PARALITIC CASES RECORDED AT HOSPITAL JESUS, RIO DE JANEIRO, (GUANABARA AND ADJACENT AREAS) AND LETALITY RATES OBSERVED — 1961/1970 *

Years / Age groups (years)	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
< 1	169	167	71	170	236	60	33	86	25	166
1 — 2	124	140	75	141	220	61	29	93	29	191
2 — 3	118	81	70	108	171	70	25	82	32	153
3 — 4	50	24	23	34	65	47	10	25	11	47
4 — 5	14	7	9	8	19	11	5	9	5	21
5 — 6	8	5	3	4	10	3	2	—	3	18
6 — 7	4	6	2	4	5	5	3	2	2	2
≥ 7	4	18	5	—	5	3	—	2	2	13
Unknown	7	—	—	—	2	—	—	—	—	1
Total of cases	498	448	258	469	733	260	107	299	109	612
Fatal cases	30	28	27	44	53	26	5	18	4	54
Letality rates	6.0	6.2	10.5	9.4	7.2	10.0	4.7	6.0	3.7	8.8

* Data from the Poliomyelitis Isolation Unit, Hospital Jesus.

TABLE 2

POLIOVIRUS ISOLATED FROM CLINICAL CASES HOSPITALIZED AT HOSPITAL JESUS, Rio de Janeiro — 1961-1971 *

Year (months)	Specimens			Virus isolations					
				P1		P2		P3	
	Studied	Positives	%	Number	%	Number	%	Number	%
1961 (Apr/Dec)	135	58	43.0	1	1.7	51	87.9	6	10.3
1962 (Jan/Feb)	7	2	28.6	—	—	2	100.0	—	—
1963	...	...	...	...	...	...	...	...	...
1964 (Jul/Dec)	173	111	64.2	23	20.7	87	78.4	1	0.9
1965 (Aug/Oct)	76	18	23.7	18	100.0	—	—	—	—
1966 (Jul/Dec)	21	5	23.8	4	80.0	—	—	1	20.0
1967 (Jan/Dec)	116	35	30.2	22	62.9	12	34.3	1	2.8
1968 (Jan/Dec)	192	104	54.2	82	78.8	22	21.2	—	—
1969 (Jan/Dec)	73	52	71.2	9	17.3	6	11.5	37	71.2
1970 (Jan/Dec)	286	171	59.8	155	90.6	14	8.2	2	1.2
1971 (Jan/Dec)	202	113	55.9	113	100	—	—	—	—

* Data obtained from: (Scorzelli et al., 1963) (Schatzmayr & Costa, 1966) (Schatzmayr & Villas Boas, 1966) Hubinger et al., 1967) Schatzmayr et al., 1968) (Villas Boas et al., 1971) (Virus Laboratory Louis Pasteur, Guanabara State, umpublished data).

TABLE 3

POLIOMYELITIS ORAL VACCINE APPLIED AT GUANABARA STATE *

Years	DOSES				Total
	First	Second	Third	Forth	
1961	112.141	382.436	—	—	494.577
1962	...	...	...	...	435.419
1963	...	...	...	...	214.296
1964	...	...	...	...	221.037
1965	...	...	...	...	184.123
1966	...	...	...	...	273.512
1967	...	...	...	...	269.281
1968	271.405	144.988	103.711	250.867	770.971
1969	...	...	46.898	...	284.765
1970	...	...	...	...	475.049

* Data from the Department of Health, Guanabara State.

TABLE 4

VACCINATION RECORDS OF THE POLIOMYELITIS PARALITIC CASES FROM HOSPITAL JESUS, INCLUDING GUANABARA STATE AND ADJACENT AREAS 1961/1970 *

Years	Total	LIVE VACCINE			
		1 dose	2 doses	3 doses	4 doses
1961	498	5	—	—	—
1962	448	36	20	—	—
1963	258	14	6	—	—
1964	469	24	6	—	—
1965	733	52	33	4	—
1966	260	9	13	4	1
1967	107	9	1	1	—
1968	299	40	26	6	—
1969	109	5	3	1	—
1970	612	42	12	12	—
Total	3.793	236	120	28	1

* Data from the Poliomyelitis Isolation Unit, Hospital Jesus.

DISCUSSION

Paralytic poliomyelitis has been found as a disease of children under 4 years old in this area of the world, and this picture does not have changed during the years here studied (Table 1) even in the periods of low polio incidence. The vaccination programms, which are discussed later, and the presence of low-income populational groups, living crowded in areas not urbanized, where vaccination programms have serious problems of penetration, have beyond any doubt, contributed heavily for this fact.

Although there is a slight tendency of decreasing paralytic cases in the age group under 1 year old, a ciclic distribution of the number of cases in this group as seen in the Figure 2, apparently shows free virus circulating in the population.

The letality cases for poliomyelitis in the hospitalized children, has changed along the years, and a comparison of Tables 1 and 2 shows that the lowest rate corresponds to poliovirus 3 predominance. Ten cases of type 3 strains of poliovirus, isolated during 1969, have been genetically studied (by kind cooperation of Dr. J. Nakano, Enterovirus Unit, C.D.C., Atlanta, Georgia) and came out to be wild strains by T-marker and in immunological studies.

In 1964, poliovirus 2 was predominant and a 9,4% letality rate was recorded. Type 2 were also isolated from paralytic cases in 1961 and in 1962 (Table 2). The responsability of type 2 in polio epidemics has also been reported in other areas like Nigeria in 1964.

The available data shows that each type of poliovirus was predominant at least once during studied period, as shown by isolation from paralytic cases, with a very high probability to be the etiological agent, although no serological studies could be stablished at that time, in the routine work.

Further investigations are badly needed to determine whether is true or not that wild strains of type 2 and 3 in tropical and subtropical areas, are more virulent than previously known, or are turning out to be more "wild", causing also epidemics of paralytic poliomyelitis, besides type 1 strain of poliovirus.

The origin of patients (Figure 3) shows an increasing number of paralytic cases from areas around Guanabara State. The reasons are not truly known but it could be speculate that probably poorer vaccination in these areas and a lower socio-economical status gives better condition to increase the virus circulation in the susceptible groups. These areas also receive continuously population through internal migration from rural parts of the country. In other hand, due to the governmental housing programm, a migration of low income population groups ocurred, from non-urbanized area in the metropolitan part, to newly urbanized areas in the border of Rio de Janeiro City, contributing to enlarge susceptible groups in this region.

As previously reported (Schatzmayr et al., 1968) a definite seasonal influence on the poliomyelitis incidence in this area is not shown by the available data (Figure 4). The epidemic periods seems rather more related to the presence of susceptible groups.

The oral poliomyelitis vaccine applied to the Guanabara State popu-

Figure 1: Regions of Guanabara State and adjacent areas included in this study.

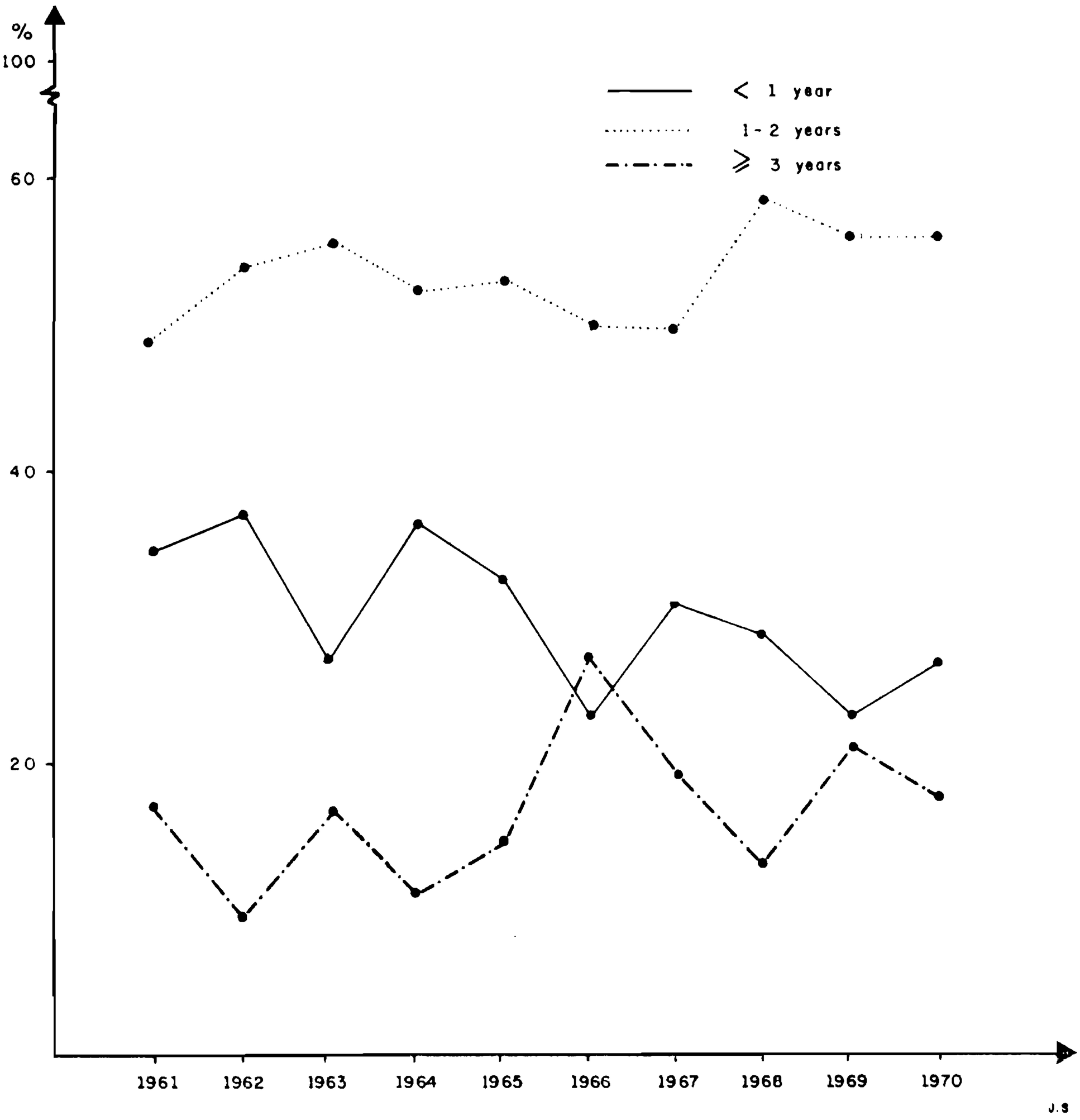

Figure 2: Age distribution of paralitic poliomyelitis cases in Guanabara State and adjacent areas.

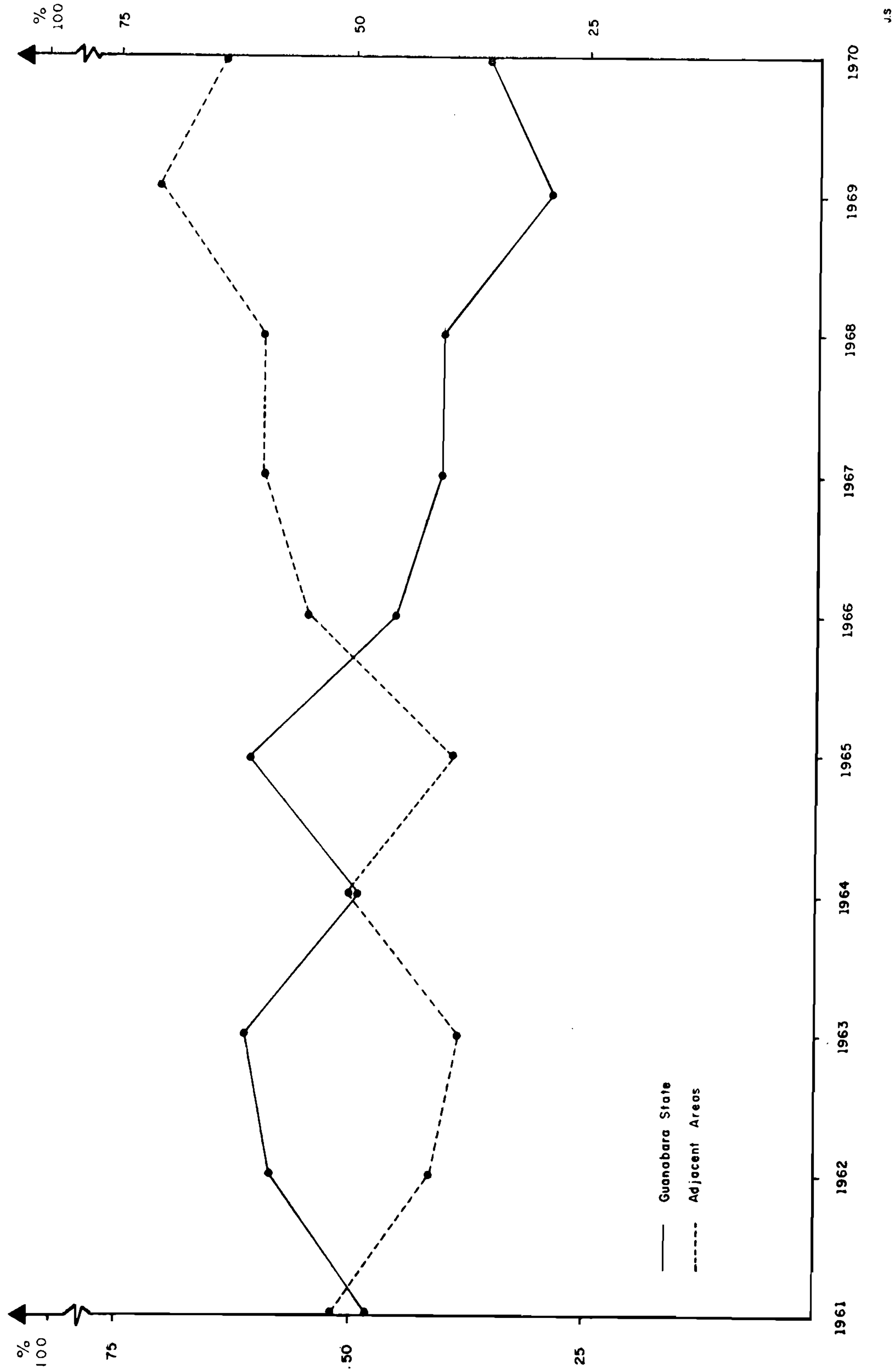

Figure 3: Paralitic cases according to the origin of patients, in Guanabara or adjacent areas.

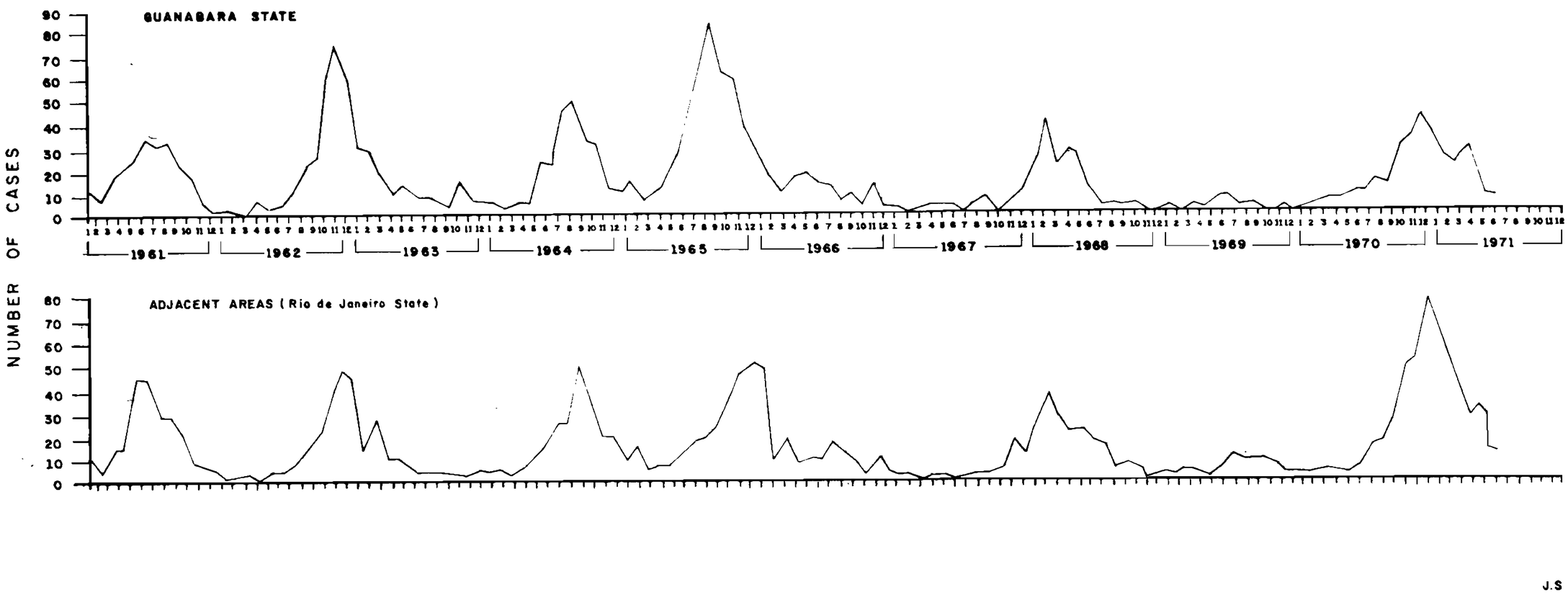

Figure 4: Monthly distribution of paralitic poliomyelitis cases 1961/1971.

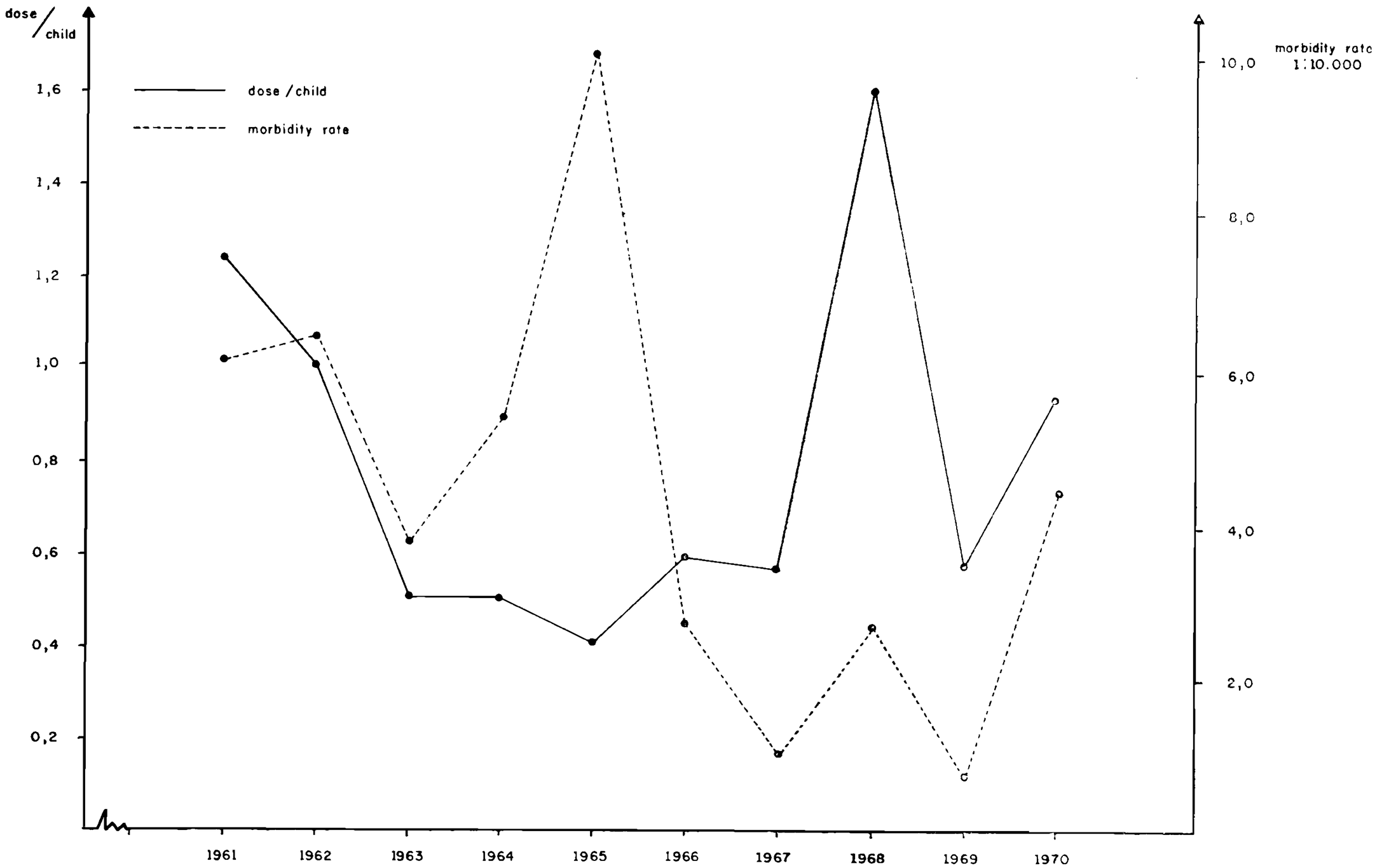

Figure 5: Dose/child ratio compared with the **morbidity** rate for poliomyelitis in Guanabara State, 1961/1970.

lation (Table 3 and Figure 5) had an irregular distribution along these years. After the introduction of stabilized oral vaccine the method of immunization has changed from mass campaign to application in Immunization Centers. Virtually all children of the high income group and most of the middle class whose parents are aware of the problem, are immunised by these Centers where vaccine is freely available to the population or even by private physicians. However, most paralytic cases occured in low-income population to whom the vaccination program are truly difficult to motivate, due to proper character of these groups.

Unfortunatelly, many aspects of poliovirus dissemination in this area can not be better discussed, due to the incomplete epidemiological investigation on the paralytic cases. It was not possible to study more carefully, the cases in which oral live vaccination has been given, according to the information from children's responsibles (Table 4).

The conversion rate, after 3 doses of trivalent vaccination, has been shown by two of us (Schatzmayr & Homma, 1969), to be 82,7% for type I, 98% for type II and 75,4% for type III, using 500,000, 200,000 and 300,000 TCD50/dose respectively, with Sabin's strains of vaccine. These data obtainned in a semi-rural community close to Rio de Janeiro City seems to agree with the presence of vaccinated children among the sick ones.

A possible lower antigenicity of the vaccinal type 3, has been already discussed (World Health Organization, 1969). This fact, beside all negatives factors of immunization, surely have contributed to poliovirus type 3 prevalence in 1969, by great accumulation of susceptible groups.

The morbidity rate for poliomyelitis in Guanabara State children's under 5 years of age (Figure 5) has changed along the studied years. By the other hand, with the incomplete available data (Table 3) it was not possible to know the number of doses received by each children and for sure many of then did not complete the vaccination schedule or have not been vaccinated at all. Such incomplete data led us to stablish the ratio: number of doses given to the population/number of children under 5 years of age, in an attempt to analyse the vaccination programms. This dose/children ratio, plotted together with morbidity rate, shows that the vaccination had apparently capacity to change the pattern of poliomyelitis morbidity rate. In 1961 and 1962, there were a better coverage of susceptible groups (1,2 and 1,0 level of dose/child ratio) and a low mobidity rate has been recorded in 1963. However, when vaccination have been applied at low levels in subsequent 3 years, there was a outbreak in 1965. The morbidity rate decreased afterwards probably due to natural immunization. In 1968 when a 1,6 level of dose/child was applied to the population the lowest morbidity rate was recorded in the subsequent year. In our opinion at least level 2,0 should be reached in the susceptible group for consecutive years, in order to control poliomyelitis in this region.

The experience gainned, tell us that vaccination through Immunization Centers, which wait passively for children being brought by parents

does not cover all the susceptible segments of population, as pointed out by Fossaert in a similar area (Fossaert, 1971). It should be conducted more actively in a mass campaign, home-by-home, for consecutive years to immunize all the possible segments of population left in the preceding campaign. Also, a scheme for long-term immunization should be undertaken along with mass campaign home-by-home, motivating equally all segments of population, using all the possible ways to aware mainly the low income populational group, of the problem. For the studied area in particular, where a large population is located in two different administrative regions, an integrate programm of vaccination should be carried out to cover all susceptible groups wherever there are located. This measure would cut down the constant and intensive wild virus dissemination in this region.

It is felt by the authors that, although the majority of studies in other areas, had showed a good conversion rate given after 3 doses of trivalent oral live type of vaccine, a constant survey in longitudinal studies of young vaccinated children besides a Virus Watch Programm, should urgently be undertaken in order to determine enterovirus infections and the role of oral vaccine. Also, the enterovirus characteristics and their distribution in the area should be studied as a guide for vaccination programms.

SUMÁRIO

Os autores analisam os aspectos epidemiológicos da poliomielite no período de 10 anos (1961-1970), com base em dados epidemiológicos do Hospital Estadual Jesus do Estado da Guanabara, responsável pelo atendimento aos casos paralíticos de poliomielite da região do Rio de Janeiro e áreas adjacentes e em estudos laboratoriais destes casos.

A poliomielite paralítica permanece nesta região, como um problema de Saúde Pública, com uma incidência típica em grupos etários menores de 4 anos. Todos os três tipos de vírus da poliomielite apresentaram-se prevalentes, ao menos por um período de tempo, nos 10 anos abrangidos por este estudo.

A vacina oral trivalente tem sido utilizada desde 1961, mas o nível de vacinação alcançado não foi suficiente para um controle permanente da doença.

Com os dados disponíveis, não pode ser observada uma definida distribuição sesonal dos casos de poliomielite.

Uma campanha ampla e ativa de vacinação, com motivação prévia de todos os segmentos da população, especialmente os grupos etários de baixo nível sócio-econômico em lugar da imunização de rotina pelos Centros de Saúde, onde se espera as crianças, levadas pelos responsáveis, parece ser a melhor técnica para o controle da poliomielite nesta área.

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