

PREVALENCE OF IgG VARICELLA ZOSTER VIRUS ANTIBODIES IN THE KUIKURO AND KAIABI INDIGENOUS COMMUNITIES IN XINGU NATIONAL PARK, BRAZIL, BEFORE VARICELLA VACCINATION

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SUMMARY

The purpose of the study was to estimate the prevalence of IgG antibodies against varicella zoster virus (VZV) in the two most populated indigenous ethnic groups from Xingu Indigenous National Park, in Brazil, prior to the introduction of vaccination against the disease, and to determine the positive and the negative predictive values of a history of varicella infection. In 2001, 589 inhabitants of two Kuikuro villages and three Kaiabi villages were evaluated and provided information concerning previous varicella infection. An indirect immunosorbent assay (ELISA) to detect IgG anti-VZV antibodies was performed in 224 blood samples - volunteer selection had no interference of anamnesis. IgG prevalence was 80.8% (95% Confidence Interval: 76% - 86%). The seroepidemiology of varicella in Xingu National Park prior to varicella vaccine introduction was comparable to the Brazilian national seroprevalence described in the literature, and so were the positive (98%) and the negative predictive value (41%) of the referred history.

KEYWORDS: Varicella Zoster; Antibodies; Brazilian native Indians.

INTRODUCTION

Varicella is a very contagious and vaccine preventable disease, occurring mostly during childhood, as a consequence of primary infection of varicella zoster virus (VZV)^{2,8,13}. Although it usually presents a benign course, it may cause complications, especially in high risk individuals^{2-3,8,13}. Morbidity and mortality due to varicella are significantly higher in adults¹³.

Studies on seroprevalence in tropical countries demonstrate a greater proportion of adolescents and adults susceptible to varicella, and with higher risk of complications, when compared with those of temperate countries^{2,13}. In these countries, indirect immunosorbent assay (ELISA) used to detect IgG VZV antibodies have demonstrated prevalence equal to or higher than 90%^{1,9,16,21,27,30-31}. In Brazil, general surveys have shown a seroprevalence of 85.4%¹⁰ and 94.2%²⁶, closer to the pattern observed in temperate countries.

Nowadays, the Brazilian Indigenous population is 350,000 inhabitants from 218 different ethnic groups distributed in 554 discontinuous territories, occupying 12% of the National territory^{6,18,20}. In 2000, an outbreak of varicella occurred in 94.6% of 278 Araweté Indians, in the state of Pará, with 3% death (personal communication). At Xingu National Park, a neighboring area, there was a varicella

outbreak in 1999, reaching 5.8% of the inhabitants, 20% of whom were over 15 years of age. Seven patients (3.2%) presented severe forms of the disease (personal communication).

In view of that, Brazilian Ministry of Health decided to vaccinate the Native Indian population. The present study was undertaken to estimate the seroepidemiology of varicella at Xingu National Park immediately before the vaccine was introduced. That allowed us to compare the results in the Indian population with national ones. We have also calculated the positive predictive value of the previous history of varicella infection in order to assess whether that information would identify potential candidates for vaccination in Brazilian Indian population.

MATERIAL AND METHODS

The study was performed between June and September 2001 at Xingu National Park, located North of the State of Mato Grosso, Brazil, encompassing an area of 2,642,003 hectares, where 14 ethnic groups live. The most populated of the indigenous ethnic groups are the Kuikuro, living in the Upper Xingu region, south of the Park, and the Kaiabi, living in the Lower Xingu region, north of the Park^{12,19}. Kuikuro Indians are autochthonous, their settling records going back to a period between 200 B.C. and 800 A.D.¹⁵. On the other hand, the Kaiabi population of the Park migrated after 1949, most of them after 1961¹⁴.

Selection of visited communities was done together with the Council of Indigenous Leaders, acknowledged by the Health Ministry¹². Written consent was obtained by the Park leaders, the community chiefs and the indigenous health agents.

The population of Xingu National Park at the time was 3919 inhabitants (personal communication). Three Kaiabi communities were visited ("Capivara", "Guarujá" and "Tuiararé") in Lower Xingu, and two Kuikuro communities ("Afukuri" and "Kuikuro") in Upper Xingu, amounting to 589 individuals (94.5% of the population of these communities).

All subjects were questioned regarding previous history of varicella infection; the answers were preferably given by individuals, but they were also given by relatives or indigenous health agents. Of note, this survey was carried out prior to the introduction of varicella vaccine.

Two hundred and twenty four blood samples were collected (38% of the individuals of the survey) through recruitment method, at each home, without interference of the answer given to anamnesis, and following the same age distribution of the population of the Park. We restrained our selection to one in two individuals under 20 years of age and one in four individuals over 20 years of age, as determined by the aforementioned Council.

After blood sample collection, serum was obtained, kept at 2 °C to 8 °C and sent to the Research Laboratory of the Division Pediatric Infectious Diseases of the Federal University of São Paulo. There it was kept at -20 °C until analysis. An *in house* indirect immunosorbent assay was performed to detect IgG VZV antibodies^{24,28}. Because an internationally accepted antibody level that predicts previous contact with wild varicella zoster virus or vaccine is not available, we have established a cutoff based on antibody values assessed on sera from 12 month-old infants without evidence of previous VZV infection. Twenty-two children who had been regularly followed up from birth and did not have evidence of previous varicella infection assessed both by clinical examination and repeated serologic testing during the first year of life were tested for varicella antibodies at 12 months of age. Cutoff value of 0.2 IU/mL was calculated by adding mean antibody levels (0.04 IU/mL) to three standard deviations (3 x 0.04 IU/mL)²⁴.

Statistical analysis was performed using Microsoft Excel® 2000, EPI INFO release 6, and SPSS release 10.0. Probabilities were assessed for 95% significance. Chi-square test and Fisher's exact test were used; Dunnett's test was used for non-comparable variance analysis, and Fleiss' test¹¹ was used to obtain confidence interval of near 100% seroprevalences.

RESULTS

The prevalence of VZV antibodies in the whole sample was 80.8% [95% Confidence Interval (CI): 76% - 86%]. The prevalence in the different age groups is summarized in Table 1. We observe a continuous increment in seropositivity up to the 11 to 15 year age group. From that age on, only one 20-year-old woman presented a negative VZV serology.

Table 2 shows sample distribution and the percentage of seropositive individuals in each village. As confidence intervals suggest, seroposi-

tivity in Afukuri (Upper Xingu), Kuikuro (Upper Xingu) and Guarujá (Lower Xingu) communities were comparable (Chi-square test, $p = 0.1595$). Seropositivities in Capivara and Tuiararé communities (both in Lower Xingu) were also comparable (Fisher's exact test, $p = 0.5915$). Comparison between the first group of three communities and the second one with two communities demonstrated a different seropositivity (Chi-square test, $p < 0.001$).

Previous history of varicella infection had a 98% positive predictive value (lower 95% CI: 95%), and a 41% negative predictive value (as derived from Table 3). No differences were noticed between males and females (Chi-square test, $p = 0.94$). Positive predictive value of the previous varicella history was 100% in subjects at the age of one to five years old, 94% in subjects at the age of six and 10 years old, and 100% in the group with subjects at the age of 11 or over.

Table 1

Seropositivity for varicella zoster virus in different age groups of Brazilian indigenous communities from Xingu National Park

Age Group (years)	Samples			
	N	Seropositivity	Percentage	95% Confidence Interval
< 1	4	1	25	0 - 67
1 to 5	64	37	57.8	46 - 70
6 to 10	57	45	78.9	68 - 89
11 to 15	38	38	100	91 - 100
16 to 20	35	34	97.1	85 - 100
21 or +	26	26	100	87 - 100
Total	224	181	80.8	76 - 86

Table 2

Distribution of the sample population and seropositivity for varicella zoster virus according to the community of Brazilian indigenous people of Xingu National Park

Community	Samples			
	N	Seropositivity	Percentage	95% Confidence Interval
Afukuri	38	23	60.5	45 - 76%
Kuikuro	94	72	76.6	68 - 85%
Capivara	29	29	100	88 - 100%
Guarujá	21	16	76.2	58 - 94%
Tuiararé	42	41	97.6	87 - 100%
Total	224	181	80.8	76 - 86%

Table 3

Varicella zoster virus serology according to previous history of varicella in indigenous communities from Xingu National Park

Anamnesis (Previous Varicella)	VZV Serology		
	Positive	Negative	Total
Yes	121	2	123
No	60	41	101
Total	181	43	224

DISCUSSION

In Brazil, varicella is popularly known as *catapora*, rather than varicella (or chickenpox), which means *irrupted fire* in Tupi language¹⁷, the “general language” in which indigenous people from different tribes used to communicate in Brazil. This is an evidence of the knowledge Brazilian indigenous groups have of the disease.

Prevalence of varicella was statistically comparable to that observed in a national study on seroprevalence, where a 85.5% prevalence was calculated in 3653 individuals between one and 40 years of age¹⁰. Varicella seropositivity in the Xingu population (57.1%), and Brazilian population (57.6%) between one and five years of age was comparable (Chi-square test, $p = 0.9685$). They were also comparable among six and 10 years old (78.9% in Xingu and 85.5% in Brazil; Chi-square test, $p = 0.179$) and among 16 and 20 years old (97.1% in Xingu, and 95.5% in Brazil; Fisher’s exact test, $p = 0.53$). In the population among 11 and 15 years old, two-tailed Fisher’s exact test did not show any difference ($p = 0.06$): thus, the prevalence is also high in this age group in Xingu National Park, 100% (CI 95% 91% - 100%), as in the country, 91% (CI 95% 88.7% - 93.2%).

Before this study, prevalence of varicella among indigenous people was evaluated in only one epidemiological study with the Tiriyo, who live in the north of Para State, in the border with Suriname. That was in the second half of the sixties, and the study demonstrated 80.4% of immunity in a sample of 51 individuals^{4,5}.

We could not explain the difference in prevalence found in the two groups of villages, Upper (Afukuri and Kuikuro) and Lower (Capivara, Guarujá and Tuaiararé) Xingu (Table 2). However, the differences in prevalence found in the study should not be attributed to internal migration, the habit of establishing new communities, the marriages among families of different communities or the changes in leaderships.

Negative predictive value of the history was 41% (Table 3), low and unreliable, as reported in the literature³⁰. By contrast, positive predictive value of previous history of varicella in Xingu National Park was high, 98%, and it could be an efficient and economic measure to avoid vaccination, excluding from the “susceptible” category the individuals who referred previous varicella.

Other studies in Brazil have demonstrated different positive predictive values, ranging from 83.1% in an age group from five months to 12 years²⁹ to 90.9% in medical students and nurses⁷, 95.1% in patients from one to 40 years¹⁰ and 100% in neonatal staff²⁸. In view of that, CLEMENS *et al.* suggested that report of previous disease should be considered as a criterion to discard vaccination¹⁰.

The positive predictive value of a previous history of varicella is higher on temperate climate countries, where seroprevalence tends to be higher²². Previous studies, as this one, have shown that, for unknown reasons, Brazil has a higher varicella seroprevalence than would be expected for a tropical country^{22,23,25}, and also a high positive predictive value of previous history of varicella.

In sum, we have shown that the seroprevalence of VZV is high in Brazilian Indigenous people, and comparable to the general prevalence

found in Brazil. Despite the cultural differences and the difficulties in communication, the positive predictive value of a previous history of varicella proved to be high, suggesting it is a reliable method to discard vaccination.

RESUMO

Prevalência de anticorpos IgG contra o vírus varicela zoster nas aldeias indígenas Kuikuro e Kaiabi do Parque Nacional do Xingu, Brasil, antes da vacinação contra varicela

O objetivo do estudo foi aferir a prevalência de anticorpos IgG contra o Vírus Varicela-Zoster (VVZ) nos dois grupos étnicos indígenas mais povoados do Parque Nacional Indígena do Xingu, Brasil, antes da introdução da vacinação contra a doença, e determinar os valores preditivos positivo e negativo da história de infecção de varicela. Em 2001, 589 habitantes de duas aldeias Kuikuro e três aldeias Kaiabi foram avaliados e forneceram dados referentes à infecção prévia por varicela. Um ensaio imunoenzimático indireto (ELISA) foi realizado em 224 amostras de sangue para detectar anticorpos IgG anti-VVZ - a seleção de voluntários não teve interferência da anamnese. A prevalência de IgG foi de 80,8% (Intervalo de Confiança de 95%: 76% - 86%). A soroprevalência de varicela no Parque Nacional do Xingu antes da introdução da vacina foi comparável à soroprevalência nacional descrita na literatura, assim como os valores preditivos positivo (98%) e negativo (41%) da história referida.

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