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Short Communication

Total lymphocyte count is a reliable surrogate marker for CD4 cell counts after the first year of antiretroviral therapy: data from an Indonesian cohort study

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Abstract Many studies have evaluated the total lymphocyte count (TLC) as a cheap surrogate marker for CD4 cells in HIV-infected patients not receiving antiretroviral therapy (ART). We assessed whether TLC can replace CD4 cell counts in evaluating the immunological response to ART. In a cohort of patients in Indonesia TLC, if measured after at least 1-year ART, correctly identified patients with <200 CD4 cells, and reliably excluded immunological failure, obviating the need for CD4 cell measurement in 43% of patients.

keywords total lymphocyte count, CD4 lymphocyte count, antiretroviral therapy, *Pneumocystis jirovecii* pneumonia-prophylaxis, immunological failure

Many studies have evaluated the total lymphocyte count (TLC) as a cheap surrogate marker for CD4 cells in HIV-infected patients not receiving antiretroviral therapy (ART). We assessed whether TLC can replace CD4 cell counts in evaluating the immunological response to ART. In a cohort of patients in Indonesia TLC, if measured after at least 1 year ART, correctly identified patients with <200 CD4-cells, and reliably excluded immunological failure, obviating the need for CD4-cell measurement in 43% of patients.

The gold standard for monitoring HIV treatment is regular measurement of circulating HIV-RNA, but in many low- and middle-income countries, this is not routinely available. Measurement of circulating CD4 cells is an accepted alternative strategy and basis for the WHO criteria for immunological failure. However, also CD4 cell count measurements are often unavailable and costly in countries with a high HIV disease burden. Therefore, the role for TLC as a relatively cheap surrogate marker has been assessed in ART-naïve patients. We found that a simple algorithm including TLC, anemia and oral candidiasis more reliably predicted CD4 cell counts necessitating ART than the WHO algorithms, while saving on average $14.05 per patient as a replacement of CD4 (Oudenhoven *et al.* 2011). TLC as a surrogate for CD4 cell counts during ART would lead to even bigger cost savings given the fact that patients on ART require lifelong monitoring. However, only a handful of studies have examined TLC in patients on ART. Some studies found TLC to be a useful prognostic marker (Rajasekaran *et al.* 2007; May *et al.* 2010) with satisfactory correlation with CD4 (Badri & Wood 2003; Mahajan *et al.* 2004) while others did not (Mbanya *et al.* 2007). Most studies were conducted in industrialized countries (Mwamburi *et al.* 2005) or in Africa (Badri & Wood 2003; May *et al.* 2010) to our knowledge none were done in Southeast Asia. We therefore compared TLC and CD4 cell counts in a cohort of patients receiving ART in Indonesia over time, aiming to define optimal cut-off values of single or repeated measurements in different subgroups of patients to identify the need for *Pneumocystis jirovecii* pneumonia (PJP)-prophylaxis or expand counselling for adherence.

From a cohort of HIV patients in Indonesia (Wisaksana *et al.* 2010), 287 consecutive patients were prospectively followed for a minimum of 6 months after starting ART. The mean duration for follow-up after starting ART was 469 days (IQR: 357–652) and 73% of the patients, of whom 76% were men, were followed for more than 365 days. The TLC was measured using the Cell Dyne 3000 (Abbott, Jakarta, Indonesia) and the CD4 cell count

