

EVALUATION OF CD4 COUNTS AND PERCENTAGES IN THE HIV INFECTED INDIAN POPULATION

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Abstract. This study was designed to evaluate the absolute CD4⁺ counts and percentages in HIV subtype C infected patients at a tertiary care hospital in northern India. The CD4⁺ counts of 377 HIV seropositive subjects were estimated by a FACS Calibur (BD) flow cytometer. Dual color immunophenotyping was performed on each sample, which was acquired and analysed using CellQUEST software. Discordance between CD4⁺ counts and percentages were found more in the early stage *ie* Group A (37.2%) when compared with Group B (31.6%) and Group C (28.8%), with the counts remaining in the normal range but percentages being severely depressed.

INTRODUCTION

The principal immunological defect occurring with the progression of human immunodeficiency virus (HIV) is the loss of CD4⁺ T-helper cells, which plays a pivotal role in the immune response to pathogens. CD4⁺ T-helper cell levels are usually considered as a principal surrogate marker for monitoring disease progression. T-helper lymphocyte percents and absolute numbers are reduced in HIV infected individuals and it is one of the most profound immunological alterations. The CD4⁺ T-helper cell level can be used for predicting the development of AIDS (Detels *et al*, 1987; Fahey *et al*, 1987) and for predicting mortality resulting from opportunistic infections (Taylor *et al*, 1986). It is also used for determining eligibility for trials of new antiretroviral therapies and as an end point measure of drug efficacy. Variability in the CD4⁺ T-helper cell measurement may occur as result of laboratory test error as well as intraperson temporal fluctuations in these measures due to biological factors such as diurnal variation, stress, and acute infection (Malone *et al*, 1990). This study was designed to evaluate the CD4⁺ T-helper cell absolute counts and CD4⁺ T-helper cell percentages to determine which is most applicable since in developing

countries only one evaluation may be available.

MATERIALS AND METHODS

The CD4⁺ T-helper cell levels of 377 HIV seropositive individuals ranging in age from 18 to 65 years were obtained from February 2001 to July 2002 at the discretion of the treating physicians. Informed consent from these subjects was obtained at the time of performing these tests and the guidelines for human experimentation of the Institutional Review Board were followed in the conduct of this clinical research. The HIV antibody status was assessed by three ERS (ELISA, Rapid, Simple) tests as recommended by the WHO for developing countries (NACO, 1986-1999). The study population was classified according to risk groups.

The CD4⁺ T-cell counts and percentages for the 377 HIV seroreactive subjects were determined by the FACS Calibur (Becton Dickinson) flow cytometer. Dual-color immunophenotyping was performed using standard whole blood methodology, four-tube panel: (CD45⁺/14⁺; Igγ1/Igγ2; CD3⁺ CD4⁺; and CD3⁺ CD8⁺) and CellQUEST software was used for all the results. Simultaneously, CD4⁺ percentages, leukocyte counts and differentials were determined for each subject, which were further classified as per CDC criteria. All CD4⁺ measurements were made using the same flow cytometer, sample preparation technique and autoanalyzer over the duration of the study.

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RESULTS

The present study group comprised of 377 HIV seropositive individuals ranging in age from 18 to 66 years; of these 290 (76.9%) were males and 87 (23%) were females. The median CD4⁺ counts/ μ l were 242 and 305 in males and females respectively. The corresponding median CD4⁺ percentages were 10.81 and 15.89 respectively. Among the 377 subjects, Group A was comprised of 110 (29.1%), Group B of 142 (37.6%) and Group C of 125 (33.1%) HIV seropositive patients. For CDC group A, B, and C the median CD4⁺ counts/ μ l was 383, 251 and 205 respectively. The corresponding median CD4⁺ percentages were 6.1, 10.9 and 10.8 respectively. The study population was also divided according to risk groups, which were comprised of heterosexual transmission 233 (61.8%), intravenous transmission 73 (19.3%) and where no known risk factors could be identified in 46 (12.2%) (Fig 1). Discordance between CD4⁺ counts and CD4⁺ percentages was found to be greater in Group A (37.2%) when compared with that of Group B (31.6%) and Group C (28.8%) (Fig 2).

DISCUSSION

The absolute CD4⁺ cell count is used routinely in the evaluation and monitoring of HIV infected people. The CD4⁺ lymphocyte level is a central aspect in the immunopathology following HIV infection, and hence is an important end point, irrespective of the clinical signs and symptoms shown by each infected individual (Taylor *et al*, 1989). In a developing country, like India, where resources are limited for repeated CD4⁺ levels, knowing the prognosis for a patient from a single measurement is of clinical importance irrespective of whether further evaluations of the marker can be done at later times. We undertook a retrospective analysis of HIV infected individu-

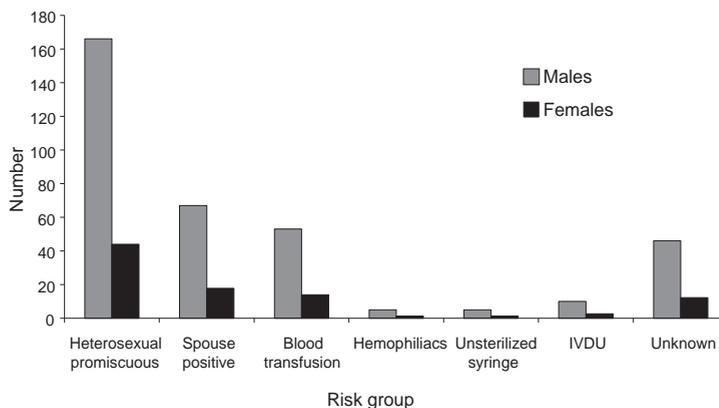
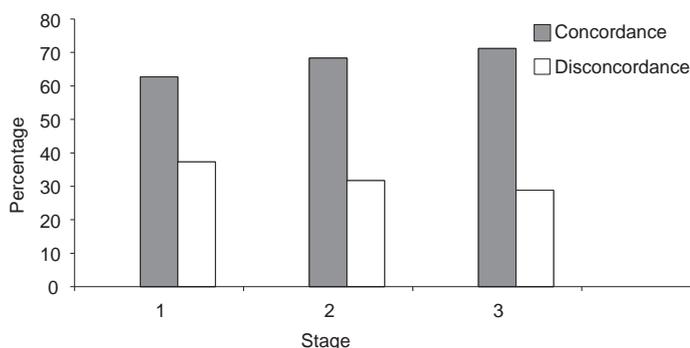


Fig 1—Characteristics of study population.

Fig 2—Comparison of CD4⁺ counts and CD4⁺ percentages - percent of concordance and disconcordance.

als who were attending outpatient medicine clinics, at the All India Institute of Medical Sciences, New Delhi and were being followed for CD4⁺ counts.

The median CD4⁺ counts among HIV seropositive patients was found to be lower when compared with that of Western populations. This trend has also been observed in other Indian studies (Ramalingam *et al*, 2001). It was also observed that the median CD4⁺ counts were lower in males when compared with females. There is no unanimous opinion about which immunological measures (CD4⁺ counts, CD4⁺ percentages or ratios) should be used as a surrogate marker in HIV infection. In a country like India, where most of the HIV infected individuals are antiretroviral treatment naïve, there is a need for stratifying individuals who are candidates for antiviral or immunotherapy and monitoring patients in clinical trials.

In this study discordance between CD4⁺ counts and CD4⁺ percentages were found to be greater in the early stages of HIV infected patients with the counts remaining in the normal range but percentages being severely depressed. Variation in auto analyzer readings can affect CD4 counts, as has been observed in earlier studies also (Le *et al*, 1997). It is important to understand the prognostic significance of this early discordance and on intervention based on the appropriate parameter. This is especially true in our setting, with future AIDS clinical trials.

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