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ORIGINAL RESEARCH

VARICELLA ZOSTER IN CHILDREN ATTENDING DAY CARE CENTERS

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OBJECTIVE: To describe morbidity associated to varicella in children attending day care centers.
METHODS: Descriptive study carried out through inquiries with parents of 664 children who acquired varicella after admission to day care centers in Taubaté (population: 244,165, census of 2004), a prosperous city in the State of São Paulo.
RESULTS: The median age was 36 months (range 6 to 80 months); 8.4% of the children had varicella before 1 year of age. The main symptoms were: exanthema (100.0%), fever (85.4%) anorexia (39.6%), and headache (15.3%). 517 children (77.9%) had at least 1 medical visit, and 80.6% received at least 1 medication; 73 (11.0%) received nonsteroidal antiinflammatory drugs, and 52 (7.8%) received antibiotics. Complications occurred in 38 children (5.7%; 95% confidence interval: 3% - 8%); 8 (1.2%) were hospitalized, and 5 (0.7%) had sequelae. Complications and hospitalizations rates were 3 times more frequent in children with less than 1 year of age than in older children. More than half of the children and of the working parents were absent from their regular activities for more than a week. **CONCLUSIONS:** Varicella was associated with significant morbidity, affected younger children, was complicated in more than 5%, and left sequelae in 0.7% of children. More than 10% of the children received nonsteroidal antiinflammatory drugs, highlighting the need to warn the population about the risks of these drugs. Although varicella vaccination is not recommended for children younger than 12 months, vaccination of the children older than a year could avoid by herd immunity the transmission to babies. Brazilian public health authorities should be alerted to this issue and offer varicella vaccine to children attending day care centers.

KEYWORDS: Varicella-zoster/complications. Children. Day care centers. Nonsteroidal antiinflammatory drugs.

INTRODUCTION

Varicella is an acute viral disease of global distribution.[1,2] The primary infection results in the appearance of papulovesicular, polymorphic exanthematic lesions of central distribution, while the reactivation of the virus results in herpes-zoster. In previously healthy children, the disease is acute, self-limited, and rarely causes death; however, recent studies have showed that children attending day care centers are a risk group for varicella complications.[3-5]

Since 1997, a varicella vaccine has been licensed in Brazil and is recommended to children, but this vaccine is not included in the routine vaccination program. In order to establish public policies for varicella immunization, it is necessary to investigate the impact of the disease in the community.[5-10]

At the beginning of the 1990s, varicella was considered the main cause of death by diseases that could be prevented by immunization in the United States,[11] Canada,[8,10] Germany,[9] and the United Kingdom.[12] In Brazil, there are only few studies about varicella complications in healthy children.[3–5,13–16] Data from the Health and Hygiene Department of Sao Paulo City show that children attending day care centers have the disease earlier and present higher rates of complications and death than other children.[5]

In the city of Taubaté (population: 244,165, census of 2004), a survey conducted by the University Hospital revealed that in the last 5 years, the annual rate of hospitali-

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zation due to varicella and its complications was 3.7 per 100,000 children under 12 years of age, which is similar to that in the United States, (2.7 – 4.2/100,000/year) in prevaccination times.[17]

Among all the exanthematic diseases, varicella is the easiest to identify by lay people,[10] enabling viable data collection about the disease through population inquiries.[18,19]

For these reasons, we consider it appropriate to describe the illness morbidity in children attending day care centers.

METHODS

Design

Descriptive study, carried out through inquiry with parents of children that acquired varicella after enrollment in day care centers, from June, 2002 to February, 2003.

After the approval by the Committee on Ethics and Research, this study was presented to the Education and Culture Department of Taubaté, and the interviews with parents and adults responsible for the children with positive antecedent to varicella were planned.

Setting and study population

Taubaté is located in São Paulo State (Brazil), having an estimated population of 244,165 inhabitants, with 41,512 people under the age of 10. Approximately 10,000 children, with ages ranging from 6 months to 7 years, are enrolled in the 44 municipal day care centers (public and subcontracted) distributed 1 per district throughout the city.[20] Most of children attending these day care centers are from low-income families. Using the program Statcalc, software Epi-Info, version 6.04,[21] it was estimated that it would be necessary to collect information about the antecedents of varicella in 1,200 children in order to collect data referring to 500 children who had actually contracted the disease after admission to the day care centers. The appraisal of the sample size was based upon the estimated prevalence of varicella complications in previously healthy children (5%), with a variation of 5% and confidence interval (CI) of 95%. It was estimated that half of the children enrolled in day care centers had not yet acquired the disease and data loss was estimated to be 20% of the sample.

The 44 day care centers were numbered and then randomly sampled to get the information about the antecedents of the disease. The first 8 day care centers sampled, totaling 1,370 children were chosen for the study. Their distribution within the city was homogeneous.The study was conducted in 2002.

Only children with positive antecedents to varicella were selected for the study; their parents were interviewed, and vaccination records were verified by one of the authors (RM). All data were compiled in a database using the software, Epi-info version 6.04.[21]

Statistical analysis

The statistical analysis was descriptive, and the results expressed in simple frequencies are shown in the tables with the average and 95% confidence interval.

Data from the standard questionnaire containing information about the children was entered into a computer and analyzed by the statistics program, Epi-info 6.04. Analysis of variables was performed by using the Mantel-Haenszel χ^2 test. Risk was calculated (OR and CI 95%) for the following variables: age of the child with varicella with complication, hospitalization, groups of children under 12 months and above 1 year of age; absent time from the centers and work, and presence of complications. The variable averages were compared using Student's *t* test, and a *P* value <0.05 was considered significant.

RESULTS

The day care centers sampled are listed on Table 1. Out of the total 1,370 children attending at the sampled day care centers, 541 (39.5%) were excluded due to a negative antecedent to varicella; of the 829 (60.5%) with positive antecedent for varicella, 106 (12.8% of positives) were excluded for having presented varicella before admission to day care centers or when on vacation. Out of the eligible 723 cases, 59 (8.2% of the elligibles) were supplementary excluded for lack of informed consent or absence of parents for the interview after 3 invitations, leaving a final sample of 664 (91.8% of the elligibles) who were included in the study,

Mothers were the main source of information (86.0%). Demographic characteristics and the health conditions of the studied population are summarized on Table 2. The median age of enrolled children was 36 months (range: 6 mo to 7 yr; std dev = 17.3 mo), without difference between genders.

Among the 73 children (10.9%) with some base disease, 57 (8.6%) had respiratory allergy, 10 (1.5%) antecedents of repetition respiratory diseases; and 5 (0.8%) had epilepsy. No children had used corticosteroids.

The morbidity of the disease was associated with clinical signs and symptoms, presence of complication, hospitalization, and sequelae (Table 3). Fever was present in 85.4% of the cases and persisted for more than 3 days in 20.2% of the children. The most prescribed medicines were

Table 1 - Number (n) and proportion (%) of children by institution, clinical history of varicella, and enrolled in this study

Day care center	Children enrolled in institution n (%)	Children with positive antecedent to varicella Total n (%)	After admission to day care center n (%)	Children included in this study n (%)
1	272 (19.9)	168 (20.3)	147 (20.3)	**137 (20.6)**
2	186 (13.5)	118 (14.3)	102 (14.1)	**95 (14.3)**
3	114 (8.3)	99 (11.8)	83 (11.9)	**78 (11.8)**
4	103 (7.5)	69 (8.3)	61 (8.5)	**55 (8.3)**
5	70 (5.4)	46 (5.7)	37 (5.2)	**35 (5.3)**
6	263 (19.0)	148 (17.8)	133 (18.4)	**122 (18.3)**
7	176 (12.9)	87 (10.5)	71 (9.9)	**68 (10.2)**
8	186 (13.5)	94 (11.3)	84 (11.7)	**74 (11.2)**
Total	**1370 (100.0)**	**829 (100.0)**	**723 (100.0)**	**664(100.0)**

Table 2 - Characteristics of children attending day care centers with positive antecedent to varicella

Characteristics		n	%
Age	< 12 months	56	8.4
	≥ 1 year of age	608	91.6
Sex	Male	331	49.9
	Female	333	50.1
Comorbidity	Yes	73	10.9
	No	591	89.1

Table 3 - Morbidity associated with varicella

Characters and complications	Presence	n	%
Exanthema	Yes	664	100.0
	No	0	0.0
Fever	Yes	567	85.4
	No	97	14.6
Anorexia	Yes	263	39.7
	No	401	60.3
Headache	Yes	101	15.2
	No	563	84.8
Illness duration (days)	≤ 7	449	67.0
	> 7	215	33.0
Drug use	Yes	540	81.3
	No	124	18.7
Complications	Yes	38	5.7
	No	626	94.3
Hospitalization	Yes	8	1.2
	No	656	98.8
Sequelae	Yes	5	0.7
	No	659	99.3

antipyretics, used by 540 children (81.3%); NSAIDs by 73 children (11.0%), and of these, 35 (47.9%) received aspirin. Antibiotics were prescribed to 52 children (7.8%), but half of the parents weren't able to point out the reason for antibiotic use. No children received acyclovir or varicella zoster immunoglobulin.

Varicella complications occurred in 38 children (5.7%), and bacterial infections were the most frequent (Table 4).

Eight children (1.2%) were hospitalized for 3 to 22 days (median, 8.5 days) and 5 (0.7%) had sequelae. The average age of the hospitalized children was 33.6 months, but children younger than 12 months showed a higher risk of complication (14.3%), as compared to the 5.7% for other ages (Odds Ratio = 2.9; CI 95%: 1.2 – 7.0). The chance of hospitalization was also higher for infants (3.5% versus 1.2 %), however, without statistical significance (OR = 3.6; CI 95%: 0.5 – 20.5).

Table 4 - Varicella complications.

Type of varicella complications	n	%
Bacterial skins infections (impetigo, abscess, cellulite)	31	81.5
Pneumonia	3	7.9
Sepsis	2	5.3
Otitis / sinusitis	2	5.3
Total	38	100.0

Five hundred and seventeen children (77.9%) had medical visits, and of these, 145 (28.1%) were evaluated more than once; 392 children (59.1%) were kept away from the centers, and of these, 263 (67.2%) stayed off for more than a week. Three hundred and forty-eight parents (53.1%) were absent from their activities, and of these, 195 (56%) stayed off for more than 7 days.

Children with varicella complications had more prolonged fever (>3 days), a higher number of medical evaluations, were absent from the day care centers for more days (OR = 2.12; CI 95% 1.02 – 4.4), and their parents missed more days of work. Nonsteroidal antiinflamatory drug use was also significantly associated with the presence of varicella complications ($P < 0.001$).

DISCUSSION

More than 60% of the children enrolled in day care centers in Taubaté had positive antecedents for varicella. Even though this information was not confirmed by serological tests, several studies on children have shown that

the diagnostic positive value for the antecedents of varicella is high when compared to the serological tests.[18,19,22]

In this study, the median age of children with positive antecedents to varicella was 3 years; in studies carried out in the U.S., the median age of children was 5.2 years.[2,3] In a study previously carried out in the State of São Paulo, Brazil, it was found that children attending day care centers were infected by varicella earlier than the children brought up at home.[4] In this study, the incidence of varicella in younger children probably was related to precocity of contact with varicella. The rate of secondary attacks by varicella is about 90%.[4,10,11,23–26] In secondary cases of varicella, children are exposed to a higher viral charge and show a higher number of skin lesions and higher rates of complications.[15,25]

In this study, a total of 56 children (8.4%) had varicella before 1 year of age; a higher percentage than that found in Italy (2.9%)[27] and Spain (6.9%).[7] It is important to emphasize that infants with varicella are a high-risk group for complications, hospitalization, and death associated with varicella.[4,10,11] In this study, children younger than 1 year had about 3 times more complications and hospitalization than the children older than 1 year.

The morbidity associated with varicella can be assessed according to different aspects, such as: frequency of signals and symptoms, duration of symptoms, complication rate, hospitalization, squelae, and death rate.

The symptoms usually described in this population were similar to the ones found in the literature.[1,2,23] In 20% of the cases, parents reported that the child had fever for more than 3 days, and more than one third of the parents reported that the disease lasted more than a week, particularly for children with complications.

Bias of information may have been a limiting factor in analyzing the results of this study, because parents' information was collected, on average, 11 months (range, 15 days to 29 months) after the disease. The information about antibiotic use (7.8%) reveals that probably more than 5% of children had complications. In Spain, in a prospective study about varicella, the rate of complications was 12%, and more than 5% of children had otitis media or sinusitis after varicella.[6] In this study, these complications were reported by only 2 parents (0.2%).

Information bias is more probable for mild symptoms, duration of the disease, treatment, and time of day care and work absenteeism than for more serious problems, such as complications, hospitalizations, and permanent sequelae. So, one of the most important findings of this study is related to the high risk of complications in infants less than 1 year of age attending day care centers, probably related to precocious exposure to other children in an crowded environment.

The social impact of varicella is associated with absenteeism of children and their parents from their daily routines. As many mothers did not work, a little more than 50% of those who did work outside the home had to be absent from their activities to take care of their children. Because most parents of these children were of low school level and income and because many were unemployed or underemployed, it was not possible to evaluate the social costs associated with varicella in this study.

No children included in this study received acyclovir or specific immunoglobulin (VZIG). In Brazil, these medications are usually prescribed to immunocompromised children; in other countries these medicines are more frequently used in healthy children.[1,2,5,11,23] All children enrolled in this study were previously healthy.

Fever was one of the main symptoms associated with varicella, and antipyretics were the most commonly prescribed medicines. Even though the use of nosteroidal intinflammatory drugs is contraindicated to children with varicella; 35 children received these drugs.[1, 9,11,28,29]

The complications related to varicella depend on age and the immunologic condition of the individual.[10,24,29] In this study, complications occurred in 5.7% of children, and the most frequent complications were bacterial skin infections (80%) similar to the ones found in the United States,[23] and Canada.[10] Epidemiological studies carried out in Europe revealed that the complication rates for varicella were of 3.5% to 5% in Italy, 2% in France, and 13.2% in Spain.[6,7] These differences are probably related to the different methods employed in the analysis of the study data. In a prospective study recently published and carried out in Spain, the complication rate of varicella was higher than 10%.[6] This result strongly suggests that in retrospective studies the complication rates are underestimated.

Although the vaccine against varicella does not prevent all cases of the disease, it is estimated that it can prevent more than 95% of the most serious complications. Unfortunately, in Brazil, the vaccine against varicella is not available in the public health system for previously healthy children, and none of the children included in this study had been vaccinated against varicella. Most of the parents of these children have no information about the benefits of varicella vaccination.

Compared with older children, infants younger than 1 year of age were 3 times more likely to have complications and hospitalization associated with varicella. Although varicella vaccine is not recommended for children less than 1 year of age, after 1995, when it was added to the US schedule of immunization, herd immunity resulted in a significant reduction in morbidity and mortality associated with varicella, even in children less than 1 year of age.[30–32]

The rate of hospitalization because of varicella complications was 1.2%, comparable to that reported for Canada and the United States (0.2% – 1.5%) before the introduction of routine vaccination against varicella.[8,10] In the United States, more than 90% of the secondary infections, two thirds of the hospitalizations, and half of the deaths occur in previously healthy children;[11] the same happened in Canada[10] and in Europe.[7] All children enrolled in this study were previously healthy. These data support the recommendations to include varicella vaccine for all eligible children.

More than two thirds of the children had at least 1 medical visit; children with varicella complications had on average 1.5 consultations. These results were similar to those found in Canada,[10] France,[7] and Spain.[6]

More than 50% of the children were kept away from the centers for more than a week. If the time of absenteeism was not overestimated by the parents, this period of time can be considered excessive, because the transmission of varicella is very low after the fifth day of the exanthema.[4,10,11]

CONCLUSION

Children enrolled in day care centers acquired varicella precociously (median, 36 mo); infants younger than 12 months of age had a high risk of varicella complications and hospitalization, 3 times higher when compared to the children older than a year.

Varicella was associated with significant morbidity and rates of complications (5.7%), hospitalization (1.2%), and sequelae (0.7%).

More than 10% of the children were treated with nonsteroidal anti-inflammatory drugs, which highlights the need to warn the population about the inherent risks of using these drugs in children.

It is important to establish a surveillance system to closely monitor the impact of varicella to children attending day care centers. Brazilian public health authorities should be alert to this issue and we hope this study may be taken as a strong exhortation for official health services to offer varicella immunization to children attending day care centers.

RESUMO

Marcitelli R, Bricks LF. Varicela-zóster em crianças que frequentam creches. Clinics. 2005; 61(2):147-52.

OBJETIVO: Descrever a morbidade associada à varicela nas crianças usuárias de creches.
MÉTODOS: Estudo descritivo, realizado através de inquérito com pais ou responsáveis por 664 crianças que contraíram varicela após admissão às creches Municipais de Taubaté, SP.
RESULTADOS: A mediana de idade das crianças acometidas por varicela foi de 36 meses (6 meses a 7 anos); 8,4% tiveram a doença antes dos 12 meses. As principais manifestações foram: exantema (100,0%), febre (85,4%), anorexia (39,6%) e cefaléia (15,3%). Quinhentas e dezessete crianças (77,9%) tiveram pelo menos uma avaliação médica, 80,6% receberam algum tipo de medicamento; 73 (11,0%) receberam antiinflamatórios não-hormonais e 52 (7,8%) receberam antibióticos. Trinta e oito crianças (5,7%) tiveram complicações (intervalo de confiança de 95%: 3 – 8%), oito (1,2%) foram hospitalizadas e cinco (0,7%) ficaram com seqüelas. Em comparação com crianças com mais de um ano, as menores de um ano apresentaram risco 3 vezes maior para complicações e hospitalizações. Mais da metade das crianças e dos pais que trabalhavam ficou mais de uma semana afastada de suas atividades.
CONCLUSÕES: A varicela acometeu crianças de baixa idade, causou complicações em mais de 5% e deixou seqüelas em 0,7% dos casos. Mais de 10% das crianças foram tratadas com antiinflamatórios não-hormonais, sendo necessário esclarecer a população sobre os riscos do uso desses fármacos. As autoridades de saúde deveriam estar atentas a essa questão e oferecer a vacina às crianças matriculadas em creches.

UNITERMOS: Varicela-zóster. Complicações. Crianças. Creches. Antiinflamatórios não hormonais.

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