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T-lymphocyte subsets and eosinophil counts in acute and convalescence chickenpox infection: a household study in Guinea-Bissau

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Summary *Objective*. To investigate changes in T-lymphocyte subsets, CD4 + and CD8 + lymphocytes, WBC, lymphocytes and eosinophil granulocytes during the acute and the convalescence phase of chickenpox infection.

Methods. During an epidemic of chickenpox, a household study was performed in a semi-urban area of Bissau, Guinea-Bissau. Varicella antibodies were determined to assess diagnostic certainty. To determine the timing of changes, haematological markers and T-cell subsets (immunocytochemical method) were analysed in the acute phase, 0–9 days after the rash, and in the convalescence phase, 35–45 days after the rash.

Results. In the acute phase, the CD4 percentage, CD4/CD8 ratio, and neutrophil percentage declined, whereas the CD8 percentage, WBC, CD4 and CD8 counts, and the lymphocyte percentage increased over the same period, most markedly for the CD8 count. The eosinophil percentage increased significantly with time from onset of rash. Between acute and convalescence samples there was an increase in CD4 percentage, CD4/CD8 ratio, and CD4 count, and a marked decrease in CD8 percentage and CD8 count. The changes were not significant for WBC, lymphocyte percentage, neutrophil percentage, and monocyte percentage, but eosinophil percentage was significantly increased 5–7 weeks after the onset of rash. The haematological changes were related to number of pox and intensity of exposure; a high eosinophil percentage was associated with less severe disease, i.e. less pox.

Conclusion. We report significant changes in T-lymphocyte subsets during the acute phase of chickenpox infection, including a suppression of CD4 + T-cells and an augmentation of CD8 + T-cells. The levels were normalized 1 month later except for eosinophils, and we found no persistent CD4 suppression after chickenpox. An increased number of eosinophils in the peripheral blood was demonstrated early in the acute phase of the disease, and remained elevated in the convalescence phase.

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Introduction

Several studies have documented transient immunosuppression in viral infections, for example, during the acute and convalescence phase of measles infection with a generalized suppression of cellular immune responses,[1] and in human infections associated with herpes virus.[2] We have previously investigated the T-cell subsets in the acute phase of measles infection and during long-term follow up,[3,4] and found significant depression of CD4 T-lymphocytes in the acute phase of infection, but no persistent long-term suppression of the T-cell subsets. A few studies have also examined the T-lymphocyte subsets during the acute phase of varicella,[2,5] and found a decrease in T-helper cells (CD4 + T-lymphocytes) and an increase in suppressor T-cells (CD8 + T-lymphocytes), resulting in an adverse CD4/CD8 ratio. However, these studies included only few cases and had no follow-up samples.

We conducted a household study of chickenpox during an epidemic in Guinea-Bissau to examine risk factors for severe disease.[6] The age distribution among the chickenpox cases in Bissau resembled the pattern seen in developed countries with a median age of infection of 3.6 years. Severity as measured by number of pox and complications, e.g. skin infections, was not related to state of nutrition measured by arm-circumference but to intensity of exposure. Secondary cases infected in the house had a higher number of pox than index cases, the difference being particularly pronounced for girls.

During the study, blood samples were collected in the acute and convalescence phase for serological verification of diagnosis and to analyse the changes in T-cell subsets during the acute phase of chickenpox in an epidemic situation in a developing country. We analysed changes in subsets in relation to severity of disease, number of pox, gender, and intensity of exposure as index or secondary case. Furthermore, we investigated eosinophils in the peripheral blood in relation to severity of infection. Using the convalescence samples, we examined the time until return of basic haematological values, including T-cell subsets and eosinophil numbers in uncomplicated disease and in more severe chickenpox infection.

Material and methods

The study was conducted as a prospective household study during the dry season from December 1994 to June 1995 in an urban area of the capital of Guinea-Bissau. The study area, Bandim, has had ongoing demographic registration and active surveillance for infections in a population of roughly 36 500 people (1993–1994 census). The detection of cases of chickenpox, the clinical examinations, and the serological verification of cases have been described earlier.[6] Exposed persons and suspected cases were followed for identification of secondary cases.

Capillary blood was collected in a heparin microtainer on the day of identification of the case and 1 month later. On the day of sample collection, the white blood cell count (WBC) was estimated using haemocytometer, and blood films for haematologic examination were prepared and air-dried. Immunocytochemical labeling was carried out with monoclonal antibodies against CD4 and CD8 T-lymphocytes by the alkaline phosphatase technique.[7] Two hundred lymphocytes were counted for each of the CD4 and CD8 labelled slides and controlled by counting of 100 lymphocytes by a second observer. Differential counts were performed on the same slides, counting 100 leucocytes. Plasma was analysed for varicella antibodies as earlier described.[6]

Statistical method

The haematological data from acute and convalescence samples were analysed and compared in a log-transformed multivariate linear model, controlling for gender and age. Haematological response in relation to disease symptoms (number of pox, skin infections), exposure (index or secondary case) or treatment (antibiotics) was analysed in a log-transformed multivariate linear model controlling for age, delay since rash, and gender. All analyses were conducted in Stata/SE 8.0 for Windows.

Ethics

The study was approved by the Danish Central Committee and the Ministry of Health in Guinea-Bissau.

Results

A total of 229 children were included in the study as suspected cases of chickenpox. Two blood samples were collected from 202 children. According to serological and epidemiological criteria, 165 were considered to have chickenpox infection, 122 were